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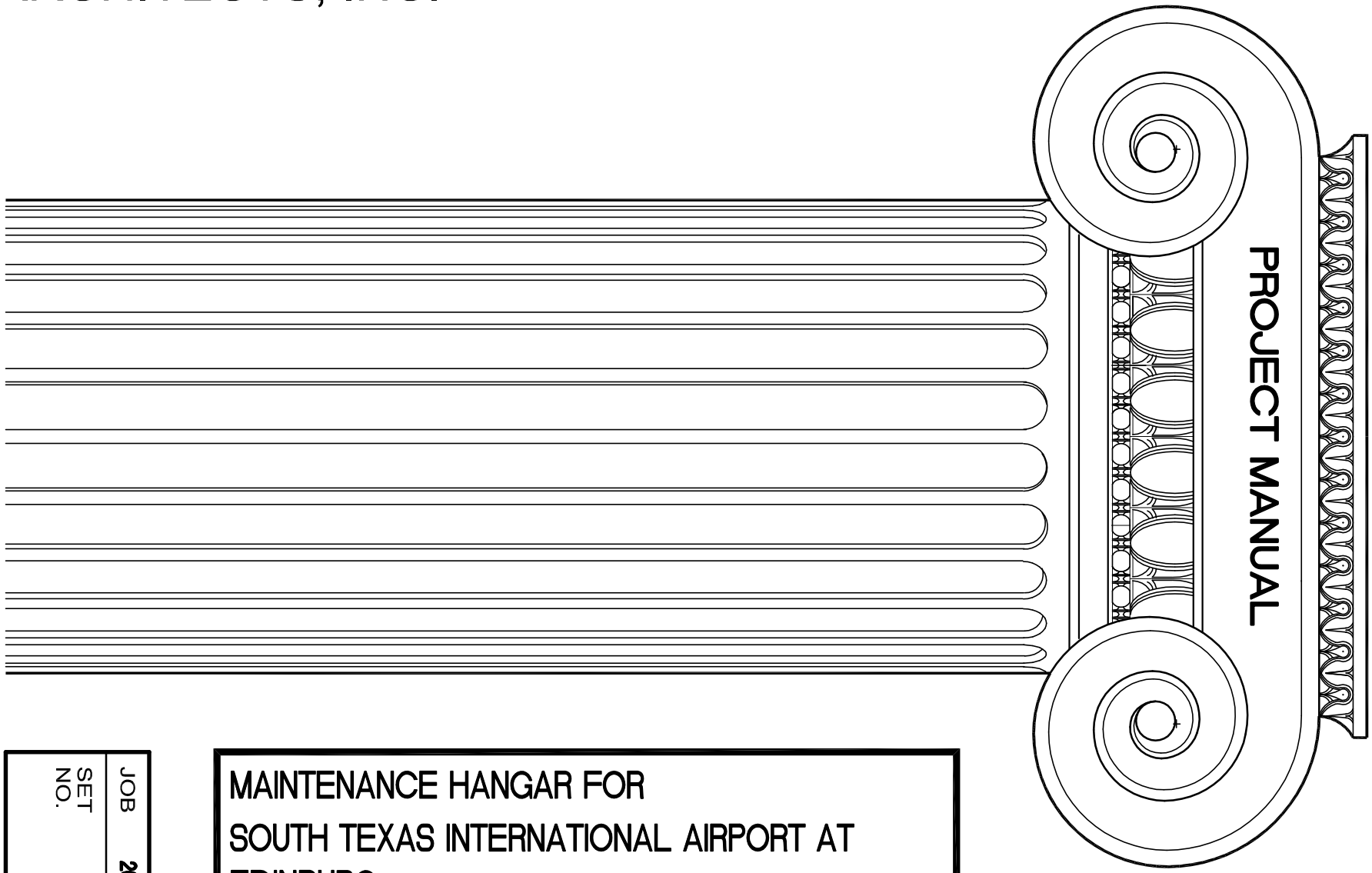
ARCHITECTS, INC.



MAINTENANCE HANGAR FOR SOUTH TEXAS INTERNATIONAL AIRPORT AT EDINBURG

EDINBURG, TEXAS

JOB 201320

SET NO.

PROJECT MANUAL

MAINTENANCE AIRPORT HANGAR
FOR
SOUTH TEXAS INTERNATIONAL AIRPORT
EDINBURG, TEXAS

PROJECT NO. 201320

TEXAS BOARD OF ARCHITECTURAL EXAMINERS
333 Guadalupe, Suite 2-350, AUSTIN, TX 78701-3942
(Tel: 512/305-9000)
HAS JURISDICTION OVER INDIVIDUALS LICENSED UNDER
THE ARCHITECT'S REGISTRATION LAW
ARTICLE 249a, VERNON'S CIVIL STATUTES".

ROFA ARCHITECTS INC.
1007 WALNUT AVENUE
McAllen, TEXAS 78501
{956}686-7771 - FAX: {956}687-3433

PROJECT MANUAL

MAINTENANCE HANGAR
FOR
SOUTH TEXAS INTERNATIONAL AIRPORT AT
EDINBURG, TEXAS

Project No. 201320

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PROJECT NAME: MAINTENANCE HANGAR FOR SOUTH TEXAS INTERNATIONAL AIRPORT AT EDINBURG

PROJECT ENGINEER: Fred L. Kurth, P.E. #54151 8-6-14

STATE OF TEXAS
FRED L. KURTH
54151
LICENSED
PROFESSIONAL ENGINEER

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STATE OF TEXAS
MIGUEL CHANIN
93127
LICENSED
PROFESSIONAL ENGINEER
8-1-14

TRINITY
MEP ENGINEERING

3533 Moreland Dr. Suite A | Weslaco, Texas 78596
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8/01/2014

DIVISION 15 – MECHANICAL

15010 SUMMARY OF MECHANICAL WORK
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16726 INTRUSION DETECTION SYSTEM
16741 TELEPHONE AND DATA COMMUNICATIONS
16900 EQUIPMENT CONNECTIONS AND CONTROL WIRING

THE CITY OF EDINBURG

NOTICE TO BIDDERS

The City of Edinburg is soliciting sealed bids to be received by the City Secretary's Office located at 415 W. University Drive, Edinburg, Texas 78541. City of Edinburg normal business days are Monday through Friday between the hours of 8:00 a.m. to 5:00 p.m. and shall be closed on recognized holidays.

Bids will be received until 3:00 p.m. Central Time, on Tuesday, September 2, 2014, shortly thereafter all submitted bids will be gathered and taken to the Edinburg City Hall Community Room, 1st Floor, to be publicly opened and read aloud. Any bid received after the closing time will not be accepted and will be returned to the bidder unopened. It is the responsibility of the bidder to see that any bid submitted shall have sufficient time to be received by the City Secretary's Office prior to the bid opening date and time. The receiving time in the City Secretary's Office will be the governing time for acceptability of the bids. Bids will not be accepted by telephone or facsimile machine. All bids must bear original signatures and figures. The Bid shall be for:

BID NO. 2014-114
CONSTRUCTION OF THE MAINTENANCE HANGAR AT THE SOUTH TEXAS INTERNATIONAL AIRPORT AT EDINBURG

Bidders receiving a "NOTICE TO BIDDERS" and/or "REQUEST FOR PROPOSALS" notice in the mail or reading same in the newspaper are advised that the bidding documents may be downloaded from the City of Edinburg web page address: www.cityofedinburg.com, or may obtain copies of same by contacting the office of:

THE DEPARTMENT OF PUBLIC WORKS, LOCATED AT 415 W. UNIVERSITY DRIVE, Edinburg, TX 78541 by calling (956) 388-8210 or by e-mailing your request to the following e-mail address: treyna@cityofedinburg.com

If Hand-delivering Bids: 415 West University Drive,
c/o City Secretary Department (1st Floor)

If using Land Courier (i.e., FedEx, UPS): City of Edinburg
c/o City Secretary
415 West University Drive
Edinburg, Texas 78541

If Mailing Bids: City of Edinburg
c/o City Secretary
P.O. Box 1079
Edinburg, TX 78540-1079

The City of Edinburg reserves the right to refuse and reject any or all bids and to waive any or all formalities or technicalities and to accept the bid deemed most advantageous to the City, and hold the bids for a period of 60 days

without taking action.

Bids must be submitted in an envelope sealed with tape and prominently marked on the lower left hand corner of the bid envelope with corresponding bid number and title.

CITY OF EDINBURG
INSTRUCTIONS TO BIDDERS

DEVIATION FROM SPECIFICATION

Please read your specifications/requirements thoroughly and be sure that the SERVICES offered comply with all specifications/requirements. Any variation from the specifications/requirements must be clearly indicated by letter attached to your bid referencing variations on a point-by-point basis. If no exceptions are noted, and you are the successful bidder, it will be required that the SERVICES be provided as specified.

PURPOSE

1. The purpose of these specifications/requirements and bidding documents is for the Bid 2014-114 Construction of the Maintenance Hangar at the South Texas International Airport at Edinburg for the City of Edinburg.

2. The SERVICES to be furnished under this bid shall be as specified in these bid documents. All specifications/requirements shown are minimum. There is no intention to disqualify any bidder who can meet these specifications/requirements.

SUBMITTAL OF BID

Bids will be submitted in sealed envelopes upon the blank bid form attached hereto. Each bid must be completely filled out and SUBMITTED IN ORIGINAL FORM, complete with all supporting documentation. Bids submitted by facsimile (fax) or electronically will NOT be accepted. Submittal of a bid in response to this solicitation for Bids constitutes an offer by the Bidder. Bids which do not comply with these specifications/requirements may be rejected at the option of the City. Bids must be filed with the City of Edinburg, before opening day and hour. No late Bids will be accepted. They will be returned to Bidder unopened (if properly identified).

If Hand-delivering Bids:	415 West University Drive, c/o City Secretary Department (1st Floor)
If using Land Courier (i.e., FedEx, UPS):	415 West University Drive, c/o City Secretary Department (1st Floor), Edinburg, Texas 78541
If Mailing Bids:	P.O. Box 1079, Edinburg, TX 78540-1079

A pre-bid conference will be held at 10:00 a.m., Monday, August 25, 2014 at the Edinburg City Hall Community Room, 1st Floor, located at 415 W. University Drive, Edinburg, Texas. All prospective bidders are encouraged to attend. If you have any questions or require additional information regarding this bid, please contact Insert Contact name, Tomas D. Reyna Assistant Director of Public Works, at (956) 388-8210.

PREPARATION OF BID

Bids MUST give full firm name and address of bidder, and be manually signed. Failure to do so will disqualify your bid. Person signing bid must show title or AUTHORITY TO BIND HIS/HER FIRM IN A CONTRACT.

Firm name and authorized signature must appear on each page that calls for this information. The legal status of the Respondent/Bidder whether corporation, partnership, or individual, shall also be stated in the bid. A corporation shall execute the bid by its duly authorized officers in accordance with its corporate by-laws and shall also list the state in which it is incorporated. A partnership Respondent/Bidder shall give full names and addresses of all partners. All partners shall execute the bid. Partnership and Individual Respondent/Bidder shall state in the bid the names and

addresses of all persons with a vested interest therein. The place of residence of each Respondent/Bidder, or the office address in the case of a firm or company, with county and state and telephone number, shall be given after the signature.

ALTERATIONS/AMENDMENTS TO BID

Bids CANNOT be altered or amended after opening time. Alterations made before opening time must be initialed by bidder guaranteeing authenticity. No bid may be withdrawn after opening time without acceptable reason in writing and only after approval by the City of Edinburg.

SALES TAX

State sales tax must not be included in the bid.

SUBSTITUTIONS

No substitutions or cancellations will be permitted without written approval of City of Edinburg.

NO BID RESPONSE

If unable to submit a bid, bidder should return inquiry giving reasons.

EXCEPTIONS

Any additions, deletions, or variations from the following specifications/requirements must be noted. The bidder shall attach to his/her bid sheet a list of any exceptions to the specifications/requirements if unable to do so, on specification sheet.

BRAND OR MANUFACTURER REFERENCE

Unless otherwise specified, any catalog or manufacturer's reference or brand name used in describing an item is merely descriptive, and not restrictive, and is used only to indicate type and style of product desired. Bids on alternate brands will be considered if they meet specification requirements. If a bidder quotes on equipment other than the one(s) specified in the bid, sufficient specifications and descriptive (pictured literature) data must accompany same to permit thorough evaluation. In the absence of these qualifications, he/she will be expected to furnish the product called for.

DELIVERY

Number of days required to deliver SERVICES after receiving order must be stated in the bid. Failure to so state will obligate bidder to complete service delivery within ONE day. Delivery time may be considered as basis of award.

DELAY IN SERVICE DELIVERY

When delay can be foreseen, Bidder shall give prior notice to City of Edinburg. Bidder must keep City of Edinburg advised at all times of status of order. Default in promised service delivery (without acceptable reasons) or failure to meet specifications/requirements, authorizes the City of Edinburg to purchase such SERVICES elsewhere and charge increase in cost to defaulting vendor. Acceptable reasons for delayed delivery are as follows: Acts of God (floods, tornadoes, hurricanes, etc.), acts of government, fire, strikes, war; Actions beyond the control of the successful bidder.

SERVICE DELIVERED PRICING

Bids in units of quantity specified - extend and show total. In the event of discrepancies in extension, unit prices will govern. Bids subject to unlimited price increase will not be considered.

VALID BID TIME FRAME

The City may hold bids 60 days after bid opening without taking action. BIDDERS shall be required to hold their Bids firm for the same period of time.

INSTRUCTIONS TO BIDDERS (Continued):

RIGHT TO REJECT/AWARD

The City of Edinburg reserves the right to refuse and reject any or all Bids, and to waive any or all formalities or technicalities, and to make such awards of contract as may be deemed to be the best and most advantageous to the City of Edinburg.

MULTIPLE VENDOR CONTRACTS

Bidders are advised that the City of Edinburg may award Contracts to multiple vendors based on low bid per item basis. All items specified on the "Bid Form" must reflect the individual unit prices. The City of Edinburg reserves the right to award all items individually or in any combination thereof.

INDEMNIFICATION CLAUSE

The Bidder agrees to indemnify and save harmless the City, from all suits and actions of every nature and description brought against them or any of them, for or on account of the use of patented appliances, products or processes, and he shall pay all royalties and charges which are legal and equitable. Evidence of such payment or satisfaction shall be submitted upon request of the Purchasing Agent, as a necessary requirement in connection with the final estimate for payment in which such patented appliance, products or processes are used.

ADDENDA

Bidder shall carefully examine the bid forms, specifications/requirements, and instructions to Bidders. Should the bidder find discrepancies in, or omissions from bid forms, specifications/requirements, or other documents, or should he/she be in doubt as to their meaning, he/she should at once notify the Purchasing Agent (Edinburg City Hall, 956-388-8972) and obtain clarification by addendum prior to submitting any bid. Explanations, interpretations, and supplemental instructions shall be in the form of written Addenda which shall become a part of the Contract documents. Said Addenda shall be mailed, e-mailed, hand delivered and/or faxed, to all prospective Bidders. All Addenda issued in respect to this project shall be considered official changes to the original bid documents. Verbal statements in response to inquiries and/or requests for explanations shall not be authoritative or binding. It shall be the Bidder(s) responsibility to ensure that they have received all Addenda in respect to this project. Furthermore, Bidders are advised that they must recognize, comply with, and attach a signed copy of each Addendum which shall be made part of their Bid Submittal. Bidder(s) signature on Addenda shall be interpreted as the bidder's "recognition and compliance to" official changes as outlined by the City of Edinburg and as such are made part of the original solicitation documents. Failure of any bidder to receive any such addendum or interpretation shall not relieve such Bidder from its terms and requirements. Addendums are available online at www.cityofedinburg.com.

PAYMENT

The City of Edinburg will execute payment by mail in accordance with the State of Texas Pay Law after SERVICES have been provided and invoiced. No other method of payment will be considered.

SYNONYM

Where in this bid package ITEMS OR SERVICES is used its meaning shall refer to the Construction of the Maintenance Hangar at the South Texas International Airport at Edinburg as specified.

ASSIGNMENT

Neither the Bidder's contract nor payment due to an awarded vendor may be assigned to a third party without the written approval of the Purchasing Department for the City of Edinburg.

INSTRUCTIONS TO BIDDERS (Continued):

INTERPRETATIONS

Any questions concerning the conditions and/or specifications/requirements with regards to this solicitation for Bids shall be directed to the designated individuals as outlined in the Request for Bids. Such interpretations, which may affect the eventual outcome of this request for Bids, shall be furnished in writing to all prospective Bidders via Addendum. No interpretation shall be considered binding unless provided in writing by the City of Edinburg in accordance with paragraph entitled "Addenda".

STATUTORY REQUIREMENTS

It shall be the responsibility of the successful Bidder to comply with all applicable State & Federal laws, Executive Orders and Municipal Ordinances, and the Rules and Regulations of all authorities having jurisdiction over the work to be performed hereunder and such shall apply to the contract throughout, and that they will be deemed to be included in the contract as though written out in full in the contract documents. (To include issues related to health, environmental, and safety to name a few.)

BIDDER'S EMPLOYEES

Neither the Bidder nor his/her employees engaged in fulfilling the terms and conditions of this Purchase Contract shall be considered employees of the City. The method and manner of performance of such undertakings shall be under the exclusive control of the vendor on contract. The City shall have the right of inspection of said undertakings at any time.

RIGHT TO WAIVE

City of Edinburg reserves the right to waive or take exception to any part of these specifications/requirements when in the best interest of the City of Edinburg.

COOPERATIVE PRICING

Bidders are advised that in addition to responding to our "local" solicitation for bids/Bids with Dealer pricing, vendors/contractors are encouraged to provide pricing on the below referenced items/products/services based on BuyBoard, TX-MAS, H-GAC and/or any other State of Texas recognized and approved cooperative which has complied with the bidding requirements for the State of Texas. If bidding other than or in addition to "dealer" pricing, kindly duplicate the bid forms for each bid being provided from a cooperative contract. Any and all applicable fees must be included. All cooperative pricing must be submitted on or before bid opening date and hour.

TIME ALLOWED FOR ACTION TAKEN

The City of Edinburg may hold bids 60 days after the opening of Bids without taking action. Bidders are required to hold their Bids firm for same period of time.

PREPARATION OF BID

The City of Edinburg shall not be held liable for any costs incurred by any bidder for work performed in the preparation of and production of a bid or for any work performed prior to execution of contract.

CONFIDENTIAL INFORMATION

Any information deemed to be confidential by the bidder should be clearly noted on the pages where confidential information is contained; however, the City cannot guarantee that it will not be compelled to disclose all or part of any public record under Texas Public Information Act, since information deemed to be confidential by the bidder may not be considered confidential under Texas Law, or pursuant to a Court order.

INSTRUCTIONS TO BIDDERS (Continued):

VERBAL THREATS

Any threats made to any employee of the City, be it verbal or written, to discontinue the providing of item/material/services for whatever reason and/or reasons shall be considered a breach of contract and the City will immediately sever the contract with the Vendor on contract.

MATHEMATICAL ERRORS

In the event that mathematical errors exist in any bid, unit prices/rates -v- totals, unit prices/rates will govern.

AUDIT

The City of Edinburg reserves the right to audit the vendor's books and records relating to the performance of this contract. The City of Edinburg, at its own expense, shall have the right at all reasonable times during normal business hours and upon at least twenty-four (24) hours' advance notice, to audit, to examine, and to make copies of or extracts from the books of account and records maintained by the vendor(s) with respect to the Supply/Service and/or Purchase Contract. If such audit shall disclose overpayment by City to vendor, written notice of such overpayment shall be provided to the vendor and the amount of overpayment shall be promptly reimbursed by vendor to the City. In the event any such overpayment is not paid within ten (10) business days after receipt of such notice, the unpaid amount of such overpayment shall bear interest at the rate of one percent (1%) per month from the date of such notice until paid.

PAST PERFORMANCE

Vendor's past performance shall be taken into consideration in the evaluation and award of Service Contract for the Purchase of SERVICES.

JURISDICTION

Contract(s) executed as part of this solicitation shall be subject to and governed under the laws of the State of Texas. Any and all obligations and payments are due and performable and payable in Hidalgo County, Texas.

VENUE

The parties agree that venue for purposes of any and all lawsuits, cause of action, arbitration, and/or any other dispute(s) shall be in Hidalgo County, Texas.

CONFLICT OF INTEREST

CHAPTER 176 OF THE TEXAS LOCAL GOVERNMENT CODE

Effective January 1, 2006, Chapter 176 of the Texas Local Government Code requires that any vendor or person considering doing business with a local government entity disclose in the Questionnaire Form CIQ, the vendor or person's affiliation or business relationship that might cause a conflict of interest with a local government entity. By law, this questionnaire must be filed with the records administrator of the City of Edinburg not later than the 7th business day after the date the person becomes aware of facts that require the statement be filed. See Section 176.006, Local Government Code. A person commits an offense if the person violates Section 176.006, Local Government Code. An offense under this section is a Class C misdemeanor. For more information or to obtain Questionnaire CIQ go to the Texas Ethics Commission web page at www.ethics.state.tx.us/forms/CIQ.pdf.

IF YOU HAVE ANY QUESTIONS ABOUT COMPLIANCE, PLEASE CONSULT YOUR OWN LEGAL COUNSEL. COMPLIANCE IS THE INDIVIDUAL RESPONSIBILITY OF EACH PERSON OR AGENT OF A PERSON WHO IS SUBJECT TO THE FILING REQUIREMENT. AN OFFENSE UNDER CHAPTER 176 IS A CLASS "C" MISDEMEANOR.

INSTRUCTIONS TO BIDDERS (Continued):

AWARD
For purposes of this project, award will be contingent on approval of budget.

SPECIAL CIRCUMSTANCES
In the event that the City of Edinburg has an immediate need for a particular service(s) that is/are on contract and the successful vendor on contract is not able to meet the special service delivery needs of the City of Edinburg, the City of Edinburg reserves the right to purchase such services elsewhere to fulfill its' immediate need.

TERMINATION OF CONTRACT
The City of Edinburg reserves the right to terminate the contract if, in the opinion of the City of Edinburg, the successful vendor's performance is not acceptable, if the City is being repeatedly over charged, improperly charged, no funds are available, or if the City wishes, without cause, to discontinue this contract. Termination will be in written form allowing a 30-day notice. The bidder shall be afforded the same right to terminate this contract in the same manner.

INSURANCE REQUIREMENTS: Staff may waive insurance requirements for contracts $0 - $4,999.99, including but not limited to contracts for food, materials, supplies, and construction. Workers' Compensation in amounts which satisfy statutory coverage shall be required for construction projects.

The following insurance requirements will be included in all City contracts of $5,000 - $14,999.99. In contracts not involving building and construction projects, as that activity is defined in TEX. LABOR CODE §406.096, contractors may obtain alternative form of worker accident insurance with minimum limits of liability of $100,000 per claim.

Minimum Insurance Requirements	
Type of Coverage	Limits of Liability
Worker's Compensation	Statutory Coverage
Comprehensive General Liability (City named as additional insured) Bodily Injury	$250,000 each person/$500,000 each occurrence
Property Damage	$100,000 each occurrence/$100,000 aggregate or $500,000 combined single limits

The following insurance requirements will be included in all City contracts of $15,000 or more.

(1) The successful bidder will be required to carry the following insurance coverage and limits of coverage, as well as list the City as an additional insured to liability coverage as requested by the City. In addition, the successful bidder shall provide the City with evidence of coverage and furnish acceptable proof of payment of insurance premiums.

(2) The successful bidder will be required to secure and/or have insurance coverage in force with an admitted property and casualty insurance company licensed by the State of Texas to conduct business in the State of Texas.

(3) In contracts not involving building and construction projects, as that activity is defined in TEX. LABOR CODE §406.096, contractors may obtain alternative form of worker accident insurance with minimum limits of liability of $100,000 per claim.

Minimum Insurance Requirements	
Type of Coverage	Limits of Liability
Worker's Compensation	Statutory Coverage
Employer's Liability	Bodily Injury by Accident: $100,000 each accident Bodily Injury by Disease: $100,000 each employee/$500,000 policy limit
Comprehensive General Liability Bodily Injury Property Damage	 $250,000 each person/$500,000 each occurrence $100,000 each occurrence/$100,000 aggregate or $500,000 combined single limits
Comprehensive Auto Liability Bodily Injury Property Damage	 $100,000 each person/$500,000 each occurrence $100,000 each occurrence/$100,000 aggregate or $500,000 combined single limits
City's Protective Liability Bodily Injury Property Damage	 $250,000 each person/$500,000 each occurrence $100,000 each occurrence/$100,000 aggregate or $500,000 combined single limits

Policies must name the City of Edinburg as an Additional Insured.
Certificates of insurance naming the CITY as an additional insured shall be submitted to the CITY for approval prior to any services being performed by Contractor. Each policy of insurance required hereunder shall extend for a period equivalent to, or longer than the term of the Contract, and any insurer hereunder shall be required to give at least thirty (30) days written notice to the CITY prior to the cancellation of any such coverage on the termination date, or otherwise. This Contract shall be automatically suspended upon the cancellation, or other termination, of any required policy of insurance hereunder, and such suspension shall continue until evidence that adequate replacement coverage is provided to the CITY. If replacement coverage is not provided within thirty (30) days following suspension of the Contract, the Contract shall automatically terminate.

BID BOND REQUIREMENTS

If the contract amount is over twenty-five-thousand dollars ($25,000) for construction of the project, the successful bidder shall provide a bid guarantee, give a good and sufficient bond in the full amount of the contract price for the faithful performance of such contract, executed by a surety company authorized to do business in the State of Texas, in accordance with Article 5160, Vernon's Texas Civil Statutes, and amendments thereto. A payment bond in the full

amount of the contract price to assure payment shall be required by law of all persons supplying labor and material in the execution of the project provided for in the contract documents.

A bid guarantee equivalent to five percent (5%) of the bid price will be required from each bidder. The "bid guarantee" shall consist of a firm commitment, such as a bid bond, certified check or other negotiable instrument accompanying a bid as assurance that the bidder will upon acceptance of his/her bid, execute such contractual documents as may be required within the time specified.

A performance bond on the part of the contractor for one-hundred percent (100%) of the contract price will be required. A "performance bond" is one executed in connection with a contract to secure fulfillment of all the contractor's obligations under such contract.

A payment bond on the part of the contractor for one-hundred percent (100%) of the contract price will be required. A "payment bond" is one executed in connection with a contract to assure payment, as required by law, of all persons supplying labor and material in execution of the work provided for in the contract documents.

Bidders are expressly advised to review the contract documents fully and insurance requirements of the proposed contract as to their legal requirements and the causes which may lead to the disqualification of a bidder and/or rejection of a bid proposal. No bid may be withdrawn within a period of sixty (60) days after the dated fixed for opening the bids. Unless all bids are rejected, the Owner will give Notice of Award of Contract to the successful bidder as soon as possible consistent with the time for a thorough analysis of bids submitted. Bidders are expected to inspect the site of work and to inform themselves regarding all local conditions which may affect their bid.

A bid guarantee, performance and payment bond will not be required for contracts zero to $25,000. The City will specify in the contract that no money will be paid to the contractor until the project has been completed and final acceptance has been made by the City.

DOCUMENTS:

A. Bidding Documents may be downloaded from the City of Edinburg web page address: www.cityofedinburg.com. Bidders may print the bid document at bidders expense. Printing expenses are not reimbursed by City of Edinburg nor Architect.

B. Complete sets of Bid Documents shall be used in preparing bids; neither the Owner nor the Architect assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

C. Complete digital sets of Drawings and Project Manuals are on file at the following locations and subcontractors may examine them there:

McGraw-Hill Construction
www.dodgeplans.construction.com

SOUTHWEST BUILDERS EXCHANGE
4047 Naco Perrin Suit 100
San Antonio, Texas 78217
(210) 564-6900

REED CONSTRUCTION DATA
30 Technology Parkway South
Norocoroff GA, 30092
(630) 288-7959

A.G.C. PLAN ROOMS
Pharr, Harlingen, Brownsville

EXAMINATION:

A. Bidders shall carefully examine the Bid Documents and the construction site to familiarize themselves with existing local conditions under which the Work is to be performed.

B. Extra payments will not be authorized for work that could have been foreseen by careful examination of the site. Submission of a Bid shall constitute acceptance, by the Bidder, of existing site conditions as a part of the requirements for this work.

C. Bidders shall carefully examine the Bid Documents to verify that they agree with the Table of Contents in the Project Manual, the Index of Drawings Sheet on the Drawings, and the Cover Page of all Addenda. Bidders shall be responsible for obtaining any pages or sheets which have been inadvertently left out during the printing process.
   1. All entities bidding on any portion of the work contained in the Contract Documents shall ascertain the completeness of the set of documents.
   2. The Contract Documents are printed by an independent vendor and, although the Architect endeavors to check the documents for completeness, the Architect has, in the past, discovered missing or misplaced sheets in the Drawings and the Specifications.
   3. Each entity receiving a set of Contract Documents shall check the indexes against the sheets or pages contained in the sets.
   4. Should pages or sheets be found to be misplaced or missing, immediately notify the Architect who will give direction as to placement or provide the sheets or pages that are missing.
   5. Failure to notify the Architect means the Bidder is providing a proposal based on a complete set of Contract Documents.

INTERPRETATION OF BID DOCUMENTS:

A. Bidders shall promptly notify the Architect of any ambiguity, inconsistency or error which they may discover upon examination of the Bid Documents or of the site and local conditions.

B. Submit all questions regarding clarification or interpretation of Bid Documents to the Office of the Architects: RIKE-OGDEN-FIGUEROA-ALLEX, ARCHITECTS, 1007 Walnut Avenue, McAllen, TX 78501. *(Attn: Humberto Rodriguez, AIA* - {956}686-7771; FAX NUMBER {956}687-3433).

C. Submit all questions in writing. In the interest of time, requests may be made by telephone, but they must be confirmed in writing the same day. Replies to questions will be issued to all Bidders in the form of an Addenda. General contractor and subcontractors shall submit questions in writing seventy two (72) hours prior to opening of proposals.

D. Make requests for interpretations as early as possible so as to allow adequate time to prepare and issue Addenda.

E. All General Contractors shall check with the Architect within *six (6)* hours prior to Bid Opening to secure all Addenda. The Architect will not be responsible for oral clarification.

BASIS OF BIDS:

A. Bids shall be on a lump sum basis and shall include all costs for this Project as described and indicated by the Contract Documents. Basis for Bidding shall be on brands, materials, processes, products, persons or organizations, etc., indicated in the Contract Documents.

B. Bids shall include all unit price costs and all Alternate costs as indicated by the Contract Documents and Proposal Form.

ALTERNATES:

A. The Owner may, at his option, elect to proceed with any or all Alternates as set forth in the Bidding Requirements.

B. Amount shown in Bid for each Alternate shall include profit, insurance, contingencies and other costs incidental to performance under such Alternative.

C. Amount shown in Bid for each Alternate shall include the making of all changes and the installation of all materials and equipment necessary to the accomplishment of the Alternate requirements.

SUBSTITUTIONS:

A. Approval Required:

1. The Contract is based on the standards of quality established in the Contract Documents.

2. All products proposed for use, including those specified by required attributes and performance, shall require approval by the Architect before being incorporated into the work.

3. Do not substitute materials, equipment, or methods unless such substitution has been specifically approved for this work by the Architect.

4. Product substitution requests shall be submitted no later than 7 days prior to Opening of Bids (Proposals) as noted in Section 00020.

BIDS:

A. Bid shall be made on unaltered Bid Forms furnished by the Architect. No oral, telephone or personal Proposals will be considered. All blank spaces shall be properly filled in by typewriter or manually in ink.

B. Where so indicated by the makeup of the Bid Form, sums shall be expressed in both words and figures, and in case of discrepancy between the two, the written amount shall govern.

C. Any alteration or erasure to information entered in the blank spaces must be initialed by the signer of the Bid. Bidder shall make no additional stipulations on the Bid Form nor qualify his bid in any other manner.

D. Original typed sheets shall be submitted, signed in longhand below the typed name of the person authorized to bind the Bidder to a Contract.

E. Where Bidder is a corporation, Bid must be signed with the legal name of the corporation followed by the name of the State of Incorporation and the legal signature of a person authorized to bind the corporation to a Contract.

F. Failure to submit a Bid on the form requested, or the inclusion of conditions, limitations or provisions distorting the intent of the Bid Documents, may render the Bid irregular and subject to rejection.

MODIFICATION OR WITHDRAWAL OF BID:

A. A bid may not be modified, withdrawn or canceled by the Bidder during the stipulated time period following the time and date designated for the receipt of Bids, unless the award of Contract has been delayed more than sixty (60) days.

B. Prior to the time and date designated for receipt of Bids, bids submitted early may be modified or withdrawn only by notice to the party receiving Bids at the place and prior to the time designated for receipt of Bids.

C. Modification of Bids shall be in writing over the signature of the Bidder or be by telegram; if by telegram, written confirmation over the signature of Bidder must have been mailed and postmarked on or before the date and time set for receipt of Bids; it shall be so worded as not to reveal the amount of the original Bid.

D. Withdrawn Bids may be resubmitted up to the time designated for the receipt of Bids provided that they are then fully in conformance with these Instructions to Bidders.

E. Bid security shall be in an amount sufficient for the Bid as modified or resubmitted.

LOCATION AND ACCESS TO PREMISES:

A. The project site location: *Refer to vicinity map on drawings.*

B. The Contractor shall have free access to the premises for the purpose of acquainting himself with the conditions, delivering equipment, and performing the work necessary to fulfill his contract. He shall cooperate with the other contractors who may concurrently be working on the premises, integrating his work with that of others, all to the best interest of the total work and its orderly completion.

STATE SALES TAX:

A. This project is exempt from state taxes. A sales tax exemption certificate may be obtained form the State Comptroller.

THE STATE OF TEXAS §

COUNTY OF HIDALGO §

CITY OF EDINBURG §

CONTRACT BETWEEN THE CITY OF EDINBURG AND (COMPANY NAME) FOR THE CONSTRUCTION OF THE MAINTENANCE HANGER AT THE SOUTH TEXAS INTERNATIONAL AIRPORT AT EDINBURG

Contract between the **City of Edinburg** (hereinafter called "City"), and **(COMPANY NAME)** (herein called "Contractor"), entered into an agreement for the construction of the maintenance hangar at the South Texas International Airport at Edinburg.

RECITALS

WHEREAS, the City desires to engage the Contractor for certain services in connection therewith; and,

WHEREAS, Contractor represents that it has the knowledge, ability, and personnel to properly provide construction services needed by the City;

NOW, THEREFORE, the City and Contractor do mutually agree as follows:

SECTION I
EMPLOYMENT OF CONTRACTOR

City agrees to employ Contractor to provide the following basic services as stated in the following sections and upon receipt of such satisfactory services, City agrees to pay Contractor as stated in the sections to follow.

SECTION II
BASIC SERVICES OF CONTRACTOR

The Contractor agrees to perform the work in connection therewith, under the terms of this Agreement and the Bid Proposal form. This includes construction of the maintenance hangar, at contractor's own proper cost and expense to furnish all the labor, insurance and other accessories and services necessary to complete the said tasks in accordance with the conditions and prices stated.

SECTION III
TIME OF PERFORMANCE

The Contractor shall perform services and materials as identified in Bid 2014-114 and Statement of Work prepared for Edinburg, Construction of the Maintenance Hangar at the South Texas International Airport at Edinburg, attached as Exhibit "A". Work shall be completed upon request of the City and during the course of **180 days**, with the contract terminating on April 4, 2015. Contractor and City shall not be liable for any delay due to circumstance beyond its control.

SAMPLE

SECTION IV
STANDARD OF PERFORMANCE

Contractor warrants to City that all labor furnished to perform the Work under the Contract Documents will be competent to perform the tasks undertaken, that the product of such labor will yield only first-class results, that materials and /or equipment furnished will be of good quality and new unless otherwise permitted by the Contract Documents, and that the Work will be of good quality, free from faults and defects, and in strict conformance with the Contract Documents. Any Work not strictly conforming to these requirements may be considered defective.

SECTION V
TERMS OF PAYMENT

City agrees to pay Contractor for services herein contracted for as follows:

A. Payment for basic services shall be upon receipt of invoice by City. Invoice shall be submitted to City upon completion and inspection of each project in accordance with the contract Documents/Bid Packet based on a unit prices for the total amount to (**$_____)**.

B. Invoice shall be completed and processed in accordance with City regulations. Contractor shall submit Applications for Payment in accordance with the general Conditions. Application for Payment will be processed by the consulting Engineers and the Department of Public Works as provided in the General Conditions.

C. City shall authorize all payments made for services rendered. Payment terms shall be net thirty (30) days from receipt of invoice.

D. If changes in plans or specifications are necessary after the performance of the contract is begun or if it is necessary to decrease or increase the quantity of work to be performed or of materials, equipment, or supplies to be furnished, the governing body of the municipality must approve change orders before making the changes in accordance with City Code of Ordinance and applicable section of the Texas Local Government Code and Texas Government Code.

E. The total contract price may not be increased because of the changes unless additional money for increased costs is appropriated for that purpose from available funds or is provided for by the authorization of the issuance of time warrants.

SECTION VI
TIME OF COMPLETION

SAMPLE

City and the Contractor recognize that time is of the essence of this agreement and that the City may suffer financial loss if the WORK is not completed within the time specified in Section III herein, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. Accordingly, instead of requiring any such proof, the City and the Contractor agree that not as a penalty, but as added expense for Engineering/Architectural supervision the Contractor shall pay the City for each day that expires after the time specified in Section III herein the amount corresponding below:

FOR AMOUNT OF CONTRACT	COST PER DAY
$ 5,000.00 to $ 25,000.00	$100.00
$ 25,001.00 to $ 100,000.00	$200.00
$ 100,001.00 to $ 500,000.00	$250.00
$ 500,001.00 to $1,000,000.00	**$300.00**
$1,000,001.00 to $2,000,000.00	$400.00
$2,000,001.00 to $3,000,000.00	$500.00
$3,000,001.00 to $4,000,000.00	$600.00
$4,000,001.00 to $5,000,000.00	$700.00
$5,000,001.00 and over	$800.00

SECTION VII
SCHEDULE REQUIREMENTS

Whenever, in the opinion of City, the Work falls behind schedule, the Contractor shall, to the extent necessary to meet said schedule, increase its labor force and/or provide overtime, Saturday, and Sunday and/or holiday work, and shall have each Subcontractor do likewise, all at no additional cost to or compensation from City. Further, City shall have the right to offset against any amounts then or thereafter due to the Contractor, or to be reimbursed by the Contractor for, any additional costs City may incur as a direct result of said increase in labor force or overtime, Saturday, Sunday, and/or holiday work.

SECTION VIII
WRITTEN NOTICE OF ISSUE

In the event that any issue arises relating to any of the provisions contained in this Agreement, including, but not limited to potential delays, change orders, time extensions, weather delays, etc. Contractor agrees to notify the City, in writing, immediately, relating to such issue and proposed resolution. Failure to give such notice shall constitute a waiver of any other remedies available to Contractor hereunder.

SECTION IX
NO DAMAGE FOR DELAY

In the event of any delay, not the fault of the Contractor, the Contractor shall be entitled to an extension of time for completion only, and shall not be entitled to any additional payment on account of such delay. Without limiting the foregoing, the Contractor shall

SAMPLE

not be entitled to payment or compensation of any kind from the City for direct, indirect or impact damages, and/or consequential damages, including but not limited to costs of acceleration arising because of hindrance or from any cause or whatsoever, whether such hindrances or delays be reasonable or unreasonable, foreseeable or unforeseeable, or avoidable or unavoidable; provided, however, that this provision shall not preclude recovery by the Contractor of damages for hindrances or delays due solely to fraud or bad faith on part of the City or his agents.

SECTION X
UNREASONABLE SITE INSPECTION REQUIREMENTS

The Contractor acknowledges that it has taken steps necessary to ascertain the nature and location of the Work and that it has investigated and satisfied itself as to the general and local conditions which can affect the Work and its costs. The Contractor also acknowledges that it has satisfied itself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered or difficulties or access insofar as this information is ascertainable from an inspection of the site, and available documents, including all information from exploratory work done by the City and its design consultants as well as from the Drawings and Specifications made a part of this Contract. The Contractor has the right to make any additional tests necessary to assure himself that the site conditions are satisfactory for the work contemplated.

SECTION XI
DUTY TO COORDINATE AMONG SEPARATE PRIME CONTRACTORS

The City reserves the right to engage separate contractors to perform aspects of the Project other than the Work under this Agreement. In such case, contractor shall coordinate sequence and schedule its work together and in cooperation with such other contractors. In the event of any difficulties caused by any such other separate contractor, this contractor shall look solely for relief to such other contractors and shall not make claim against City.

SECTION XII
CONTRACT DOCUMENTS

The Contract Documents which comprise the entire agreement between City and Contractor concerning the WORK consist of this Agreement and the following attachments to this Agreement:

- Notice to Bidders
- Addenda
- Instructions to Bidders
- Bid Proposal Forms including the Bid, Bid Schedule(s), Information Required of Bidder, Bid Bond, and all required certificates and affidavits
- Special Provisions
- Agreement for Engineering/Architectural Construction

SAMPLE

- Performance Bond
- Payment Bond
- General Conditions of Contract for Engineer/Architectural Construction
- Supplemental General Conditions
- Affidavit and Waiver of Lien Prime Contractor
- Release and Waiver by Subcontractor and Product Vendor
- Contractor's Affidavit as to Status of Lien
- Technical Specifications, as listed in the Table of Contents.
- Drawings
- Change Orders which may be delivered or issued after Effective Date of the Agreement and are not attached hereto.

There are no Contract Documents other than those listed in this Section VI. The Contract Documents may only be amended by Change Order as provided in the General Conditions.

SECTION XIII
ASSIGNMENT

No assignment by a party hereto of any rights under or interests in the Contract Documents will be binding on another party hereto without the written consent of the party sought to be bound; and specifically but without limitation monies that may become due and monies that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

SECTION XIV
NON-APPROPRIATIONS

Not withstanding anything in the contract documents to the contrary, any and all payments which the City is required to make under this contract shall be subject to annual appropriation or other availability of funds, as certified by the Director of Finance.

If the City cannot appropriate sufficient funding, then either party has the right to terminate the contract by providing (10) ten days written notice to the other party.

Furthermore, execution of this contract does not automatically guarantee a renewal of contract upon expiration.

SECTION XV
MINIMUM INSURANCE REQUIREMENTS

In accordance with City ordinances, Contractor shall be required to hold the following minimum insurance coverage throughout the duration of this Agreement:

SAMPLE

A. Workers Compensation-
In accordance with the State statute

B. Employer's Liability

Bodily Injury by Accident:	$100,000 each accident
Bodily Injury by Disease:	$100,000 each employee
	$500,000 policy limits

C. Comprehensive General Liability

Bodily Injury	$250,000 each person
	$500,000 each occurrence
Property Damage	$100,000 each occurrence
	$100,000 aggregate
-or-	$500,000 combined single limits

D. Comprehensive Auto Liability

Bodily Injury	$250,000 each person
	$500,000 each occurrence
Property Damage	$100,000 each occurrence
	$100,000 each aggregate
-or-	$500,000 combined single limits

E. City's Protective Liability

Bodily Injury	$250,000 each person
	$500,000 each occurrence
Property Damage	$100,000 each occurrence
	$100,000 each aggregate
-or-	$500,000 combined single limits

Evidence of the above insurance coverage shall be required prior to final execution of the agreement. The City shall be listed as an additional insured.

Contractor warrants that it is adequately insured and carries liability, workers compensation, and automobile insurance for injury to its employees and others incurring loss or injury as a result of the acts of Contractor or its employees.

Contractor shall not commence work under this agreement until all insurance requirements have been obtained and proof of such insurance shall have been provided to the City, nor shall Contractor allow any Sub-Contractor to commence work until all insurance as noted above has been so obtained and provided to the City. Approval of the insurance by City shall not relieve or decrease the liability of the Contractor.

SECTION XVI

SAMPLE

TERMINATION OF CONTRACT

In addition to any other terminate clause in this agreement, either party to this agreement shall have the right to terminate this contract at any time, and for any reason, after 30 days' written notice and any payment requested shall be made on work completed and/or goods delivered and as provided for in the contract.

SECTION XVII
SEVERABILITY

If any term or provision of this Agreement is held by a court of competent jurisdiction to be invalid, void, or unenforceable, the remainder of the provisions of this Agreement shall remain in full force and effect and shall in no way be affected, impaired or invalidated.

SECTION XVIII
ALTERNATE DISPUTE RESOLUTION/NEUTRAL PARTY

A. Any controversy, claim or dispute between the parties arising out of or relating to the provisions of this Agreement or the breach, termination or validity thereof shall, upon written request of either party, immediately be referred jointly for resolution of the controversy by non-binding mediation.

B. The mediation must be concluded within any period mutually agreed upon by the parties but in no event no later than within forty-five (45) days after written notice is given by either party of its intent to proceed to mediation. Unless the parties expressly agree otherwise, each party shall bear its own costs, legal and expert fees incurred in the mediation, and evenly share the costs of the mediator. If, after proceeding in good faith the parties, with the assistance of a neutral mediator, do not resolve the dispute within the forty-five (45) day period, the parties may proceed in accordance with paragraph (C) below.

C. After exhausting the procedures set forth above, either party may initiate litigation to resolve the dispute. The Law of the State of Texas shall control the matter in controversy. Venue is mandatory in Hidalgo County, Texas.

SECTION IXX
NOTICE

All notices or other communications required under this Agreement may be affected either by personal delivery in writing or by Certified Mail, Return Receipt Requested. Notice shall be deemed to have been given when delivered or mailed to the parties at their respective addresses as set for the below or when mailed to the last address provided in writing to the other party by the addressee.

SECTION XX

SAMPLE

HOLD HARMLESS CLAUSE

Contractor hereby agrees to indemnify and hold harmless and defend Lessor, its agents, employees, and officers from and against any claim, loss, damage, liability, and expense, including reasonable attorney's fees, incurred or suffered by it, by reason of any and all claims, demands, or causes of action asserted or that may be asserted, against any or all of the above named parties, whether alleging intentional or negligent acts or omissions, and whether seeking compensatory or punitive damages, and involving, arising out of, or in any manner relating to this Contract.

SECTION XXI
MISCELLANEOUS

Any changes to this document must be approved by City and signed by both parties to the agreement.

EXECUTED by the parties in triplicate originals on this _____ day of _____, 2014.

CITY OF EDINBURG:

BY:_____
Ramiro Garza Jr., City Manager
City of Edinburg
415 W. University Dr.
Edinburg, Texas 78540
Phone: (956)383-5661
Fax: (956)383-7111

ATTEST:

BY:_____
Myra L. Ayala Garza, City Secretary

APPROVED AS TO FORM:
PALACIOS, GARZA & THOMPSON, P.C.

BY: _____
City Attorney

(COMPANY NAME)

BY:_____

SAMPLE

Name
Title
Address
City, State, Zip
Phone
Email:

ATTACHMENTS: Exhibit A: Scope of Work
Exhibit B: Certificates of Insurance

SAMPLE

Exhibit A: Scope of Work

Please Refer to the Bid Proposal Form:

***The contract is being awarded based on the base bid price, and quantities are only an estimate, subject to increase or decrease to accommodate changes in project scope, schedules, locations, and funding.*

SAMPLE

Exhibit B: Certificates of Insurance

SAMPLE

SECTION 00310

PROPOSAL FORM FOR COMPETITIVE SEALED BIDS

BID FROM: _____

ATTN: Tomas Reyna Assistant Director of Public Works

RE: Maintenance Airport Hangar for South Texas International Airport in Edinburg Texas

The Undersigned proposes to furnish all labor, services, materials, tools, and necessary equipment for the construction of the ***Maintenance Airport Hangar for South Texas International Airport in Edinburg Texas*****,** and to perform the work required for the construction of said project at the location set out by the Drawings, Project Manual and Specifications, in strict accordance with the Contract Documents for the completed work.

In submitting this Proposal, it is understood that this Proposal may not be altered or withdrawn for sixty (60) calendar days and that the Owner has reserved the right to reject any and all Proposals.

The Undersigned certifies that this Proposal is made in good faith, without collusion or connection with any other person, persons, partnership, company, firm, association, or corporation offering on this work, for the following sum or prices to wit:

BASE BID: _____

_____ ($ _____) DOLLARS

Alternate No. 1 Storm Sewer Junction Box: That amount to provide labor and materials to install a storm sewer junction box as indicated on civil drawing C-2:

_____

_____ ($ _____) DOLLARS

Alternate No. 2 Electric Operating Aircraft doors: That amount to provide labor and materials to install an electric operating aircraft doors system as indicated on drawings:

_____

_____ ($ _____) DOLLARS

Alternate No. 3 Foam-water fire sprinkler system for Hangar A100: *Base bid shall include a fully sprinkled building as per NFPA 13*. Alternate No. 3 shall include that amount to provide labor and materials to install a foam-water fire sprinkler system as per NFPA16, reference sheets FP1.1:

_____

_____ ($ _____) DOLLARS

The Undersigned further agrees that in case of authorized variations of quantities from those shown or specified, the attached ***UNIT PRICE SCHEDULE*** will be used in adjusting the Contract Price.

The Undersigned hereby declares that he/she has visited the site and has carefully examined the Drawings, Specifications, Contract Documents and Proposal Documents related to the Work covered by this proposal.

Upon receipt of *"NOTICE TO PROCEED"*, the Undersigned will immediately execute the formal contract (Agreement).

The Undersigned agrees to complete upon request of the City and during the course of 180 days with the contract terminating on April 04, 2014. Contractor and City shall not be liable for any delay due to circumstances beyond its control

The Contract required will be that Standard Form of the American Institute of Architects or an owner modified form and shall provide for payment on accounts of ***ninety-five (95%)*** percent of the value monthly.

The Proposal, the Agreement, the Drawings, the General Conditions, Supplementary General Conditions, the Specifications and any Addenda shall all become a part of the Contract.

I HEREBY ACKNOWLEDGE RECEIPT OF THE FOLLOWING ADDENDUM:

_____

BONDING COMPANY (IES):

_____
(Name and address)

If awarded this contract, the offerer intends to use the following subcontractors:

ELECTRICAL: _____

PLUMBING: _____

AIR CONDITIONING: _____

STRUCTURAL STEEL FABRICATOR: _____

AISC Certificate Number: _____
Or
IAS - ICC Certificate Number: _____
Or
IBC - Certificate Number: _____

Respectfully Submitted:

BY: _____

FIRM: _____ If corporation affix seal here

TITLE: _____

DATE: _____

SECTION 00310
BID PROPOSAL FORM (UNIT PRICES)

A. In case of additions or deletions to the Work from the Work shown in the Contract Documents, the following Unit Prices shall be used in adjusting the Contract Price. All Unit Prices shall remain in effect until completion of the Project. All Unit Prices shall be the total cost for material, labor, tax if applicable insurance mark-ups, overhead and profit.

ITEM		ADD	DEDUCT
1.	***Resilient Flooring as specified in Section 09660. (VCT)***	***$ /S.F.***	***$ /S.F.***
2.	***Tape, float and paint gypsum board as specified in Section 09900 (one side).***	***$ /S.F.***	***$ /S.F.***
3.	***4 ½" X 4 ½" Ceramic Wall Tile as specified in Section 09312***	***$ /S.F.***	***$ /S.F.***
4.	***120 duplex wall outlet – device, cover plate, and rough-in. Include 10 ft. ½" C and 30ft. No. 12 wire (assume new circuit is not required).***	***$ /each***	***$ /each***
5.	***Multi-purpose wall outlet – empty box, blank cover plate. Include 9 ft. ¾" conduit, empty.***	***$ /each***	***$ /each***
6.	***Light Switch, in wall -Empty wall box, cover plate. Include 10 ft of ½" C and No. 12 wires.(assume new circuit is not required).***	***$ /each***	***$ /each***
7.	***24" x 24" ceiling diffuser with 20 ft. of 12" round duct.***	***$ /each***	***$ /each***
8.	***Water hose bib (exterior) with 50 ft. of 3" copper line including tee and 2 els. 24" deep trench.***	***$ /each***	***$ /each***
9.	***Fire extinguishers and extinguisher cabinet, as specified.***	***$ /each***	***$ /each***
10.	***Door, frame, classroom function lock and hardware for: (As applicable)***		
	a) Type 'A" Door	***$ /each***	***$ /each***
	b) Type 'B' Door	***$ /each***	***$ /each***
11.	***Acoustical tile Type "C.1" and suspension system – SECTION 09511***	***$ /S.F.***	***$ /S.F.***
12.	***5/8" thick Gyp. Bd. Ceiling installed***	***$ /S.F.***	***$ /S.F.***
13.	***4" thick sidewalk.***	***$ /S.F.***	***$ /S.F.***
14.	***Metal stud wall framing, provide for material and labor:***		
	a) 3 5/8" x 12' tall metal partition to include sill and top runners.	***$ /Ln. Ft.***	***$ /Ln. Ft.***
	b) 6" x 12' tall metal partition to include sill and top runners.	***$ /Ln. Ft.***	***$ /Ln.Ft.***

Respectfully Submitted:

By:

Date:

Business Address Complete:

Seal, If Bid is by a Corporation.

SECTION 00320

SOIL INVESTIGATION DATA

PART 1: GENERAL:

1.01 SUBSURFACE SOIL INVESTIGATION:

A. Subsurface borings have been taken at the Project Site and a Final Report on Foundation Soil investigation has been prepared.

B. The information was obtained for use in preparing the foundation design, but is indicative only of the soil conditions where the boring is taken.

C. Bidders are expected to examine the site and the record of investigation to determine character of materials to be encountered.

D. If soil conditions other than those indicated are encountered during construction, notify the Architect before work continues.

E. Attached.

END OF SECTION

Information To Build On
Engineering • Consulting • Testing

July 23, 2014

Mr. Humberto Rodriguez
ROFA Architects
Rike Odgen Figueroa Allex
1007 Walnut Avenue
McAllen, Texas 78501

Re: Geotechnical Engineering Services Report
Proposed Maintenance Hangar - Edinburg International Airport
Edinburg, Texas
PSI Project No. 328-1219

Dear Mr. Rodriguez:

Professional Service Industries, Inc. is pleased to transmit our Geotechnical Engineering Services Report for the referenced project. This report includes the results of laboratory testing and recommendations for foundation and pavement design, as well as general site preparation.

We appreciate the opportunity to perform this Geotechnical Study and look forward to continued participation during the design and construction phases of this project. If you have any questions pertaining to this report, or if we may be of further service, please contact our office.

Respectfully submitted,
Professional Service Industries, Inc.

Héctor J. López, P.E.
Branch Manager

GEOTECHNICAL ENGINEERING SERVICES REPORT

For the proposed

MAINTENANCE HANGAR
EDINBURG INTERNATIONAL AIRPORT
EDINBURG, TEXAS

Prepared for:
ROFA ARCHITECTS
1007 WALNUT AVENUE
MCALLEN, TEXAS 78501

Prepared by:

PROFESSIONAL SERVICE INDUSTRIES, INC.
2020 NORTH LOOP 499, SUITE 302
HARLINGEN, TEXAS 78550
Telephone: (956) 423-6826
Fax: (956) 423-5735

PSI PROJECT No. 328-1219

Texas Board of Professional Engineers Certificate of Registration # F003307

July 23, 2014

STATE OF TEXAS
07-23-14
H J LOPEZ SEPULVEDA
70040
LICENSED
PROFESSIONAL ENGINEER

Héctor J. López, P.E.
Branch Manager

Lucas Castillo, E.I.T
Staff Engineer

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APPENDIX

Boring Location Plan
Boring Logs
Key to Terms and Symbols Used on Logs

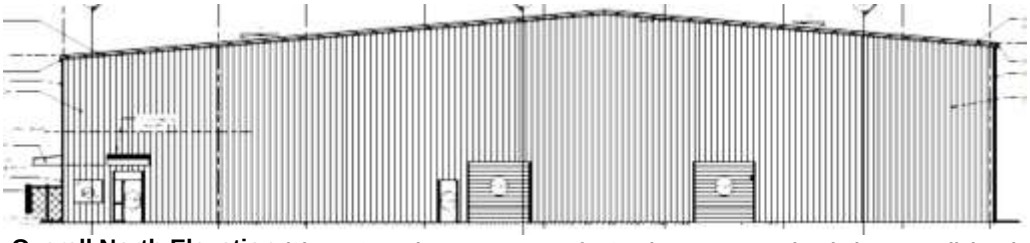
PROJECT INFORMATION

Project Authorization

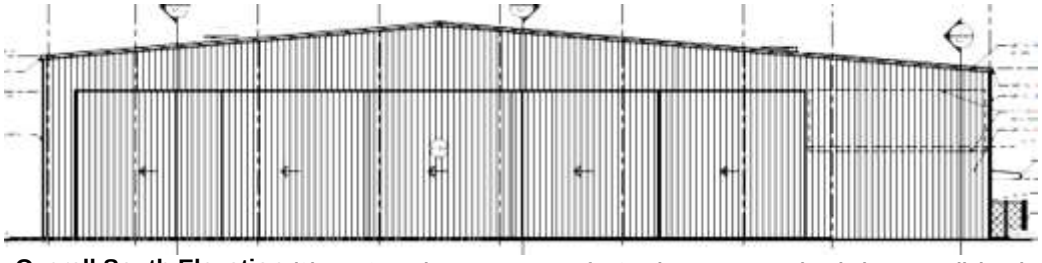
Professional Service Industries, Inc. (PSI) has completed a geotechnical exploration for the proposed Maintenance Hangar to be located at the Edinburg International Airport in Edinburg, Hidalgo County, Texas. This exploration was completed in accordance with PSI Proposal No. G2014-009 dated February 7, 2014, authorized by Mr. Humberto Rodriguez, AIA for Rike Ogden Figueroa Allex (ROFA) Architects on May 4, 2014.

Project Description

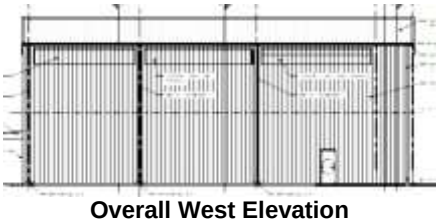
Project information was provided by Mr. Rodriguez which included a Preliminary Plan Set illustrating the proposed development and building specifications. In addition, an Overall Site Plan and architectural/structural plan set were also provided. Based on this information, the proposed project consists of the construction of a new Maintenance Hangar to be located at the Edinburg International Airport in Edinburg, Hidalgo County, Texas. Elevation drawings (Sheet A3.1) provided by ROFA Architects of the anticipated structure are shown below.



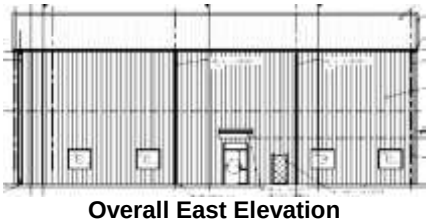
Overall North Elevation **(Sheet A3.1 Maintenance Hangar for South Texas International Airport at Edinburg)**



Overall South Elevation **(Sheet A3.1 Maintenance Hangar for South Texas International Airport at Edinburg)**



Overall West Elevation
(Sheet A3.1 Maintenance Hangar for South Texas International Airport at Edinburg)



Overall East Elevation
(Sheet A3.1 Maintenance Hangar for South Texas International Airport at Edinburg)

In reference to the provided plan set, the proposed construction will consist of a new warehouse type structure, rectangular in shape and measuring 156 feet long by 84 feet wide

encompassing approximately 13,104 square feet (sf). The warehouse will be 30 feet high and consist of an approximate 10,800 sf airplane hangar area and two-story offices and storage areas within the warehouse building. The proposed warehouse building structure will consist of pre-fabricated steel columns/joists, and metal siding and roof panels. A shallow foundation system consisting of slab-on-grade or spread/strip footings is anticipated for supporting the building structure. Structural loads were not provided; however, based upon our past experience, we anticipate the buildings column loads and bearing wall loads will be up to 75 kips and 3 kips per linear foot, respectively

The geotechnical recommendations presented in this report are based on the available project information, project location, and the subsurface materials described in this report. If any of the noted information is incorrect, please inform PSI in writing so that we may amend the recommendations presented in this report if appropriate and if desired by the client. PSI will not be responsible for the implementation of its recommendations when it is not notified of changes in the project.

Purpose and Scope of Services

The purpose of this study was to explore the subsurface conditions at the site to enable an evaluation of acceptable foundation and pavement systems for the proposed construction. Our scope of services included drilling and sampling soil test borings, performing laboratory testing of selected samples, and preparing this geotechnical report. This report briefly outlines the testing procedures, presents available project information, describes the site and subsurface conditions, and presents recommendations regarding the following:

- Site preparation.
- Foundation types, depths, allowable bearing capacities, and an estimate of potential settlement.
- General pavement design criteria and pavement subgrade preparation.
- Comments regarding factors that will impact construction and performance of the proposed construction.

The scope of services did not include an environmental assessment for determining the presence or absence of wetlands, or hazardous or toxic materials in the soil, bedrock, surface water, groundwater, or air, on or below, or around this site. Any statements in this report or on the boring logs regarding odors, colors, and unusual or suspicious items or conditions are strictly for informational purposes. Prior to development of this site, an environmental assessment is advisable.

SITE AND SUBSURFACE CONDITIONS

Site Location and Description

The site for the proposed project is located at the Edinburg International Airport east of the intersection of US Highway 281 and FM 490 in Edinburg, Texas. A site map indicating the proposed project location is shown below.

The designated area for the proposed construction located within the airport facility was vacant and covered with grass at the time of our field activities. The surficial soils were relatively firm, our truck-mounted drill rig experienced little difficulty in moving about the site.

Subsurface Conditions

The site subsurface conditions were explored with four (4) soil test borings performed within the proposed building's "footprint" area. Each soil test boring was drilled to a depth of 25 feet below the ground surface. Two (2) additional soil test borings drilled to a depth of 10 feet were performed in the proposed pavement areas. The boring locations and depths were selected by the Client. The borings were located in the field by PSI personnel by measuring distances from existing boundaries located at the site.

Elevations of the ground surface at the various boring locations were not provided to PSI and should be determined by others prior to construction. However, all references to depths of the various materials encountered are from the existing grade at the time of drilling, which was performed on July 14, 2014. The borings were advanced utilizing solid stem auger drilling methods. Soil samples were routinely obtained during the drilling process. Drilling and sampling techniques were accomplished generally in accordance with ASTM procedures. Select soil samples were tested in the laboratory to determine material properties for our evaluation. Laboratory testing was accomplished in general accordance with ASTM procedures.

In general, based on the soil borings, the lithology across the site is relatively uniform laterally and consisted of an upper Clayey Sand stratum underlain by a Fat Clay stratum. From the surface to a depth of 6 feet, a stratum consisting of dark brown and tan Clayey Sand (SC) soils was encountered. Standard Penetration Test (SPT) N-Values obtained within this stratum ranged from 7 to 39 blows per foot indicating a loose to dense relative density. These cohesionless soils contain approximately 32% to 47% clay/silt sized particles as indicated by minus #200 sieve tests performed on select samples.

Underlying the upper Clayey Sand stratum, to the boring termination depth of 25 feet, a stratum consisting of tan and reddish brown Fat Clay (CH) was encountered. These cohesive soils are considered to be high in plasticity as indicated by Atterberg Limit tests performed on selected samples. Liquid Limits (LL) obtained within these soils ranged from 55% to 83% with Plasticity Indices (PI) ranging from 24% to 55%. Unconfined compressive test results ranged from 2.27 tons per square foot (tsf) to 3.82 tsf indicating a very stiff consistency. These soils contain approximately 87% to 93% clay/silt sized particles.

The above subsurface description is of a generalized nature to highlight the major subsurface stratification features and material characteristics. The boring logs included in the Appendix should be reviewed for specific information at individual boring locations. These records include soil descriptions, stratifications, penetration resistances, locations of the samples and laboratory test data.

The stratifications shown on the boring logs represent the conditions only at the actual boring locations. Variations may occur and should be expected between boring locations. The stratifications represent the approximate boundary between subsurface materials, and the actual transition may be gradual. Water level information obtained during field operations is also shown on these boring logs. The samples which were not altered by laboratory testing will be retained for 60 days from the date of this report and then will be discarded.

Groundwater Information

Groundwater was encountered at a depth of about 23 to 24 feet during our field drilling activities in Borings B2 and B4, however it was not was not observed present in the remainder of the soil test borings performed on site. It is possible for a groundwater table to be present within the depths explored during other times of the year depending upon climatic and rainfall conditions. Additionally, discontinuous zones of perched water may exist within the overburden materials and/or at the contact with clay lenses. We recommend that the Contractor determine the actual groundwater levels at the site at the time of the construction activities.

EVALUATION AND RECOMMENDATIONS

Geotechnical Discussion

The following design recommendations have been developed based on the previously described project characteristics and subsurface conditions encountered. If there are any changes in these project criteria, including project location on the site, a review must be made by PSI to determine if any modifications in the recommendations will be required. The findings of such a review should be presented in a supplemental report. Once final design plans and specifications are available, a general review by PSI is strongly recommended as a means to check that the conditions assumed in the project description are correct and that the earthwork, pavement, and foundation recommendations are properly interpreted and implemented.

Potential Vertical Rise (PVR)

The laboratory test results indicate that the near surface soils and subsoils at this site are low to moderately high in expansive characteristics. The potential vertical rise (PVR) for slab-on-grade construction at this site is estimated to be on the order of one 1-inch. This estimate was calculated using the Texas Department of Transportation Method TEX-124E and

utilizes the moisture contents and Atterberg limit test results of the soils within the seasonally active zone estimated to be approximately ten (10) feet at the site.

The estimated PVR value provided is based on the proposed floor system applying a sustained surcharge load of approximately 1 pound per square inch on the subgrade materials. The value represents the vertical rise which can be experienced by subsoils if they are subjected to conditions which allow them to increase their moisture content, such as poor drainage. The actual movement of the subsoils is dependent upon their degree of increased moisture content. Differential vertical movements can potentially be equal to the expected total movements.

Site Preparation

We recommend that the existing topsoil, vegetation, roots, and near surface soils within the proposed construction area to a minimum depth of 6-inches be excavated and removed to expose the clean natural subgrade soils. The materials excavated should be segregated if desired, and either wasted or stockpiled for later use in landscaping or applications, as appropriate.

Due to the dry soil condition of the near surface soils, PSI recommends that the near surface soils to a minimum depth of 3 feet within the proposed building area be reconditioned. These soils should be excavated, stockpiled and placed back in a controlled manner (moisture conditioned and compacted). The removal area should extend at least 5 feet beyond the perimeter of the proposed new building foundation. Raise in finished site grade should be done with properly compacted select fill in addition with the remedial site work described above.

After stripping and excavating to the proposed subgrade level, as described above, the exposed subgrade soils within the proposed building area should be proof-rolled with a tandem axle dump truck or similar rubber tired vehicle. Soils which are observed to rut or deflect excessively under the moving load should be undercut and replaced with properly compacted select fill. The proof-rolling and undercutting activities should be witnessed by a representative of the Geotechnical Engineer and should be performed during a period of dry weather. The subgrade soils should be scarified and compacted to at least 95 percent of the standard Proctor maximum dry density as determined by ASTM D 698 for a depth of at least six (6) inches below the surface. The soils should be at a moisture content in the range of optimum to four (4) percent above the optimum moisture content.

After subgrade preparation and observation have been completed, select fill placement may begin. The first layer of select fill should be placed in a relatively uniform horizontal lift and be adequately keyed into the stripped and scarified subgrade soils. Select fill materials should be free of organic or other deleterious materials, should have a maximum particle size less than two (2) inches, and should have a liquid limit of thirty five (35) percent or less and a plasticity index of seven (7) to seventeen (17). If a fine-grained silt or clay soil is used for fill, close moisture content control will be required to achieve the recommended degree of compaction. Structural fill should be compacted to at least 95 percent of the Standard Proctor maximum dry density as determined by ASTM D 698.

Select fill should be placed in maximum lifts of eight (8) inches of loose material and should be compacted within the range of minus one (-1) percentage point below to three (3) percentage points above the optimum moisture content value. If water must be added, it should be uniformly applied and thoroughly mixed into the soil by disking or scarifying. Each lift of

compacted engineered fill should be tested by a representative of the Geotechnical Engineer prior to placement of subsequent lifts. The edges of compacted select fill should extend at least five (5) feet beyond the edges of buildings prior to sloping. Care should be taken to apply compactive effort throughout the fill and fill slope areas.

Footing Recommendations

The planned construction can be supported on conventional spread footing foundations bearing on natural soils or properly compacted select fill material. Spread footings for building columns and continuous footings for bearing walls, founded at a depth of two (2) to three (3) feet below existing site grade, can be designed utilizing a net allowable soil bearing pressure of 2,500 psf and 2,150 psf, respectively, based on dead load plus long-term live loads. Minimum width dimensions of 24 inches for spread footings and 12 inches for continuous footings should be used in foundation design to reduce the possibility of a local shear failure.

Uplift resistance of shallow foundations formed in open excavations should be taken as the weight of the foundation and soil above it. For design purposes, the uplift resistance should be based on effective unit weights of 100 and 150 lbs. per cubic foot (pcf) for soil and concrete, respectively.

Consolidation of the overburden resulting from the foundation loads will result in measurable but tolerable increments of soil settlement. Based on results of the field tests and the anticipated foundation loads, we estimate that the maximum foundation settlement will not exceed one (1) inch. Differential settlement between two (2) adjacent footings will probably approximate 75 percent of the total increment. While settlement of this magnitude is generally considered tolerable for structures of the type proposed, the design of masonry walls should include provisions for liberally spaced, vertical control joints to reduce the effects of cosmetic "cracking".

The foundation excavations should be observed by a representative of PSI prior to steel or concrete placement to assess that the foundation materials are capable of supporting the design loads and are consistent with the materials discussed in this report.

After opening, footing excavations should be observed and concrete placed as quickly as possible to avoid exposure of the footing bottoms to wetting and drying. Surface run-off water should be drained away from the excavations and not be allowed to pond. The foundation concrete should be placed during the same day the excavation is made. If it is required that footing excavations be left open for more than one (1) day, they should be protected to reduce evaporation or entry of moisture.

Slab-on-Grade Foundation Recommendations

A grid type beam and slab foundation is used to support relatively light structures upon expansive soils where soil conditions are relatively uniform, and where uplift and settlement can be tolerated and is taken into account in the design. The intent of a stiffened slab-on-grade foundation is to allow the structure and foundation to move up and down freely with soil movements while providing sufficient stiffness to limit differential movements within the superstructure.

Provided that movements of the magnitude as discussed above can be tolerated, and will not impair the performance of the structures, a stiffened grid type beam and slab foundation may be utilized at this site. Grade and widened beams based at two (2) to three (3) feet below the finished floor elevation founded within the compacted select fill or bearing on natural soils, can be designed for an allowable soil bearing capacity of 2,150 psf based on dead load plus long term live load conditions (includes a factor of safety of 3). Foundation beams and widened columns should be a minimum of 12 inches and 24 inches wide, respectively, to prevent local shear failure. A vapor barrier should be placed beneath the floor slab in order to break the rise of capillary moisture.

Saw cut joints should be provided within the monolithic slab-on-grade foundation to help control shrinkage cracks. The joints and spacing should meet the structural and/or civil engineers' drawings and specifications. Reinforcing steel will also be required and should meet the requirements shown on the structural engineer's or civil engineer's drawings and specifications.

The foundation excavations should be observed by a representative of PSI prior to steel or concrete placement to assess that the bearing materials are capable of supporting the design loads and are consistent with the materials discussed in this report. This is especially important to identify the acceptability of the bearing soils under the footings. Soft or loose soil zones encountered at the bottom of the footing or beam excavations should be removed down to firm soils. The undercut area should then be backfilled with Select or Structural fill and compacted as determined by the Geotechnical Engineer.

After opening, footing and beam excavations should be observed and concrete placed as quickly as possible to avoid exposure of the footing bottoms to wetting and drying. Surface run-off water should be drained away from the excavations and not be allowed to pond. If it is required that foundation excavations be left open an extended period, they should be protected to reduce evaporation or entry of moisture.

Consolidation of the overburden resulting from the foundation loads will result in measurable but tolerable increments of soil settlement. Based on results of the field tests and the anticipated foundation loads, we estimate that the maximum foundation settlement will not exceed one (1) inch. Differential settlement between two (2) adjacent columns will probably approximate 50 percent of the total increment.

Utilizing the "Building Research Advisory Board No. 33" (BRAB Report) as a guideline, the following design criteria are provided for this site for existing soils conditions and for undercutting the dry existing site soils and replacing with select fill.

	Remedial Earthwork PVR ≈ 1"
Climatic Rating (Cw)	15
Effective Plasticity Index	18
Support Index	0.98
Unconfined Compressive Strength (tsf)	1.25

Alternatively, the foundation may be designed based on the "Design of Slab-On-Ground Foundations" published by the Wire Reinforcement Institute, Inc. (Aug., 1981) using the following design criteria:

	Remedial Earthwork PVR ≈ 1”
Climatic Rating (Cw)	15
Effective Plasticity Index	18
Soil Climatic Rating Factor (1-C)	0.04
Maximum Beam Spacing (ft)	22

Soil supported floor slabs are subject to vertical movements as discussed earlier in this report. This movement often causes distress to interior wall partitions supported by these slabs. This should be understood and addressed in the design phase of this project.

Based on this information and using the "Design and Construction of Post-Tensioned Slabs-On-Ground", 2nd Edition, published by the Post-Tensioning Institute (PTI) as a guideline, the following design criteria may be used for this site considering the minimum site preparation previously presented.

	Remedial Earthwork PVR ≈ 1”
Edge Moisture Variation Distance (center lift)	5.5’
Edge Moisture Variation Distance (edge lift)	2.5’
Differential Swell (center lift)	1.26”
Differential Swell (edge lift)	0.76”

Utilities which project through slab-on-grade floors should be designed with some degree of flexibility and/or with sleeves in order to prevent damage to these lines should vertical movement occur.

Contraction, control, or expansion joints should be designed and placed in various portions of the structure. Properly planned placement of these joints will assist in controlling the degree and location of material cracking which normally occurs due to material shrinkage, thermal effects, soil movements, and other related structural conditions.

Floor Slab Recommendations

The floor slab can be grade supported on properly compacted select fill. Proof-rolling, as discussed earlier in this report, should be accomplished to identify any soft or unstable soils which should be removed from the floor slab area prior to the placement of select fill and/or floor slab construction.

Floor slabs can be designed for an allowable soil bearing pressure of 1,200 psf, based on dead load plus long-term live loads. For the natural and select structural soil backfill material, a modulus of subgrade reaction of 100 lbs/in^3 can be utilized for the concrete floor slab. Select fill should also be used to elevate the site where possible so that positive drainage is provided away from the building. A relatively consistent thickness of fill should be provided so that the floor slabs are more uniformly supported.

As an alternative, we recommend that a minimum four (4) inch thick granular mat consisting of gravel or sand be placed beneath the floor slab to enhance drainage and provide a capillary break. Vapor barrier sheeting should be placed on the granular mat. The floor slabs should have an adequate number of joints to reduce cracking resulting from any differential movement and shrinkage. The floor slab should not be rigidly connected to columns, walls, or foundations.

Pavement Recommendations

The "AASHTO Guide for Design of Pavement Structures" published by the American Association of State Highway and Transportation Officials was used to develop the pavement thickness recommendations in this report. This method of design considers pavement performance, traffic, roadbed soil, pavement materials, environment, drainage and reliability. Each of these items is incorporated into the design methodology.

Our scope of services did not include extensive sampling and CBR testing of the existing subgrade or potential sources of imported fill for the specific purpose of a detailed pavement analysis. Instead, we have assumed pavement-related design parameters that are considered to be typical for the area soil types. The recommended pavement thicknesses presented in the following portions of this report are considered typical and minimum for the assumed parameters in the general site area. We understand that budgetary considerations sometimes warrant thinner pavement sections than those presented. However, the client, the owner, and the project designers should be aware that thinner pavement sections may result in increased maintenance costs and lower than anticipated pavement life. The pavement subgrade should be prepared as discussed in the site preparation section of this report. We have estimated the subgrade soils will be prepared to achieve a minimum CBR value of three (3).

The following AASHTO Pavement Design parameters for flexible pavement were used for our analyses of the proposed Access Roads and Parking Lot:

Subgrade CBR	3.0
Reliability	80%
Overall Deviation, flexible Overall Deviation, rigid	0.45 0.35
Initial Serviceability, flexible Initial Serviceability, rigid	4.2 4.5
Terminal Serviceability	2.0
Design Life (years)	20

Flexible Pavement Design Thickness

RECOMMENDED ASPHALT PAVEMENT THICKNESS (INCHES)						
Pavement Materials	Light Duty Automobile (11,300 ESALs)		Medium Duty Automobile (22,350 ESALs)		Light Duty Truck (41,900 ESALs)	
Structural Number (SN)	1.84		2.06		2.28	
Asphalt Surface Course	2	2	2.5	2.5	3	3
Caliche Base Material Or Limestone Base Material	8	---	8	---	8	---
	---	6	---	6	---	6
Compacted Subgrade	6	6	6	6	6	6

Rigid Pavement Design Thickness

PAVEMENT MATERIAL(S)	LIFE EXPECTANCY, ESALS		
	72,950	206,800	511,850
Portland Cement Concrete (4,000 psi)	5.0 inches	6.0 inches	7.0 inches
Compacted Subgrade	As Discussed Previously		

All related civil design factors such as drainage, cross-sectional configurations, surface elevations, and environmental factors which will significantly affect the service life of the pavement must be included in the preparation of the construction drawings and specifications.

After stripping and excavating to the proposed subgrade level, as necessary, the proposed pavement areas should be proof-rolled with a tandem axle dump truck or similar rubber tired vehicle. Soils which are observed to rut or deflect excessively under the moving load should be undercut and replaced with properly compacted select fill. The subgrade soils should then be scarified and compacted to at least 95 percent of the standard Proctor maximum dry density as determined by ASTM D 698 for a depth of at least six (6) inches below the surface. The soils should be at moisture content in the range of optimum to four (4) percent above the optimum moisture content.

Base materials in flexible pavement areas should be placed in maximum eight (8) inch loose or six (6) inch compacted lifts and compacted to at least 95 percent of the modified Proctor (ASTM D 1557) maximum dry density near optimum moisture content. Limestone base materials should meet performance standards specified in TxDOT Item 247, Type A, Grade 2 or better. Caliche base material should meet the plasticity and gradation requirements specified in TxDOT Item 247, Type B, Grade 2 or better. Hot-mix asphaltic concrete shall conform to TxDOT Item 340, Type D.

Water should not be allowed to pond behind curbs and saturate the pavement base stone. In down grade areas base should extend through the slope to allow any water entering the base a path to exit. If landscape islands are incorporated into the design, provisions to collect and remove water at the curbs by means of commercially available drain systems are recommended.

Rigid Pavement Reinforcement Recommendations: Joints are typically placed in pavements to control cracking, to facilitate construction, and to isolate a section of pavement from a structure or an adjacent pavement section. Joints used to control cracking are typically known as contraction joints as they are intended to control cracking that arises out of the shrinkage of concrete as it cures. Construction joints are used to provide clean breaks between pavement sections that result from the construction process. Isolation joints (or expansion joints) are used to separate the pavement from other structures or pavements and typically include the use of compressible materials in the joint as opposed to contraction or construction joints. Contraction joints should be spaced no greater than 15 feet between the nearest parallel joints with joint depths of at least one-quarter (¼) of the slab thickness. Construction and isolation joints should be full-depth joints and should be spaced no greater than 54 feet for rebar reinforcement and 30 feet for welded wire fabric reinforcement between the nearest parallel construction or isolation joint. Contraction and construction joints should be no wider than one-eighth (⅛) of an inch whereas isolation joints may be up to one (1) inch wide.

Steel reinforcement of concrete is typically not necessary for concrete pavements with construction or isolation (expansion) joint spacing closer than 15 feet. When these joints are spaced greater than 15 feet, steel reinforcement can be used to control the widths of cracks that form between these joints such that the fracture faces that form in the concrete are held together. Steel reinforcement is also used where subgrade conditions are not likely to provide uniform support to the concrete pavement. Because the soils at the ground surface of this site have some potential for expansion, it is likely that uniform support will not be available to the rigid pavements. Therefore, reinforcing steel should be used to span between construction and isolation (expansion) joints and should consist of the following:

- Rebar may be used as reinforcement and should consist of No. 3 bars spaced 18 inches on-centers each way. The rebar should be Grade 60 steel.

- Flat sheets of welded wire fabric, including either 6 X 6 – W2.9 X W2.9 or 4 X 4 – W1.4 X W1.4, may be used with a maximum wire tensile strength of at least 60 ksi.

As with steel reinforcement, load transfer devices such as dowels are not typically necessary for most parking lots. However, in situations were heavy traffic loads are present or where the subgrade may not provide uniform support to the pavement, dowels should be used to transfer loads across joints. Smooth dowels may be used for this purpose and should be utilized as recommended in the following table.

Dowel Design Information

Slab Thickness, in.	Dowel Diameter, in.	Dowel Embedment Each side, in.	Dowel Length, in.	Dowel Spacing On-Centers, in
5	5/8	5	12	12
6	3/4	6	14	12
7	7/8	7	16	12

The joint and reinforcing design of a rigid pavement system is largely a function of geometry for the pavement area. The proper length of concrete panels (defined as the distance between discontinuous pavement sections; e.g. between construction or isolation joints, or a combination of the two) and the location of contraction, construction, and isolation (expansion) joints are not included as a function of the above concrete pavement guidelines. Rather, these features should be determined based on the geometry and construction sequencing of the pavement. Actual joint spacing should be based on actual pavement areas and final panel lengths so that joints are evenly spaced. Joints should be designed to form approximately square panels where geometrically feasible. The values provided herein are guidelines and the recommendations selected by the project civil engineer and any guidelines not provided or mentioned herein should not exceed the American Concrete Institute (ACI) 330R recommendations.

Site Class and Site Coefficients

Please note that the project site is located within a municipality that employs the International Building Code (IBC), 2012 edition. As part of this code, the design of structures must consider dynamic forces resulting from seismic events. These forces are dependent upon the magnitude of the earthquake event as well as the properties of the soils that underlie the site. Part of the IBC code procedure to evaluate seismic forces requires the evaluation of the Seismic Site Class, which categorizes the site based upon the characteristics of the subsurface profile within the upper 100 feet of the ground surface.

To define the Seismic Site Class for this project, we have interpreted the results of our soil test borings drilled within the project site and estimated appropriate soil properties below the base of the borings to a depth of 100 feet, as permitted by Section 1613.5.2 of the code. The estimated soil properties were based upon data available in published geologic reports as well as our experience with subsurface conditions in the general site area.

Based upon our evaluation, it is our opinion that the subsurface conditions within the site are consistent with the characteristics of the Specific Site Class D as defined in Table 1613.5.2 of the building code.

The USGS-NEHRP probabilistic ground motion values for the site latitude 26.4469˚ and longitude -98.1222˚ which were obtained from the USGS geohazards web page are as follows:

Period (seconds)	Design Spectral Response Acceleration Parameters	Site Coefficient F_a	Site Coefficient F_v
0.2 (S_s)	0.064 (SDs)	1.6	--
1.0 (S_1)	0.024 (SD1)	--	2.4

The Site Coefficients, Fa and Fv presented in the above table were also obtained from the USGS geohazards webpage as a function of the site classification and mapped spectral response acceleration at the short 0.2 seconds (S_s) and 1 second (S_1) periods.

CONSTRUCTION CONSIDERATIONS

Moisture Sensitive Soils/Weather Related Concerns

The upper clayey sand soils encountered at this site may be sensitive to disturbances caused by construction traffic and changes in moisture content. During wet weather periods, increases in the moisture content of the soil can cause significant reduction in the soil strength and support capabilities. In addition, soils which become wet may be slow to dry and thus significantly retard the progress of grading and compaction activities. It will, therefore, be advantageous to perform earthwork, foundation and pavement construction activities during dry weather.

Drainage and Groundwater Concerns

Water should not be allowed to collect in the foundation excavation, on floor slab areas, or on prepared subgrades of the construction area either during or after construction. Undercut or excavated areas should be sloped toward one corner to facilitate removal of any collected rainwater, groundwater, or surface runoff. Positive site surface drainage should be provided to reduce infiltration of surface water around the perimeter of the building and beneath the floor slabs. The grades should be sloped away from the building and surface drainage should be collected and discharged such that water is not permitted to infiltrate the backfill and floor slab areas of the building.

Groundwater was encountered at a depth of 23 to 24 feet in borings B1 and B4 during drilling operations. Groundwater was not encountered during or upon completion of drilling activities in the remaining soil test borings performed on site. However; it is possible that seasonal variations will cause fluctuations, or a water table to be present in the upper soils at a later time. Perched water may be encountered in discontinuous zones within the overburden and/or near the contact with clay lenses. Any water accumulation should be removed from excavations by pumping. Should excessive and uncontrolled amounts of seepage occur, the Geotechnical Engineer should be consulted.

Excavations

As was discussed previously, typically native materials were encountered at this site. Typically soils penetrated by geotechnical augers, such as those encountered at this site can be removed with conventional earthmoving equipment. However, areas of very stiff to hard materials may be encountered during construction and are very difficult to excavate. The excavation of these materials may require the use of heavy duty excavation equipment and techniques. Well maintained, high torque drilling equipment will be required to excavate in these materials.

It should be noted that excavation equipment varies and field conditions may vary. Generally, geologic processes are erratic and large variations can occur in small lateral distances. Details regarding “means and methods” to accomplish the work (such as excavation equipment and technique selection) are the sole responsibility of the project contractor. The comments contained in this report are based on the observations of small diameter boreholes.

The performance of large diameter drilled holes (such as pier shafts) or other excavations may differ significantly as a result of the differences in hole sizes.

In Federal Register, Volume 54, No. 209 (October 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its "Construction Standards for Excavations, 29 CFR, part 1926, Subpart P". This document was issued to better insure the safety of workmen entering trenches or excavations. It is mandated by this federal regulation that excavations, whether they be utility trenches, basement excavation or footing excavations, be constructed in accordance with the new OSHA guidelines. It is our understanding that these regulations are being strictly enforced and if they are not closely followed the owner and the contractor could be liable for substantial penalties.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor's "responsible person", as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations.

We are providing this information solely as a service to our client. PSI does not assume responsibility for construction site safety or the contractor's or other parties' compliance with local, state, and federal safety or other regulations.

Recommended Minimum Sampling and Testing Frequencies

It is recommended that PSI be retained to provide observation and testing of construction activities involved in the foundations, pavements, earthwork and related activities of this project. PSI cannot accept any responsibility for any conditions that deviate from those described in this report, nor for the performance of the foundations if not engaged to also provide construction observation and testing for this project.

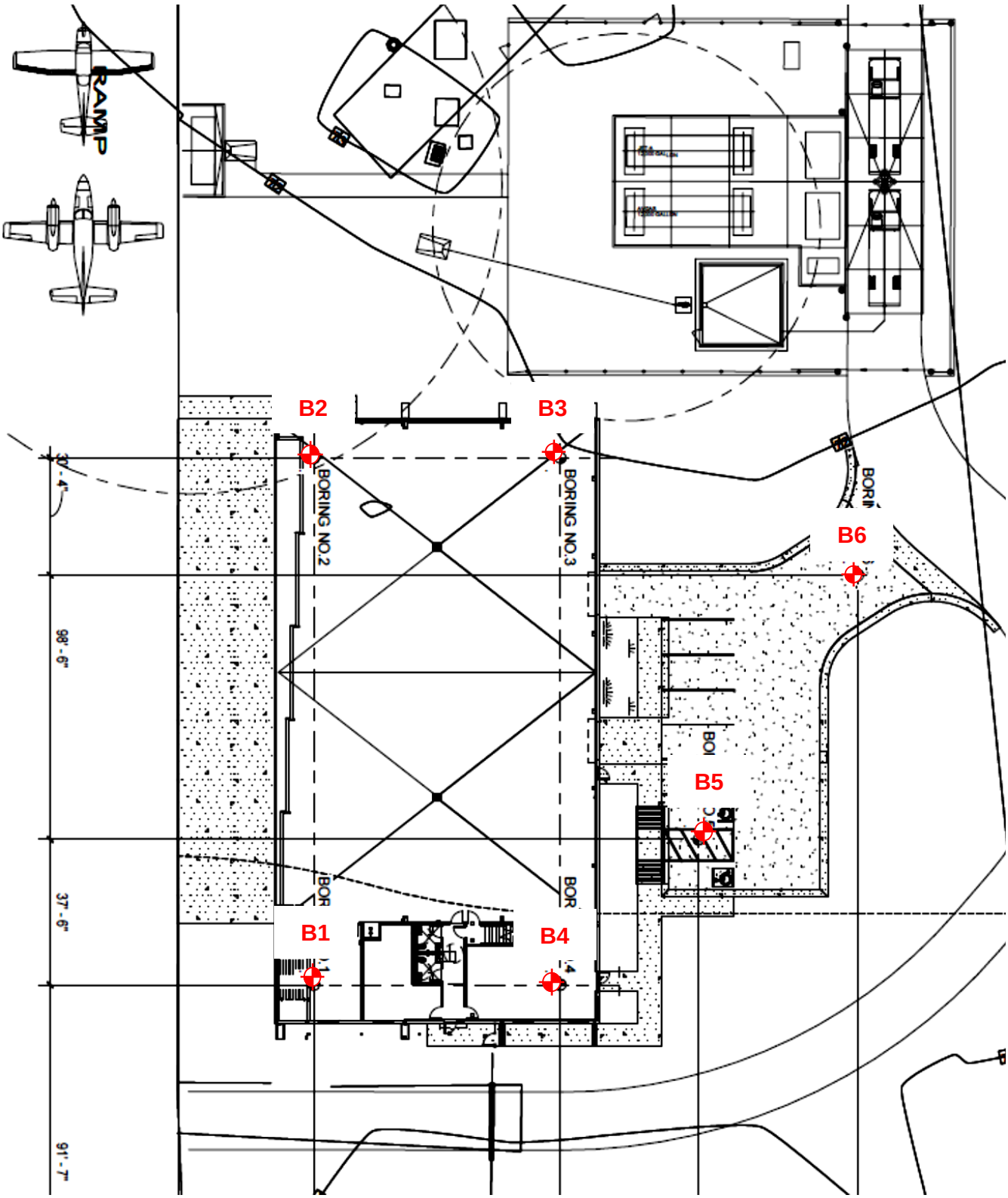
REPORT LIMITATIONS

The recommendations submitted in this report are based on the available subsurface information obtained by PSI and design details furnished by the client for the proposed project. If there are any revisions to the plans for this project, or if deviations from the subsurface conditions noted in this report are encountered during construction, PSI should be notified immediately to determine if changes in the foundation recommendations are required. If PSI is not notified of such changes, PSI will not be responsible for the impact of those changes on the project.

The Geotechnical Engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional Geotechnical Engineering practices in the local area. No other warranties are implied or expressed.

After the plans and specifications are more complete, the Geotechnical Engineer should be retained and provided the opportunity to review the final design plans and specifications to check that our engineering recommendations have been properly incorporated into the design documents. At that time, it may be necessary to submit supplementary recommendations. If PSI is not retained to perform these functions, PSI will not be responsible for the impact of those conditions on the project. This report has been prepared for the exclusive use of the ROFA Architects and their Design Team for the specific application to the proposed Maintenance Hangar to be located at the Edinburg International Airport in Edinburg, Hidalgo County, Texas.

APPENDIX



SITE LOCATION MAP	Project	Boring Locations
psi Information To Build On Engineering • Consulting • Testing	Proposed Maintenance Hangar Edinburg International Airport Edinburg, Texas **PSI Project No. 328-1219**	**NOT TO SCALE**

LOG OF BORING NO. B1

Proposed Maintenance Hangar
Edinburg, Texas
PSI Project No.:328-1219

TYPE BORING: Solid Stem Auger

LOCATION: See Plate 1

SURF. ELEV.: 0.0 ft.

DEPTH, FT.	SOIL DESCRIPTION	% PASSING #200 SIEVE	BLOWS PER FOOT	LIQUID LIMIT	PLASTIC INDEX	MOISTURE CONTENT	UNIT DRY WT. LB./CU FT.
	CLAYEY SAND (SC) dark brown and tan in color, silty, medium dense, dry with calcareous nodules.	32	14			8	
			14	29	12	7	
5			17			10	
	-6.0 ft						
	FAT CLAY (CH) tan and reddish brown in color, hard, calcareous, moist.	93	49			19	
			37	83	48	22	
10							
						21	
15							
						18	
20							
						22	
25	-25.0 ft						
30							

SHEAR STRENGTH KSF
○ HAND PEN ● UNC
1.0 2.0 3.0

PL WC LL
20 40 60

COMPLETION DEPTH: 25.0 FEET
DATE: 7/14/14

DEPTH TO WATER: Water encountered at the depth of 23.5 ft. during drilling operations.
DELAYED WATER READING: Water was not present upon completion of drilling.

BL_TEXAS LOGS EDINBURG.GPJ PSI_CORP.GDT 7/23/14

Geotechnical Consulting Services
Harlingen, Texas

LOG OF BORING NO. B2

Proposed Maintenance Hangar
Edinburg, Texas
PSI Project No.:328-1219

TYPE BORING: Solid Stem Auger | LOCATION: See Plate 1

SURF. ELEV.: 0.0 ft.

DEPTH, FT.	SOIL DESCRIPTION	% PASSING #200 SIEVE	BLOWS PER FOOT	LIQUID LIMIT	PLASTIC INDEX	MOISTURE CONTENT	SHEAR STRENGTH KSF (○ HAND PEN ● UNC; 1.0 2.0 3.0) (PL ✚ WC ✕ LL ✚; 20 40 60)	UNIT DRY WT. LB./CU FT.
	CLAYEY SAND (SC) dark brown and tan in color, silty, medium dense, dry with calcareous nodules.		38			5		
			7	26	8	10		
5	-6.0 ft		16			13		
	FAT CLAY (CH) tan and reddish brown in color, hard, calcareous, moist.		49	55	24	16		
		87	48			21		
10								
						21	>● ○	109
15								
						21	>> ○	
20								
						20	>> ○	
25	-25.0 ft							
30								

COMPLETION DEPTH: 25.0 FEET
DATE: 7/14/14

DEPTH TO WATER: Water was not encountered during drilling operations.
DELAYED WATER READING: Water was not present upon completion of drilling.

BL_TEXAS LOGS EDINBURG.GPJ PSI_CORP.GDT 7/23/14

Geotechnical Consulting Services
Harlingen, Texas

LOG OF BORING NO. B3

Proposed Maintenance Hangar
Edinburg, Texas
PSI Project No.:328-1219

TYPE BORING: Solid Stem Auger | LOCATION: See Plate 1

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION (SURF. ELEV.: 0.0 ft.)	% PASSING #200 SIEVE	BLOWS PER FOOT	LIQUID LIMIT	PLASTIC INDEX	MOISTURE CONTENT	SHEAR STRENGTH KSF (○ HAND PEN ● UNC; 1.0 2.0 3.0) / PL ✚ WC × LL ✚ (20 40 60)	UNIT DRY WT. LB./CU FT.
			CLAYEY SAND (SC) dark brown and tan in color, silty, medium dense, dry with calcareous nodules.		37			6	×	
				38	19			7	×	
5			-6.0 ft		14	26	4	10	× ✚	
			FAT CLAY (CH) tan and reddish brown in color, hard, with traces of calcium deposits, moist.		49			19	×	
					48			22	×	
10										
						67	35	23	× ✚ ● ✚ >>○	101
15										
								23	× >>○	
20										
								23	× ○	
25			-25.0 ft							
30										

COMPLETION DEPTH: 25.0 FEET
DATE: 7/14/14

DEPTH TO WATER: Water was not encountered during drilling operations.
DELAYED WATER READING: Water was not present upon completion of drilling.

BL_TEXAS LOGS EDINBURG.GPJ PSI_CORP.GDT 7/23/14

PLATE 4

Geotechnical Consulting Services
Harlingen, Texas

LOG OF BORING NO. B4

Proposed Maintenance Hangar
Edinburg, Texas
PSI Project No.:328-1219

TYPE BORING: Solid Stem Auger

LOCATION: See Plate 1

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION SURF. ELEV.: 0.0 ft.	% PASSING #200 SIEVE	BLOWS PER FOOT	LIQUID LIMIT	PLASTIC INDEX	MOISTURE CONTENT	SHEAR STRENGTH KSF ○HAND PEN ●UNC (1.0, 2.0, 3.0) PL ✚ WC × LL ✚ (20, 40, 60)	UNIT DRY WT. LB./CU FT.
			CLAYEY SAND (SC) dark brown and tan in color, silty, medium dense, dry with calcareous nodules.		37			6	×	
					20			7	×	
5			-6.0 ft	47	21			10	×	
			FAT CLAY (CH) tan and reddish brown in color, hard, calcareous, moist.		47	67	31	19	× ✚ ✚	
								22	× ○	
10										
								23	× >>●	122
15										
								19	× ○	
20										
								19	× ○	
25			-25.0 ft							
30										

COMPLETION DEPTH: 25.0 FEET
DATE: 7/14/14

DEPTH TO WATER: Water encountered at the depth of 23.5 ft. during drilling operations.
DELAYED WATER READING: Water was not present upon completion of drilling.

BL_TEXAS LOGS EDINBURG.GPJ PSI_CORP.GDT 7/23/14

Geotechnical Consulting Services
Harlingen, Texas

LOG OF BORING NO. B5

Proposed Maintenance Hangar
Edinburg, Texas
PSI Project No.:328-1219

TYPE BORING: Solid Stem Auger | LOCATION: See Plate 1

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	% PASSING #200 SIEVE	BLOWS PER FOOT	LIQUID LIMIT	PLASTIC INDEX	MOISTURE CONTENT	SHEAR STRENGTH KSF ○HAND PEN ●UNC (1.0, 2.0, 3.0) PL ✚ WC × LL ✚ (20, 40, 60)	UNIT DRY WT. LB./CU FT.
			SURF. ELEV.: 0.0 ft.							
			CLAYEY SAND (SC) dark brown and tan in color, silty, medium dense, dry with calcareous nodules.	35	39			7	×	
					9			7	×	
5			-6.0 ft		27			14	×	
			FAT CLAY (CH) tan and reddish brown in color, hard, calcareous, moist.		48			17	×	
10			-10.0 ft		49			18	×	
15										
20										
25										
30										

COMPLETION DEPTH: 10.0 FEET
DATE: 7/14/14

DEPTH TO WATER: Water was not encountered during drilling operations.
DELAYED WATER READING: Water was not present upon completion of drilling.

Geotechnical Consulting Services
Harlingen, Texas

LOG OF BORING NO. B6

Proposed Maintenance Hangar
Edinburg, Texas
PSI Project No.:328-1219

TYPE BORING: Solid Stem Auger | LOCATION: See Plate 1

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	% PASSING #200 SIEVE	BLOWS PER FOOT	LIQUID LIMIT	PLASTIC INDEX	MOISTURE CONTENT	SHEAR STRENGTH KSF ○HAND PEN ●UNC (1.0, 2.0, 3.0) PL ✚ WC × LL ✚ (20, 40, 60)	UNIT DRY WT. LB./CU FT.
			SURF. ELEV.: 0.0 ft.							
			CLAYEY SAND (SC) dark brown and tan in color, silty, medium dense, dry with calcareous nodules.	38	15			5		
					6			9		
5			-6.0 ft		16			11		
			FAT CLAY (CH) tan and reddish brown in color, hard, calcareous, moist.		36			17		
10			-10.0 ft		49			22		
15										
20										
25										
30										

COMPLETION DEPTH: 10.0 FEET
DATE: 7/14/14

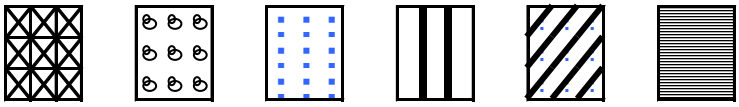
DEPTH TO WATER: Water was not encountered during drilling operations.
DELAYED WATER READING: Water was not present upon completion of drilling.

BL_TEXAS LOGS EDINBURG.GPJ PSI_CORP.GDT 7/23/14

Geotechnical Consulting Services
Harlingen, Texas

KEY TO TERMS AND SYMBOLS USED ON LOGS

SOIL TYPE

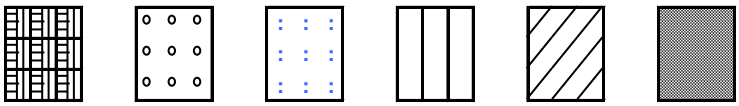


ROCK GRAVEL SAND SILT CLAY SHALE

SAMPLER TYPE

NO SAMPLE | AUGER SAMPLE | SHELBY TUBE | SPLIT SPOON

MODIFIERS



STONE GRAVELY SANDY SILTY CLAYEY FILL

NO RECOVERY | ROCK CORE | 2" SHELBY TUBE | TXDOT CONE

UNIFIED SOIL CLASSIFICATION SYSTEM - ASTM D 2487

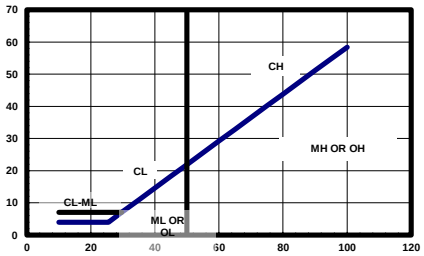
MAJOR DIVISIONS			LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS LESS THAN 50% PASSING NO. 4 SIEVE	GRAVEL & GRAVELY SOILS LESS THAN 50% PASSING NO. 4 SIEVE	CLEAN GRAVEL (LITTLE OR NO FINES	GW	WELL GRADED GRAVEL, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
			GP	POORLY GRADED GRAVEL, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
		W/ APPRECIA BLE FINES	GM	SILTY GRAVEL, GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SANDS MORE THAN 50% PASSING NO. 4 SIEVE	CLEAN SANDS LITTLE FINES	SW	WELL GRADED SAND, GRAVELY SAND (LITTLE FINES)
			SP	POORLY GRADED SANDS, GRAVELY SAND (L.FINES)
		SANDS WITH APPREA. FINES	SM	SILTY SANDS, SAND-SILT MIXTURES
			SC	CLAYEY SANDS,SAND-CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% PASSING NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS & VERY FINE SANDS,ROCK FLOUR SILTY OR CLAYEY FINE SANDS OR CLAYEY SILT W/ LOW PI
			CL	INORGANIC CLAY OF LOW TO MEDIUM PI LEAN CLAY GRAVELY CLAYS, SANDY CLAYS, SILTY CLAYS
			OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PI
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY FAT CLAYS
			OH	ORGANIC CLAYS OF MED TO HIGH PI, ORGANIC SILT
HIGHLY ORGANIC SOIL			PT	PEAT AND OTHER HIGHLY ORGANIC SOILS
UNCLASSIFIED FILL MATERIALS			ARTIFICIALLY DEPOSITED AND OTHER UNCLASSIFIED SOILS AND MAN-MADE SOIL MIXTURES	

CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	SHEAR STRENGTH IN TONS/FT^2
VERY SOFT	0. TO 0.125
SOFT	0.125 TO 0.25
FIRM	0.25 TO 0.5
STIFF	0.5 TO 1.0
VERY STIFF	1.0 TO 2.0
HARD	> 2.0 OR 2.0+

RELATIVE DENSITY - GRANULAR SOILS

CONSISTENCY	N-VALUE (BLOWS/FOOT)
VERY LOOSE	0-4
LOOSE	4-9
MEDIUM DENSE	10-29
DENSE	30-49
VERY DENSE	> 50 OR 50+



ABBREVIATIONS

HP - HAND PENETROMETER
TV - TORVANE
MV - MINIATURE VANE

UC - UNCONFINED COMPRESSION TEST
UU - UNCONSOLIDATED UNDRAINED TRAIXIAL
CU - CONSOLIDATED UNDRAINED

NOTE: PLOT INDICATES SHEAR STRENGTH AS OBTAINED BY ABOVE TESTS

HYDRO-STATIC WATER LEVEL

WATER LEVEL UNDER HYDRO - STATIC PRESSURE HEAD

CLASSIFICATION OF GRANULAR SOILS

U.S. STANDARD SIEVE SIZE(S)

6" 3" 3/4" 4 10 40 200

BOUL--DERS	COBBLES	GRAVEL		SAND			SILT OR CLAY	CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE		

152 76.2 19.1 4.76 2.0 0.42 0.074 0.002

GRAIN SIZE IN MM

SECTION 00400

ADDENDUM AND MODIFICATIONS

PART 1: GENERAL:

1.01 All issued Addenda and Modifications to the Contract Documents shall be inserted immediately following this page.

1.02 INDEX OF ADDENDA:

No.	Issue Date	General Description
1		
2		
3		
4		
5		
6		

1.03 INDEX OF MODIFICATIONS:

No.	Issue Date	General Description
1		
2		
3		
4		
5		
6		

END OF SECTION

SECTION 01010
SUMMARY OF WORK

PART 1: GENERAL

1.01 GENERAL:

A. The Work for this Contract comprises of the general construction of ***Maintenance Airport Hangar for South Texas International Airport*** located at ***Edinburg, Texas***

B. General Contractor shall submit required applications and notices to the Federal Aviation Administration. Refer to notice of proposed construction or alteration and supplemental notice forms.

1.02 ASSIGNED CONTRACTS:

A. Relations and responsibilities between Contractor and assigned subcontractors shall be identical to that between Contractor and subcontractors he has selected.

B. Assigned subcontractors shall furnish to Contractor bonds covering faithful performance of the subcontract work and payment of all obligations thereunder, when Contractor is required to furnish such bonds to Owner.

C. Employ subcontractors assigned by the Owner for:
   1. None

1.03 WORKS BY OTHERS:

A. Work on the Project will be executed concurrent with the Work of this Contract, and which is excluded from this Contract, are as follows:
   1. Utilities and Drainage Contract, beyond project site boundaries, unless otherwise indicated on Drawings.
   2. Owner provided and installed F.F.E.
   3. Certain alternates, if not accepted, may be bid separately at a later date.

1.04 CONTRACTOR'S USE OF PREMISES:

A. Assume full responsibility for the protection and safekeeping of Products under this Contract, stored on the site.

B. Move any stored Products, under Contractor's control, which interfere with operations of the Owner and separate contractor.

1.05 PRE-ORDERED PRODUCTS:

A. None

1.06 OWNER-FURNISHED PRODUCTS:

A. Products furnished and paid for by the Owner, described in specification sections:
   1. Furniture, Fixtures, and Equipment (FFE): Owner furnished; Owner installed.

B. Owner's Responsibilities:
   1. Arrange and pay for products delivery to the site and installation thereof, in accordance with the construction schedule.
   2. Inspect deliveries.
   3. Submit claims for transportation damage.
   4. Arrange for manufacturer's warranties, bonds, services, inspections, as required.

C. Contractor's Responsibilities:
   1. Protect products from exposure to elements and from damage until Substantial Completion.

END OF SECTION

NOTICE OF PROPOSED CONSTRUCTION OR ALTERATION

§77.13 Construction or alteration requiring notice.

(a) Except as provided in §77.15, each sponsor who proposes any of the following construction or alteration shall notify the Administrator in the form and manner prescribed in §77.17.

(1) Any construction or alteration of more than 200 feet in height above the ground level at its site.
(2) Any construction or alteration of greater height than imaginary surface extending outward and upward at one of the following slopes:
(i) 1 00 to 1 for horizontal distance of 20,000 feet from the nearest point of the nearest runway of each airport specified in paragraph (a)(5) or this section with at least one runway more than 3,200 feet in actual length, excluding heliports.
(ii) 50 to 1 for horizontal distance of 10,000 feet from the nearest point of the nearest runway of each airport specified in paragraph (a)(5) of this section with its longest runway no more than 3,200 feet in actual length, excluding heliports.
(iii) 25 to 1 for a horizontal distance of 5,000 feet from the nearest point of the nearest landing and takeoff area of each heliport specified in paragraph (a)(5) of this section.

(3) Any highway, railroad, or other traverse way for mobile objects, of a height which, if adjusted upward 17 feet for an Interstate Highway that is part of the National System of Military and Interstate Highways where overcrossings are designed for a minimum of 17 feet vertical distance, 16 feet for any other public roadway, 10 feet or the height of the highest mobile object that would normally traverse the road, whichever is greater, for a private road, 23 feet for a railroad, and for a waterway or any other traverse way not previously mentioned, an amount equal to the height of the highest mobile object that would normally traverse it, would exceed a standard of paragraph (a)(1) or (2) of this section.

(4) When requested by the FAA, any construction or alteration that would be in an instrument approach area (defined in the FAA standards governing instrument approach procedures) and available information indicates it might exceed a standard of Subpart C of this part.

(5) Any construction or alteration on any of the following airports (including heliports):
(i) An airport that is available for public use and is listed in the Airport Directory of the current Airman's Information Manual or in either the Alaska or Pacific Airman's Guide and Chart Supplement.
(ii) An airport under construction, that is the subject of a notice or proposal on file with the Federal Aviation Administration, and except for military airports, it is clearly indicated that airport will be available for public use.
(iii) An airport that is operated by an armed force of the United States.

(b) Each sponsor who proposes construction or alteration that is the subject of a notice under paragraph (a) of this section and is advised by an FAA regional office that a supplemental notice is required shall submit that notice on a prescribed form to be received by the FAA regional office at least 48 hours before the start of construction or alteration.

(c) Each sponsor who undertakes construction or alteration that is the subject of a notice under paragraph (a) of this section shall, within 5 days after that construction or alteration reaches its greatest height, submit a supplemental notice on a prescribed form to the FAA regional office having jurisdiction over the region involved, if –
(1) The construction or alteration is more than 200 feet above the surface level of its site; or
(2) An FAA regional office advises him that submission of the form is required.

§77.15 Construction or alteration not requiring notice.

No person is required to notify the Administrator for any of the following construction or alteration:
(a) Any object that would be shielded by existing structures of a permanent and substantial character or by natural terrain or topographic features of equal or greater height, and would be located in the congested area of a city, town, or settlement where it is evident beyond all reasonable doubt that the structure so shielded will not adversely affect safety in air navigation.
(b) Any antenna structure of 20 feet or less in height except one that would increase the height of another antenna structure.
(c) Any air navigation facility, airport visual approach or landing air, aircraft arresting device, or meteorological device, of a type approved by the Administrator, or an appropriate military service on military airports, the location and height of which is fixed by its functional purpose.
(d) Any construction or alteration for which notice is required by any other FAA regulation.

§77.17 Form and time of notice

(a) Each person who is required to notify the Administrator under §77.13 (a) shall send one executed form set of FAA Form 7460-1, Notice of Proposed Construction or Alteration, to the Manager, Air Traffic Division, FAA Regional Office having jurisdiction over the area within which the construction or alteration will be located. Copies of FAA Form 7460-1 may be obtained from the headquarters of the Federal Aviation Administration and the regional offices.

(b) The notice required under §77.13 (a)(1) through (4) must be submitted at least 30 days before the earlier of the following dates –
(1) The date the proposed construction or alteration is to begin.

(2) The date an application for a construction permit is to be filed.

However, a notice relating to proposed construction or alteration that is subject to the licensing requirements of the Federal Communications Act may be sent to the FAA at the same time the application for construction is filed with the Federal Communications Commission, or at any time before that filing.

(c) A proposed structure or an alteration to an existing structure that exceeds 2,000 feet in height above the ground will be presumed to be a hazard to air navigation and to result in an inefficient utilization of airspace and the applicant has the burden of overcoming that presumption. Each notice submitted under the pertinent provisions of this part 77 proposing a structure in excess of 2,000 feet above ground, or an alteration that will make an existing structure exceed that height, must contain a detailed showing, directed to meeting this burden. Only in exceptional cases, where the FAA concludes that a clear and compelling showing has been made that it would not result in an inefficient utilization of the airspace and would not result in a hazard to air navigation, will a determination of no hazard be issued.

(d) In the case of an emergency involving essential public services, public health, or public safety that required immediate construction or alteration, the 30 day requirement in paragraph (b) of this section does not apply and the notice may be sent by telephone, telegraph, or other expeditious means, with an executed FAA Form 7460-1 submitted within five (5) days thereafter. Outside normal business hours, emergency notices by telephone or telegraph may be submitted to the nearest FAA Flight Service Station.

(e) Each person who is required to notify the Administrator by paragraph (b) or (c) of §77.13, or both shall send an executed copy of FAA Form 7460-2, Notice of Actual Construction or Alteration, to the Manager, Air Traffic Division, FAA Regional Office having jurisdiction over the area involved.

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office Obstruction Evaluation Service, AJR-322
2601 Meachum Boulevard
Fort Worth, TX 76193
Fax: 817-838-1991
Phone: 817-838-1990

Website: https://oeaaa.faa.gov

INSTRUCTIONS FOR COMPLETING FAA FORM 7460-1

PLEASE TYPE or PRINT

ITEM #1. Please include the name, address and phone number of a personal contact point as well as the company name.

ITEM #2. Please include the name, address and phone number of a personal contact point as well as the company name.

ITEM #3. New Construction would be a structure that has not yet been built.

Alteration is a change to an existing structure such as the addition of a side mounted antenna, a change to the marking and lighting, a change to power and/or frequency, or a change to the height. The nature of the alteration shall be included in **ITEM #21** "Complete Description of Proposal".

Existing would be a correction to the latitude and/or longitude, a correction to the height, or if filing on an existing structure which has never been studied by the FAA. The reason for the notice shall be included in **ITEM #21** "Complete Description of Proposal".

ITEM #4. If Permanent, so indicate. If Temporary, such as a crane or drilling derrick, enter the estimated length of time the temporary structure will be up.

ITEM #5. Enter the date that construction is expected to start and the date that construction should be completed.

ITEM #6. Please indicate the type of structure. DO NOT LEAVE BLANK.

ITEM #7. In the event that obstruction marking and lighting is required, please indicate type desired. If no preference, check "other" and indicate "no preference" **DO NOT LEAVE BLANK.** ***NOTE:*** *High Intensity lighting shall be used only for structures over 500' AGL.* In the absence of high intensity lighting for structures over 500' AGL, marking is also required.

ITEM #8. If this is an existing tower that has been registered with the FCC, enter the FCC Antenna Structure Registration number here.

ITEM #9 and #10. Latitude and longitude must be geographic coordinates, accurate to within the nearest second or to the nearest hundredth of a second if known. Latitude and longitude derived solely from a **hand-held GPS instrument is NOT acceptable.** A hand-held GPS is only accurate to within 100 meters (328 *feet*) 95 percent of the time. This data, when plotted, should match the site depiction submitted under **ITEM #20**.

ITEM #11. NAD 83 is preferred; however, latitude and longitude may be submitted in NAD 27. Also, in some geographic areas where NAD 27 and NAD 83 are not available other datums may be used. It is important to know which datum is used. **DO NOT LEAVE BLANK.**
ITEM #12. Enter the name of the nearest city and state to the site. If the structure is or will be in a city, enter the name of that city and state.

ITEM #13. Enter the **full** name of the nearest public-use ***(not private-use)*** airport or heliport or military airport or heliport to the site.

ITEM #14. Enter the distance **from** the airport or heliport listed in **#13 to the structure.**

ITEM #15. Enter the direction **from** the airport or heliport listed in **#13 to the structure.**

ITEM #16. Enter the site elevation above mean sea level and expressed in whole feet rounded to the nearest foot (e.g. 17'3" rounds to 17', 17'6" rounds to 18'). This data should match the ground contour elevations for site depiction submitted under **ITEM #20.**
ITEM #17. Enter the total structure height **above ground level** in **whole feet** rounded to the **next highest foot** (e.g. 17'3" rounds to 18'). **The total structure height shall include anything mounted on top of the structure, such as antennas, obstruction lights, lightning rods, etc.**

ITEM #18. Enter the overall height above mean sea level and expressed in **whole feet.** This will be the total of **ITEM #16 + ITEM #17.**

ITEM #19. If an FAA aeronautical study was previously conducted, enter the previous study number.

ITEM #20. Enter the relationship of the structure to roads, airports, prominent terrain, existing structures, etc. Attach an 8-1/2" x 11" non-reduced copy of the appropriate 7.5 minute U.S. Geological Survey *(USGS)* Quadrangle Map MARKED WITH A PRECISE INDICATION OF THE SITE LOCATION. To obtain maps, contact USGC at 1-800-435-7627 or via internet at "http://mapping.usgs.gov". If available, attach a copy of a documented site survey with the surveyor's certification stating the amount of vertical and horizontal accuracy in feet.

ITEM #21.

- For transmitting stations, include maximum effective radiated power *(ERP)* and all frequencies.
- For antennas, include the type of antenna and center of radiation *(Attach the antenna pattern, if available).*
- For microwave, include azimuth relative to true north.
- For overhead wires or transmission lines, include size and configuration of wires and their supporting structures *(Attach depiction).*
- For **each** pole/support, include coordinates, site elevation, and structure height above ground level or water.
- For buildings, include site orientation, coordinates of **each** corner, dimensions, and construction materials.
- For alterations, explain the alteration thoroughly.
- For existing structures, thoroughly explain the reason for notifying the FAA *(e.g. corrections, no record or previous study, etc.).*

Filing this information with the FAA does not relieve the sponsor of this construction or alteration from complying with any other federal, state or local rules or regulations. If you are not sure what other rules or regulations apply to your proposal, contact local/state aviations and zoning authorities.

Paperwork Reduction Work Act Statement: This information is collected to evaluate the effect of proposed construction or alteration on air navigation and is not confidential. Providing this information is mandatory for anyone proposing construction or alteration that meets or exceeds the criteria contained in 14 CFR, part 77. We estimate that the burden of this collection is an average 19 minutes per response. An agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a currently valid OMB control number. The OMB control number for this collection is 2120-0001. Comments concerning the accuracy of this burden and suggestions for reducing the burden should be directed to the FAA at: 800 Independence Ave. SW, Washington, DC 20591, Attn: Information Collection Clearance Officer, ABA-20

Please Type or Print on This Form

Form Approved OMB No.2120-0001
Expiration Date: 9/30/2010

U.S. Department of Transportation
Federal Aviation Administration

Failure To Provide All Requested Information May Delay Processing of Your Notice

Notice of Proposed Construction or Alteration

FOR FAA USE ONLY

Aeronautical Study Number

1. Sponsor *(person, company, etc. proposing this action):*

Attn. of: _____

Name: _____

Address: _____

_____

City: _____ State: _____ Zip: _____

Telephone: _____ Fax: _____

2. Sponsor's Representative *(if other than #1):*

Attn. of: _____

Name: _____

Address: _____

_____

City: _____ State: _____ Zip: _____

Telephone: _____ Fax: _____

3. Notice of: ☐ New Construction ☐ Alteration ☐ Existing

4. Duration: ☐ Permanent ☐ Temporary (____ months, ____ days)

5. Work Schedule: Beginning _____ End _____

6. Type: ☐ Antenna Tower ☐ Crane ☐ Building ☐ Power Line
☐ Landfill ☐ Water Tank ☐ Other _____

7. Marking/Painting and/or Lighting Preferred:
☐ Red Lights and Paint ☐ Dual - Red and Medium Intensity White
☐ White - Medium Intensity ☐ Dual - Red and high Intensity White
☐ White - High Intensity ☐ Other

8. FCC Antenna Structure Registration Number *(if applicable)*:

_____

9. Latitude: _____ ° _____ ' _____ , _____ "

10. Longitude: _____ ° _____ ' _____ , _____ "

11. Datum: ☐ NAD 83 ☐ NAD 27 ☐ Other

12. Nearest: City: _____ State _____

13. Nearest *Public-use* *(not private-use)* or Military Airport or Heliport:

_____

14. Distance from #13. to Structure: _____

15. Direction from #13. to Structure: _____

16. Site Elevation *(AMSL)*: _____ ft.

17. Total Structure Height *(AGL)*: _____ ft.

18. Overall Height (#16 + #17) *(AMSL)*: _____ ft.

19. Previous FAA Aeronautical Study Number *(if applicable)*:

_____-OE

20. Description of Location: *(Attach a USGS 7.5 minute Quadrangle Map with the precise site marked and any certified survey)*

21. Complete Description of Proposal:

Frequency/Power (kW)	

Notice is required by 14 Code of Federal Regulations, part 77 pursuant to 49 U.S.C., Section 44718. Persons who knowingly and willingly violate the notice requirements of part 77 are subject to a civil penalty of $1,000 per day until the notice is received, pursuant to 49 U.S.C., Section 46301(a)

I hereby certify that all of the above statements made by me are true, complete, and correct to the best of my knowledge. In addition, I agree to mark and/or light the structure in accordance with established marking & lighting standards as necessary.

Date	Typed or Printed Name and Title of Person Filing Notice	Signature

Paperwork Reduction Act Statement: This information is collected to process obstruction data that is critical to flight safety and is not confidential. Providing this information is mandatory for anyone proposing construction or alteration that meets or exceeds the criteria contained in 14 CFR, part 77. We estimate that the burden of this collection is an average 15 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, completing and reviewing the collection of information. A federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with a collection of information subject to the requirements of the Paperwork Reduction Act unless that collection of information displays a currently valid OMB Control Number. The OMB control number associated with this collection is 2120-0001. Comments concerning the accuracy of this burden and suggestions for reducing the burden should be directed to the FAA at: 800 Independence Ave SW, Washington, DC 20591, Attn: Information Collection Clearance Officer, AES-200.

Form Approved OMB No. 2120-0001
Expiration Date: 8/31/2014

SUPPLEMENTAL NOTICE

Submission Instructions: For Advance Notice of Actual Construction or Alteration. Complete items 1, 2, 3A (1), 3A(2), and 6. If applicable, also complete items 4 and 5. Detach Part 1. Fold and tape at bottom. Mail to the FAA Regional Office for your area. Part 1A is provided for your file.

Aeronautical Study No.

U.S. Department of Transportation
Federal Aviation Administration

Notice of Actual Construction or Alteration

(Please Type or Print on this Form)

1. Construction

A. Type and Description of Construction
☐ New
☐ Alteration

B. Owner of Structure

2. Construction Location -- Height

A. Coordinates *(To hundredths of seconds, if known)*

Latitude			Longitude		
°	'	"	°	'	"

B. Location *(City, State, include Street Address if any)*

C. Construction Heights

Site Elevation Ft. AMSL
Structure Height Ft. AGL

Total Height *(Structure & Site)* Above Mean Sea Level
Ft. AMSL

D. Site Elevation Determined By
☐ Actual Survey
☐ USGS 7.5' Quad Chart
☐ Other *(Specify)*

E. Reference datum of coordinates
☐ NAD 27
☐ NAD 83
☐ Other *(Specify)*

F. Name of Nearest Public-Use or Military Airport *(include Distance and Direction from the Airport)*

3. Construction Notifications

A. Notification (Notice Is Critical to Flight Safety --- FAR Part 77 Required) ★	Date	B. Construction/Project	Date
★ (1) Construction will start (Submit at least 48 hrs. in advance		(1) Project Abandoned	
(2) Estimated Completion			
★ (3) Structure Reached Greatest Height *(Submit within 5 days)*		(2) Construction Dismantled	

4. Marking and Lighting

A. Marked
☐ Yes ☐ No ☐ Temporary

B. Lighted
☐ Medium Intensity White
☐ Dual (Medium Intensity White & Red)
☐ High Intensity White
☐ Dual (High Intensity White & Red)
☐ Red
☐ None

5. Antenna Requiring FCC License

A. Call Sign	B. Frequency	C. Date Applied for FCC Construction Permit	D. Date Construction Permit Issued

6. Preparer's Certification

Submitted by: (If submitted by a proponent's representative, please also complete item B.)

A. Proponent's Representative
Name:
Address:
Tel. No.: *(Include Area Code)*

B. Construction Proponent
Name:
Address:
Tel. No.: *(Include Area Code)*

I hereby certify that the information provided is true, complete, and correct to the best of my knowledge.

Signature	Title	Date

Notice is required by 14 Code of Federal Regulations, part 77 pursuant to 49 U.S.C., Section 44718. Persons who knowingly and willingly violate the notice requirements of part 77 are subject to a civil penalty of $1,000 per day until the notice is received, pursuant to 49 U. & C., Section 46301(a).

SECTION 01020
ALLOWANCES

PART 1: GENERAL:

1.01 GENERAL:

A. Include in the Contract Sum the following allowances and cause the work so covered to be performed in accordance with the Contract Documents.

B. Refer to Conditions of the Contract for general requirements with regard to allowances. Allowance sum covers materials delivered to the job site only, unless otherwise indicated.

C. Allowance money may, if required, be returned to the Owner by Change Order for purpose of payment for materials or services specified.

D. Where allowance is indicated as a cost, this is to establish the quality of material, and Contractor shall be responsible for ascertaining the total quantity required, including waste, necessary to complete the installation.

E. The amount of each allowance includes:
1. The cost of the Contractor of materials and equipment delivered to the site.
2. All required taxes, unless exempt from State sales tax.
3. Labor required under the allowance, only when labor is specified to be included in the allowance.
4. Respective overhead and profit per Section 00811, Paragraph 7.3.10.

F. In addition to the amount of each allowance, include in the Contract sum an amount of 6% of the Allowance as Contractor's cost for:
1. Handling at the Site; including unloading, uncrating, and storage.
2. Labor for installation and finishing, except where labor is specified to be a part of the Allowance.
3. Protection from the elements and from damage.
4. Other expenses contemplated or required for stated allowance.
5. Contractor's overhead and profit per Section 00811 paragraph 7.3.10.2.

1.02 CONTINGENCY ALLOWANCE:

A. Include in the Contract Sum a lump sum CONTINGENCY ALLOWANCE of ***THIRTY THOUSAND*** (**$*30,000.00*) DOLLARS** including respective labor.

B. At the closeout of Contract, balance of monies remaining in the CONTINGENCY ALLOWANCE and applicable contractor's cost of 6% of the Contingency Allowance balance will be credited to the Owner by Change Order.

1.03 LANDSCAPING & IRRIGATION ALLOWANCE:

C. Include in the Contract Sum a lump sum LANDSCAPING & IRRIGATION ALLOWANCE of ***TWENTY THOUSAND*** (**$*20,000.00*) DOLLARS** including respective labor.

B. At the closeout of Contract, balance of monies remaining in the LANDSCAPING & IRRIGATION ALLOWANCE and applicable contractor's cost of 6% of the Contingency Allowance balance will be credited to the Owner by Change Order.

END OF SECTION

SECTION 01035

CIVIL ENGINEERING REQUESTS FOR INFORMATION

PART I GENERAL

1.01 SUMMARY

A. Section Includes:

1. Administrative and procedural requirements for handling and processing "Requests for Information" (RFI).

2. "Request for Information" process diagram is attached at the end of this Section.

3. "Request for Information" form is attached at the end of this Section.

1.02 DEFINITION

A. Requests for Information: A formal process used during the construction phase to facilitate communication between the contractor and the Civil Engineering consultant with regard to requests for additional information and clarification of the intent of the Contract Documents (Drawings and Specifications).

B. Do not use "Request for Information" form during bidding. Direct questions during bidding phase as indicated in the bid documents.

1.03 PROCEDURE

A. Conditions Requiring Clarification of the Contract Documents:

1. Contractor shall submit a "Request for Information" to the civil Engineering Consultant.

2. Submit "Requests for Information" from Contractor's office or field office only. "Requests for Information" submitted directly from subcontractors or suppliers will not be accepted.

3. Generate "Requests for Information" by one source per project and number accordingly.

4. Submit one "Request for Information" per form.

B. Civil Engineering Consultant will review RFI from the Contractor with reasonable promptness and the Contractor will be notified in writing of decisions made.

1. The Civil Engineering Consultant's written response to the RFI shall <u>not</u> be considered as a Change Order or Change Directive, nor does it authorize changes in the Contract Sum or Contract Time.

C. Contractor shall maintain a log of "Requests for Information" sent to, and responses from Civil Engineering Consultant. "Requests for Information" log shall be sent, by Fax, every Friday to the Civil Engineering Consultant.

D. All "Requests for Information" regarding scheduling, costing and owner provided equipment coordination shall be directed to the owner's Construction Manager.

1.04 REQUEST FOR INFORMATION FORM

A. Submit "Requests for Information" on the attached "Request for Information" form, or format accordingly on letterhead. Civil Engineering Consultant will not respond to requests for information unless this form or format is utilized.

B. Where submittal form or format does not provide space needed for complete information, additional sheets may be attached.

END OF SECTION 01035

CIVIL ENGINEERING REQUEST FOR INFORMATION

RFI NO. _____

DATE: _____

PROJECT _____
(CITY, STATE)

TO: _____
(CIVIL ENGINEERING CONSULTANT)

FROM: _____
(GENERAL CONTRACTOR)

_____
(PROJECT SUPERINTENDENT)

_____
(JOB SITE FAX NUMBER)

DRAWING NO. _____

DETAIL NO. _____

SPECS SECTION NO. _____

RFI Type:

( ) Demolition	( ) Rock	( ) utilities	( ) Site Lighting
( ) Site Preparation	( ) Erosion Control	( ) Paving	( ) Slope Stabilization/ Retaining Walls
( ) Earthwork	( ) Storm Sewer	( ) Landscape/ Irrigation	( ) Traffic Related
			( ) Other

Information Requested:

Requested By: _____

Reply:

_____
Response By:

_____
Date:

File Distribution:

Revised 7-9-93

SECTION 01045

CUTTING AND PATCHING

PART 1: GENERAL:

1.01 DESCRIPTION:

A. Contractor shall be responsible for all cutting, fitting and patching, including attendant excavation and backfill, required to complete the Work and to make its several parts fit together properly.

1.02 SUBMITTALS:

A. Submit a written request to Architect well in advance of executing any cutting or alteration which affects the structural value or integrity of any structural element of the Project. Obtain Architect's approval prior to executing any of the foregoing.

PART 2: PRODUCTS:

2.01 MATERIALS:

A. Comply with applicable specifications section for each specific product involved.

PART 3: EXECUTION:

3.01 INSPECTION:

A. Report unsatisfactory or questionable conditions to the Architect in writing; do not proceed with the work until the Architect has provided further instructions.

3.02 PREPARATION:

A. Provide adequate temporary support as necessary to assure the structural value or integrity of the affected portion of the Work.

B. Provide devices and methods to protect other portions of the Project from damage.

C. Provide protection from the elements for that portion of the Project which may be exposed by cutting and patching work, and maintain excavations free from water.

3.03 PERFORMANCE:

A. Execute cutting by methods which will prevent damage to other work, and will provide proper surfaces to receive installation of repairs.

B. Execute excavating and backfilling by methods which will prevent settlement or damage to other work.

C. After installation of the Work, carefully fit around, close up, repair, patch and/or point up all such work to match adjoining surface by use of proper tools and materials and by skilled workmen to which the work belongs.

D. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes.

E. Restore work which has been cut or removed; install new products to provide completed Work in accordance with requirements of Contract Documents.

F. Fit work airtight to pipes, sleeves, ducts, conduit and other penetrations through surfaces.

G. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes. For continuous surfaces, refinish to nearest intersection. For an assembly, refinish the entire unit.

END OF SECTION

SECTION 01050

FIELD ENGINEERING

PART 1: GENERAL:

1.01 GENERAL:

A. The Contractor shall, at his expense, engage a Texas licensed Surveyor, to locate all surveyor marks, including bench marks in order that the exact lines of the property, building and grades will be determined and verified.

B. Surveyor shall layout out entire Project prior to start of construction.

C. On completion of foundation walls and major site improvements, the Surveyor shall furnish a certified plat verifying property lines and building lines in accordance with the plot plan.

D. Any discrepancies arising in locating the work in respect to property and building lines shall be reported immediately to the Owner and the Architect.

E. Locate and protect control points prior to starting work, and preserve all permanent reference points during construction. Replace project control points which may be lost or destroyed.

F. Establish a minimum of two permanent bench marks on the site, referenced to data established by survey control points. Record locations, with horizontal and vertical data, on Project Record Documents.

G. Establish all construction lines and levels, by instrumentation and similar appropriate means.

END OF SECTION

SECTION 01085

APPLICABLE STANDARDS

PART 1: GENERAL:

1.01 DESCRIPTION:

A. Work Included:

1. Throughout the Contract Documents, reference is made to codes and standards which establish qualities and types of workmanship and materials, and which establish methods for testing and reporting on the pertinent characteristics.
2. Where materials or workmanship are required by these Contract Documents to meet or exceed the specifically named code or standard, it is the Contractor's responsibility to provide materials and workmanship which meet or exceed the specifically named code or standard.
3. It is also the Contractor's responsibility, when so required by the Contract Documents or by written request from the Architect, to deliver to the Architect all required proof that the materials or workmanship, or both, meet or exceed the requirements of the specifically named code or standard. Such proof shall be in the form requested in writing by the Architect, and generally will be required to be copies of a certified report of tests conducted by a testing agency approved for that purpose by the Architect.

B. Related Work Described Elsewhere:
Specific naming of codes or standards occurs on the Drawings and in other Sections of these specifications.

1.02 QUALITY ASSURANCE:

A. Familiarity with pertinent codes and standards: In procuring all items used in this work, it is the Contractor's responsibility to verify the detailed requirements of the specifically named codes and standards and to verify that the items procured for use in this work meet or exceed the specified requirements.

B. Rejection of non-complying items: The Architect reserves the right to reject items incorporated into the work which fail to meet the specified minimum requirements. The Architect further reserves the right, and without prejudice to other recourse the Architect may take, to accept non-complying items subject to an adjustment in the Contract Amount as approved by the Architect and the Owner.

C. Applicable standards listed in these specifications include, but are not necessarily limited to, standards promulgated by the following agencies and organizations:

1. AASHTO =American Association of State Highway and Transportation Officials, 341 National Press, Washington, D.C. 20004

2. ACI = American Concrete Institute, Box 19150, Redford Station, Detroit, Michigan 48129

3. AISC = American Institute of Steel Construction, Inc., 1221 Avenue of the American, New York, New York 10020.

4. ANSI = American National Standards Institute (successor to USASI and ASA), 1430 Broadway, New York, New York 10018.

5. ASTM = American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.

6. AWS = American Welding Society, Inc., 2501 N.W. 7th Street, Miami, Florida 33125.

7. AWWA = American Water Works Association, Inc., 6666 West Quincy Avenue, Denver, Colorado 80235.

8. CRSI = Concrete Reinforcing Steel Institute, 228 North LaSalle Street, Chicago, Illinois 60610.

9. CS = Commercial Standard of NBS, U.S. Department of Commerce, Government Printing Office, Washington, D.C. 20402.

10. FGMA = Flat Glass Marketing Association, 3310 Harrison, Topeka, Kansas 66611

11. NAAMM = National Association of Architectural Metal Manufacturers, 1033 South Boulevard, Oak Park, Illinois 60403.

12. NEC = National Electrical Code (see NFPA).

13. NEMA = National Electrical Manufacturers Association, 155 East 44th Street, New York, New York 10017.

14. NFPA = National Fire Protection Association, 470 Atlantic Avenue, Boston, Massachusetts 02210.

15. SDI = Steel Deck Institute, 135 Addison Avenue, Elmhurst, Illinois 60125.

16. SSPC = Steel Structures Painting Council, 4400 5th Avenue, Pittsburgh, Pennsylvania 15213.

17. TCA = Tile Council of America, Inc., P.O. Box 326, Princeton, New Jersey 08540.

18. UL = Underwriter's Laboratories, Inc., 207 East Ohio Street, Chicago, Illinois 60611.

19. FED SPECS and FED STANDARDS:
Specifications Sales (3FRI), Bldg. 197, Washington Navy Yard, General Services Administration, Washington, D.C. 20407.

20. INTERNATIONAL BUILDING CODE 2012 or latest edition.

21. NATIONAL FIRE PROTECTION ASSOCIATION STANDARDS:/CURRENT EDITION

22. INTERNATIONAL PLUMBING CODE – 2012 or latest edition.

23. ANSI A 17.1, -Safety Code for Elevators, Dumbwaiters, Escalators and Moving Walks; and Supplement ANSI A17.1a, current edition.

24. American Society of Heating, Refrigerating and Air Conditionings Engineers ANSI/ASHREA/IES Standard 90.1-2010- Energy Conservation in New Building Design, current edition.

25. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHREA)-Standard No.52- - Methods of Testing Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter , current edition.

26. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHREA)-Handbook of Applications, current edition.

27. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHREA)-Handbook of Fundamentals, current edition.

28. American Society for Testing and Materials (ASTM)-Standard No.E 84- Method of Test for Surface Burning Characteristic of Building Materials, current edition.

29. INTERNATIONAL MECHANICAL CODE – 2012 or latest edition.

30. National Bureau of Standards (NBS) (available through GPO - Technical No.#708 - Appendix II, GPO SD Catalog No. C13.45, 708, NTIS COM:72:50062-Inner Laboratory Evaluation of Smoke Density Chamber. Appendix II-Test Method for Measuring the Smoke Generation Characteristics of Solid Materials.

31. Underwriter's Laboratories, Inc. (UL) - Standard No.181, - Factory Made Air Duct Material and Air Duct Connectors.

32. State Purchasing and General Services Commission-Commission's Rules and Regulations for the Elimination of Architectural Barriers.

33. Texas Department of Licensing and Regulation, Texas Architectural Barriers Act.

END OF SECTION

SECTION 01100

ALTERNATES

PART 1 - GENERAL:

1.01 SCOPE:

A. Quote as additions or deductions to the Base Proposal, Alternates to the various sections of the Work, which may be included in the Contract Price.

B. Price all Alternates complete, furnished and installed, including taxes, insurance, overhead and profit. Alternates shall be listed in the order shown on Proposal Form and shall be shown as one figure only; that is, the credit and/or extra involved for any one alternate shall have been reconciled into one figure, which can at Owner's option be added to (or deducted from - as the case may be) the Base Proposal, thus deleting or adding the applicable work in Proposal.

C. Include in the price quoted for each Alternate, any changes required in other Sections as a result of the Alternate.

D. Refer to the respective Section for complete Specifications of each Alternate.

E. If an Alternate is accepted, it shall be included as a part of the Contract Documents.

Alternate No. 1 Storm Sewer Junction Box: That amount to provide labor and materials to install a storm sewer junction box as indicated on civil drawing C-2:

Alternate No. 2 Electric Operating Aircraft doors: That amount to provide labor and materials to install an electric operating aircraft doors as indicated on drawings:

Alternate No. 3 Foam-water fire sprinkler system for Hangar A100: *Base bid shall include a fully sprinkled building as per NFPA 13*. Alternate No. 3 shall include that amount to provide labor and materials to install a foam-water fire sprinkler system as per NFPA16, reference sheets FP1.1:

END OF SECTION

SECTION 01152

APPLICATIONS FOR PAYMENT

PART 1: GENERAL:

1.01 GENERAL:

A. Submit Applications for Payment to Architect for each site in accordance with the schedule established by Conditions of the Contract and Agreement Between Owner and Contractor.

B. Submit itemized applications typed on AIA DOCUMENT G702, Application and Certificate for Payment, and continuation sheets G703. To purchase original forms call the LRGV/AIA office at 956-994-0939.

C. Application for payment shall also be accompanied by a written notarized statement from the surety confirming that the surety has reviewed the application for payment and approves, without reservation, of its payment by the Owner.

1.02 PREPARATION OF APPLICATION:

A. Application Form:

1. Fill in required information, including that for Change Orders executed prior to the date of submittal of application.
2. Fill in summary of dollar values to agree with the respective totals indicated on the continuation sheets.
3. Indicate percentage of retainage for completed work and for stored materials as agreed upon in the Owner-Contractor Agreement.
4. Execute notarized certification with the signature of a responsible officer of the Contract firm.

B. Continuation Sheets:

1. Fill in total list of all scheduled component items of Work, with item number and the scheduled dollar value for each item.
2. Fill in the dollar value in each column for each scheduled line item when work has been performed or products presently stored.
   a. Round off values to nearest dollar, or as specified for the Schedule of Values.
3. List each Change Order executed prior to the date of submission, at the end of the continuation sheets unless otherwise agreed upon.
   a. List each Change Order Number, and description, as for an original component item of work unless it is agreed that the schedule of values should be revised.

C. Construction Schedule:

1. **Provide original construction schedule with first application for payment.**
2. **With subsequent applications provide updated construction schedule indicating deviations from original construction schedule.**

1.03 SUBMITTAL PROCEDURE:

A. Submit three {3} copies of Applications for Payment to Architect at the times stipulated in the Agreement.

B. When Architect finds the Application properly completed and correct, he will transmit a certificate of payment to Owner. If an adjustment in the requested amount is made, he will advise the Contractor in writing.

END OF SECTION

SECTION 01153

CHANGE ORDER PROCEDURES

PART 1: GENERAL:

1.01 PROPOSED CHANGES:

A. Upon discovery of circumstances or conditions leading to the conclusion that a construction change should be made, the Architect will issue a Request for Change Order Proposal (R.F.P.) form.

B. Any work done by Contractor not authorized by the Owner shall be subject to removal at the Contractor's expense.

C. Upon determination that a proposed change appears feasible, the Architect will assign a R.F.P. number and log the information. The Architect will then prepare necessary drawings, specifications or descriptions as required for pricing.

D. The Architect will forward the package to the Contractor for pricing. Typically, ten (10) working days will be allowed for pricing; however, additional time will be allowed for more extensive changes.

E. The Contractor shall submit his price proposal along with all required back-up information to the Architect. The submittal shall include separate breakdowns for general contract and subcontract work.

F. The breakdowns shall show materials by quantities and unit prices. Cost including labor, tax, insurance mark-ups, and equipment costs. Overhead and profit shall be shown separately. Quotation shall include all costs. No additional costs will be allowed for a proposed change.

G. The Contractor's proposed change quotations will be reviewed by the Architect within a reasonable amount of time, usually not more than ten (10) working days. Conformance with the contract and the proposed change documents, as well as material, labor and equipment quantities and costs, and allowed mark-up percentages will be verified. Requests for additional time will also be evaluated based on the contractor's written evidence submitted along with a revised construction schedule proving impact on final completion date. Lack of such written evidence shall cause the request for time extension to be rejected. In case of differences, discrepancies, errors, etc. the Contractor will take action to obtain necessary revisions or corrections to the quotation.

H. "Cost of Doing business" items such as, but not limited to, supervision, field and home office expenses, warranty reserve, clean-up, and expendable supplies are a part of the overhead expense and as such shall not be included as a part of the change order proposal.

I. Bond premiums may be included as an expense item in an additive R.F.P. if also included in a deductive R.F.P. Percentage allowed shall be limited to actual percentage paid by General Contractor to bonding agent. Premiums for subcontractor bonds, if required by General Contractor, shall not be passed on the Owner.

J. When a price quotation has been considered acceptable, the Architect will forward his recommendations and all back-up information to the Owner. A recommendation either for or against the proposed change will accompany this submittal from the Architect.

1.02 AUTHORIZATION FOR CONSTRUCTION TO PROCEED:

A. Within a reasonable time, the Owner will notify the Architect whether the change will be implemented. If the change is approved, the Architect will issue a Change Order. The Change Order may be issued, at the Architect's discretion, immediately or in conjunction with several other approved RFP's if considered appropriate.

END OF SECTION

SECTION 01200

PROJECT MEETINGS

PART 1 - GENERAL:

1.01 DESCRIPTION:

A. Contractor shall schedule and administrate pre-construction meeting, monthly progress meetings, and specially called meetings throughout the progress of the work.

1. Prepare agenda for meetings.
2. Distribute written notice of each meeting and the agenda four (4) working days in advance of meeting date.
3. Make physical arrangements for meetings.
4. Preside at meetings.
5. Record the minutes; include all significant proceedings and decisions.
6. Reproduce and distribute copies of minutes within three (3) working days after each meeting.

B. Representative of contractors, subcontractors and suppliers attending the meetings shall be qualified and authorized to act on behalf of the entity each represents.

C. Architect's and Owner's Representative may attend meetings.

1.02 PRE-CONSTRUCTION MEETING:

A. Schedule within fifteen (15) days after date of Notice to Proceed.

B. Location: RIKE-OGDEN-FIGUEROA-ALLEX ARCHITECTS INC.
1007 Walnut Avenue, McAllen, Texas 78501

C. Attendance:

1. Owner's Representative.
2. Architect and his professional consultants.
3. Contractor's Superintendent.
4. Major Subcontractors.
5. Others as appropriate.

1.03 PROGRESS MEETINGS:

A. Schedule regular monthly meetings at **a scheduled time** on an agreed upon date of each month.

B. Hold called meetings as required by progress of the Work.

C. Location of the meetings: on site or designated meeting place.

D. Attendance:

1. Architect and his professional consultants as needed.
2. Subcontractors as appropriate to the agenda.
3. Suppliers as appropriate to the agenda.
4. Others as appropriate.

END OF SECTION

SECTION 01300

SUBMITTALS AND SUBSTITUTIONS

PART 1: GENERAL:

1.01 DESCRIPTION:

A. Work Included:

1. Wherever possible throughout the Contract Documents, the minimum acceptable quality of workmanship and materials has been defined by manufacturer's name and catalog numbers, reference to recognized industry and government standards, or description of required attributes and performance.

2. To ensure that the specified products are furnished and installed in accordance with design intent, procedures have been established for advance submittal of design data and for their review by the Architect.

3. Make all submittals required by the Contract Documents, and revise and resubmit as necessary to establish compliance with the specified requirements. Submittals should include cut sheets of original specified items.

4. Product substitutions request shall be submitted no later than 72 hours prior to opening of Bids (Proposals) as noted in Section 00020.

B. Related Work Described Elsewhere: Individual requirements for submittals are described in pertinent other Sections of these Specifications.

1.02 QUALITY ASSURANCE:

A. Coordination of Submittals: Prior to each submittal, carefully review and coordinate all aspects of each item being submitted and verify that each item and the submittal for it conforms in all respects with the requirements of the Contract Documents. By affixing the Contractor's signature to each submittal, Contractor certifies that this coordination has been performed. Contractor shall approve all submittals prior to submission to Architect. Contractor shall verify all dimensions and conditions on the job.

B. Certificate of Compliance:

1. Certify that all materials used in the work comply with all specified provisions thereof. Certification shall not be construed as relieving the Contractor from furnishing satisfactory materials if, after tests are performed on selected samples, the material is found to not meet specified requirements.

2. Show on each certification the name and location of the work, name and address of Contractor, quantity and date or dates of shipment or delivery to which the certificate applies, and name of the manufacturing or fabricating company. Certification shall be in the form of letter or company-standard forms containing all required data. Certificates shall be signed by an officer of the manufacturing or fabricating company.

3. In addition to the above information, all laboratory test reports submitted with Certificates of Compliance shall show the date or dates of testing, the specified requirements for which testing was performed, and results of the test or tests.

1.03 SUBMITTALS:

A. Submittals Schedule: Provide submittal schedule with first Application for Payment , and before any items are submitted for approval, submit to the Architect two copies of the schedule described in Article 2.01 of this Section.

B. Certification of Compliance: Upon completion of the Work, and as a condition of its acceptance, submit to the Architect all Certificates of Compliance.

C. Procedures: Make submittals in strict accordance with the provisions of this Section.

PART 2: PRODUCTS:

2.01 SUBMITTAL SCHEDULE:

A. General: Compile a complete and comprehensive schedule of all submittals anticipated to be made during progress of the work. Include a list of each type of item for which Contractor's drawings, shop drawings, Certificates of Compliance, material samples, guarantees, or other types of submittals are required. Upon approval by the Architect this schedule will become part of the Contract and the Contractor will be required to adhere to the schedule except when specifically otherwise permitted. **Submittals will not be processed & reviewed until schedule is received.**

B. Coordination: Coordinate the schedule with all subcontractors and materials suppliers to ensure their understanding of the importance of adhering to the approved schedule. Coordinate as required to ensure the grouping of submittals as described in Paragraph 3.02 below.

C. Revisions: Revise and update the schedule on a monthly basis as necessary to reflect conditions and sequences. Promptly submit revised schedule to the Architect for review and comment with each application for payment.

D. It is the Contractor’s responsibility to notify the Architect in writing if and when the submittal not returned from review are going to impact the construction schedule.

2.02 SHOP DRAWINGS AND COORDINATION DRAWINGS:

A. Shop Drawings:

1. Scale and Measurements: Make all shop drawings accurately to a scale sufficiently large to show all pertinent aspects of the items and its method of connection to the work (construction document drawings shall not be traced, copied or reproduced).

2. Type of Prints Required: Submit two printed copies and one reproducible (vellum) of each submittal.

3. Review of Shop Drawings: All review comments of the Architect will be shown on the reproducible drawings when it is returned to the Contractor. The Contractor shall be responsible for making all copies required for his purpose and distributing them to the subcontractors & suppliers.

4. Failure to submit one printed & one reproducible copy will cause the submittal to be returned unchecked.

2.03 MANUFACTURERS' LITERATURE:

A. General: Where contents of submitted literature from manufacturers includes data not pertinent to the submittal, **clearly indicate which portion of the contents is being submitted for review. Highlight pertinent information with green highlighter.**

B. Number of Copies Required: ***Submit number required by the general contractor for construction plus one copy for architect, one copy for consultants, one copy for owner.*** General contractor copies will be returned to the contractor with all review comments of the architect and respective consultant.

2.04 SAMPLES:

A. Accuracy of Samples: Samples shall be of the precise article proposed to be furnished.

B. Number of Samples Required: Unless otherwise specified, submit all samples in the quantity which is required to be returned plus two (2) which will be retained by the Architect.

C. Reuse of Samples: In situations specifically so approved by the Architect, the Architect's retained sample may be used in the construction as one of the installed items.

2.05 COLORS AND PATTERNS:

A. Unless the precise color and pattern is specifically described in the Contract Documents, and whenever a choice of color pattern is available in a specified product, submit accurate color and pattern charts to the Architect for review and selection.

2.06 SUBSTITUTIONS:

A. Approval Required:

1. The Contract is based on the standards of quality established in the Contract Documents.

2. All products proposed for use, including those specified by required attributes and performance, shall require approval by the Architect before being incorporated into the work.

3. Do not substitute materials, equipment, or methods unless such substitution has been specifically approved for this work by the Architect.

4. Product substitution requests shall be submitted no later than 72 hours prior to Opening of Bids (Proposals) as noted in Section 00020.

B. "Or Equal":

1. Where the phrase "or equal" or "or equal as approved by the Architect" occurs in the Contract Documents, do not assume that materials, equipment, or methods will be approved as equal unless the item has been specifically approved for this work by the Architect.

2. The decision of the Architect will be final.

3. It is the Contractor’s responsibility to compare all aspects of the substitute and prove the substitute is equal.

4. Coordinate submission of submittals with the different submittals related to the parts of Work so that the submittal will proceed according to the submittal schedule.

5. Processing of submittal which contain finishes for selection will not begin until all related submittals are received.

2.07 DEVIATIONS:

A. Clearly note, in written form, any deviations from the contract documents.

2.08 COMPLIANCE:

A. Clearly mark specific items which are submitted in compliance with the contract documents.

PART 3: EXECUTION:

3.01 IDENTIFICATION OF SUBMITTALS:

A. General: Identify each submittal with specification section number and project name. Accompany each submittal with a letter of transmittal containing all pertinent information required for identification and check of submittals.

B. Internal Identification: On at least the first page of each copy of each submittal, and elsewhere as required for positive identification, clearly indicate the submittal specification section number in which the item was included.

C. Resubmittals: When material is resubmitted for any reason, transmit under a "REVISED" letter of transmittal and with a "REVISED" submittal specification section number. (e.g.: 03100 becomes 03100R-1)

D. Submittal Log: Maintain an accurate submittal log for the duration of the Contract, showing current status of all submittals at all times. Make the submittal log available for the Architect's review upon request.

3.02 COORDINATION OF SUBMITTALS:

A. Coordinate, prepare, and process submittals in accordance with work to be performed.

B. General: Prior to submittal for approval, use all means necessary to fully coordinate all materials and work task activities including, but not necessarily limited to:
   1. Determine and verify all conditions, catalog numbers, and similar data.
   2. Coordinate with other trades as required.
   3. Clearly indicate all deviations from requirements of the Contract Documents.

C. Grouping of Submittals: Unless otherwise specified, make all submittals in groups containing all associated items to ensure that information is available for checking each item when it is received. Partial submittals may be rejected as not complying with the provisions of the Contract Documents and the Contractor shall be strictly liable for all delays so occasioned.

3.03 SUBMITTAL SCHEDULE:

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmitted, ordering, manufacturing, fabrication, and delivery when establishing dates.
   1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor’s Construction Schedule.
   2. Material Submittal: Submit all material submittals required to maintain orderly progress of the Work and those required early because of long lead-time for manufacture or fabrication or for final color selection.

3.04 TIMING OF SUBMITTALS:

A. General: Make all submittals far enough in advance of scheduled dates for installation to provide all time required for reviews, for securing necessary approvals, for possible revisions and resubmittals, and for placing orders and securing delivery. Allow time for the above tasks in construction submittal schedule.

B. Submittal time schedules: Submittals shall be provided to architect for project based on:

3 month to 6 month projected completion	***1 month from date of contract for items requiring color selection and 2 months for other items.***
7 month to 12 month projected completion	***2 months from date of contract for items requiring color selection and 3 months for other items.***
13 month to 16 month projected completion	***3 months from date of contract for items requiring color selection and 4 months for other items.***
over 17 months projected completion	***4 months from date of contract for items requiring color selection and 5 months for other items.***

C. Architect's Initial Review Time: In scheduling, allow at least fifteen (15) working days for initial review by the Architect following receipt of the submittal. Items requiring color coordination will be delayed pending receipt of all items that require color coordination and owner approval.

D. Consultant’s review time: In scheduling allow at least (20) work days for initial review of each submittals.

E. Delays: Delays caused by tardiness in receipt of submittals will not be an acceptable basis for extension of the Contract completion date.

3.05 ARCHITECT'S REVIEW:

A. General: Review by the Architect shall not be construed as a complete check, but only that the general method of construction and detailing is satisfactory. Review shall not relieve the Contractor from responsibility for errors which may exist.

B. Authority to Proceed: The notations **“no exception taken"** or **“make corrections noted”** authorize the Contractor to proceed with fabrication, purchase, or both, of the items so noted, subject to the revisions, if any, required by the Architect's review comments.

C. Revisions: Make all revisions required by the Architect. If the Contractor considers any required revision to be a change, he shall so notify the Architect as provided for under "Changes" in the General Conditions before proceeding with the work. Show each drawing revision by number, date, and subject in a revision block on the drawing. Make only those revisions directed or approved by Architect.

D. Revisions after Approval: When a submittal has been reviewed by the Architect, resubmittal for substitution of materials, or equipment, will not be considered.

END OF SECTION

SECTION 01310

CONSTRUCTION SCHEDULE

PART 1: GENERAL:

1.01 CONSTRUCTION SCHEDULE:

A. The Contractor shall, within thirty (30) working days after Notice to Proceed, prepare and submit to the Owner and Architect for approval, a practicable Work Schedule, showing the order in which the Contractor proposes to carry on the Work and the time at which the several milestone features will be started and completed.

B. The Contractor shall incorporate into this analysis that work being performed by each subcontractor so that all work involved is shown in the schedule for the complete project.

C. Activities shown on the schedule shall consist not only of the actual construction operations, but will include also the submittal of shop drawings and samples, procurement of materials and equipment and installation and testing of major and critical items.

D. Activities of the Owner that affect the progress, such as approvals and the deliveries of Owner-furnished materials shall also be shown.

E. Related activities shall be grouped on the schedule for simplification. The selection of activities will be subject to approval by the Owner and Architect.

F. For each activity there shall be listed an earliest and latest start time, the earliest and latest finish time and the slack time.

G. During progress of the work, any changes in the original schedule desired by the Contractor must be approved by the Owner and Architect before being put into effect.

H. When changes in the work are required and directed by the Owner and Architect under applicable paragraphs of this Contract, the original schedule may if required, be revised without delay to incorporate such changes, or new work, and indicate the effect, if any, thereof on the Project as a whole. The cost of such schedule change shall be considered as part of the overhead cost of revised work.

I. If the Contractor falls behind the original Schedule, the Contractor shall take such steps as may be necessary to improve the progress, which may require the contractor to increase the number of shifts, and/or overtime operation, days of work and/or the amount of construction plant, and to submit for approval revised schedules in the form above in order to demonstrate the manner in which the agreed rate of progress will be regained, all without additional cost to the Owner.

END OF SECTION

SECTION 01320

DAILY CONSTRUCTION PROGRESS REPORT

PART 1: GENERAL:

1.01 GENERAL:

A. The Contractor shall submit to the Architect upon request, Daily Reports, wherein the following data is provided relative to his work and the Work of his Subcontractors:

1. Location and description of work being performed.

2. Problems, if any, encountered during the course of the day's work.

3. Number of personnel on job for Contractor and each Subcontractor (broken down as to the number of journeymen, apprentices, etc.).

4. Temperature and weather conditions.

5. Report of any accident or accidents that may have occurred during the reporting period.

6. General description of delivery of material to be stored on site.

END OF SECTION

SECTION 01330

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1: GENERAL:

1.01 RELATED DOCUMENTS:

A. Related Documents:

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY:

A. This Section includes administration and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Preliminary Construction Schedule.
2. Contractor's Construction Schedule.
3. Submittal Schedule.
4. Daily construction reports.
5. Material location reports.
6. Field condition reports.
7. Special reports.
8. Construction photographs.

B. Related Sections include the following:

1. Division 1 Section Schedule of Values for submitting the Schedule of Values.
2. Division 1 Section "Project meetings" for submitting and distributing meeting and conference minutes.
3. Division 1 Section "Submittal and Substitutions" for submitting schedules and reports.
4. Division 1 Section "Testing Laboratory Services" for submitting a schedule of tests and inspections.
5. Division 1 Section "Contract Closeout" for submitting photographic negatives as Project Record Documents at Project closeout.

1.03 DEFINITIONS:

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
2. Predecessor activity is an activity that must be completed before a given activity can be started.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determined when activities can be performed and the critical path of Project.

C. Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Event: The starting or ending point of an activity.

E. Float the measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the following activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

F. Fragment: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

G. Major Area: A story of construction, a separate building, or a similar significant construction element.

H. Milestone: A key or critical point in time for reference or measurement.

I. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

1.04 SUBMITTALS:

A. Submittals Schedule: Submit three copies of schedule. Arrange the following information in a tabular format.

1. Scheduled date for first submittal.
2. Specification Section number and title.
3. Submittal category (action or informational).
4. Name of subcontractor.
5. Description of the Work covered.
6. Scheduled date for Architect's final release or approval.

B. Contractor's Construction Schedule: The construction schedule shall be in the form of a CPM. Provide the CPM in graphic flow chart format along with reports. Submit two copies of the CPM in printed for and one in reproducible form. Concurrent with CPM schedule, submit three printed copies of each of the following computer-generated reports. Format for each activity in reports shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float.

1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
3. Total Float Report: List of all activities sorted in ascending order of total float.

C. Daily Construction Progress Reports: Contractor shall maintain a daily log on the site. It shall be available for review by the Architect and Owner at any time during normal working hours.

The Contractor shall submit to the Architect upon request, Daily Reports, wherein the following data is provided relative to the work and the Work of the Subcontractors:

1. Location and description of work being performed.
2. Problems, if any, encountered during the course of the day's work.
3. Number of personnel on job for Contractor and each Subcontractor (broken down as to the number of journeymen, apprentices, etc.).
4. Temperature and weather conditions.
5. Report of any accident or accidents that may have occurred during the reporting period.
6. General description of delivery of material to be stored on site.

D. Material Location Reports: Should materials be stored off site for which the contractor is requesting payment, a complete inventory of the material shall be made. Each month the off-site inventory continues to be stored off-site then the report shall be maintained including the description of the material, the location of the material and a certification by the General Contractor that he has inventoried and examined the material at the location and certifies to the correctness of the report. The General Contractor shall accompany the Architect each month to verify the inventory prior to the progress payment.

1.05 COORDINATION:

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from parties involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

END OF SECTION

SECTION 01370

SCHEDULE OF VALUES

PART 1: GENERAL:

1.01 SUMMARY:

A. Provide a detailed breakdown of the agreed Contract Sum showing values allocated to each of the various parts of the Work, as specified herein and in other provisions of the Contract Documents.

B. RELATED WORK:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

2. Preparation and submittal of a Schedule of Values is required by the General Conditions.

3. Schedule of Values is required to be compatible with the "Continuation Sheet" accompanying Applications for Payment, as described in Section 0152.

1.02 SUBMITTAL:

A. With first Application for Payment, submit a proposed Schedule of Values to the Architect.

1.03 QUALITY ASSURANCE:

A. Use required means to assure arithmetical accuracy of the sums described.

B. When so required by the Architect, provide copies of the subcontracts or other data acceptable to the Architect, substantiating the sums described.

END OF SECTION

SECTION 01380

CONSTRUCTION PHOTOGRAPHS

PART 1: GENERAL:

1.01 CONSTRUCTION PHOTOGRAPHS:

A. Construction progress photographs shall be taken once a month with the time, direction of view and vantage points noted, **and submit to architect at monthly construction meeting.**

B. Photograph from locations to adequately illustrate the condition of construction and the state of the Project.

1. At successive periods of construction, take at least one photograph from the same overall view as previously and other locations to demonstrate the daily activity of construction please submit photos in electronic format in form of DVD.

END OF SECTION

SECTION 01400

TESTING LABORATORY SERVICES

PART 1: GENERAL:

1.01 DESCRIPTION:

A. Work Included: Testing includes, but is not necessarily limited to:

1. Soil Compaction
2. Concrete
3. Grout
4. Mortar

B. Related Work Described Elsewhere: Requirements for testing may be described in various specification sections.

C. Testing Laboratory: The Testing Laboratory will by PSI Professional Service Industries Inc. Harlingen Texas 956-423-6826 paid by owner.

1.02 QUALITY ASSURANCE:

A. Qualifications of testing laboratory: The laboratory will be qualified in accordance with ASTM E-329-70 "Recommended Practice for Inspection and Testing Agencies for Concrete and Steel Used in Construction".

B. Codes and Standards: (Testing) In accordance with pertinent codes and regulations and with selected standards of the American Society for Testing and Materials.

1.03 PRODUCT HANDLING:

A. Promptly process and distribute test reports and related instructions to assure necessary retesting and/or replacement of materials with least possible delay in work.

PART 2: PRODUCTS:

2.01 PAYMENT FOR RETESTING SERVICES:

A. Retesting: When initial tests indicate non-compliance with Contract Documents, subsequent retesting shall be performed by the same laboratory and costs borne by Contractor.

2.02 CODE COMPLIANCE TESTING:

A. Inspections and test required by codes or ordinances, or by plan approval authority, and made by a legally constituted authority, shall be the responsibility of, and shall be paid for, by the Contractor.

2.03 CONTRACTOR’S CONVENIENCE TESTING:

A. Inspection or testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.

PART 3: EXECUTION:

3.01 COOPERATION WITH TESTING LABORATORY:

A. Representative of testing laboratory shall have access to Work at all times; provide facilities for such access in order that laboratory may properly perform its functions.

3.02 SCHEDULES FOR TESTING:

A. Establishing Schedule:

1. Determine with laboratory, time required to perform tests and issue findings.
2. Provide required time in construction schedule.

B. Revising Schedule: Coordinate changes of schedule with laboratory as required. Testing Laboratory shall provide a twenty-four (24) hour phone number to enable the Contractor to revise the schedule at times other than regular business hours.

C. Adherence to Schedule: When laboratory is prevented from testing or taking specimens according to the determined schedule due to incompleteness of work, extra costs attributable to delay may be back charged to Contractor and not borne by Owner.

3.03 TAKING SPECIMENS:

A. Testing Laboratory shall perform the following services:

1. Take samples and specimens.
2. Furnish sampling equipment and personnel.
3. Deliver specimens and samples to laboratory.

END OF SECTION

SECTION 01510

TEMPORARY UTILITIES

PART 1: GENERAL:

1.01 SCOPE:

A. Furnish, install and maintain temporary utilities required for construction; remove on completion of Work.

1.02 TESTING:

A. All power, water, light or heat required for testing of Architectural, Structural, Mechanical and Electrical Work shall be paid for by the Contractor.

1.03 REQUIREMENTS OF REGULATORY AGENCIES:

A. Comply with National Electric Code.

B. Comply with Federal, State and local codes and regulations and with utility company requirements.

PART 2: PRODUCTS:

2.01 MATERIALS, GENERAL:

A. Materials and equipment may be new or used, but must be adequate in capacity for the required usage, must not create unsafe conditions, and must not violate requirements of applicable codes and standards.

2.02 TEMPORARY ELECTRICITY AND LIGHTING:

A. Provide connections and temporary metering, size to provide services required for power and lighting; Contractor shall pay for the costs of power used for construction.

B. Install ground fault interrupting circuit(s) and branch wiring, with area distribution boxes located so that power and lighting is available throughout the construction by the use of construction-type power cords.

C. Provide adequate artificial lighting for all areas of work when natural light is not adequate for work.

D. Each Sub-contractor shall provide it's own extension cords and any additional lighting that may be required to complete it's work.

E. Prior to final inspection remove temporary lamps and install new lamps if permanent fixtures were used for temporary lighting.

2.03 TEMPORARY HEAT AND VENTILATION:

A. Provide temporary heat and ventilation as required to maintain adequate environmental conditions to facilitate progress of the Work, to meet specified minimum conditions for the installation of materials, and to protect materials and finishes from damage due to temperature or humidity.

B. Provide adequate forced ventilation of enclosed areas for curing of installed materials to disperse humidity, and to prevent hazardous accumulations of dust, fumes, vapors or gases.

C. Portable heaters shall be standard U.L. approved units complete with controls. Pay all costs of installation, maintenance, operation and removal, and for fuel consumed.

2.04 TEMPORARY TELEPHONE SERVICE:

A. Arrange with local telephone service company, provide direct line telephone service at the construction site for the use of personnel and the Architect.

B. List telephone with information operator in the name of the Project and in the name of the Contractor.

C. Pay all costs for installation, maintenance and removal, and service charges for local calls. Contractor may install a pay telephone for sub-contractors use.

2.05 TEMPORARY WATER:

A. General Contractor shall provide water at site for construction purposes; General Contractor will pay costs of water used for construction.

B. General Contractor shall provide potable drinking water at the site.

2.06 TEMPORARY SANITARY FACILITIES:

A. Provide and maintain adequate temporary outside toilet facilities for use of persons working at the Site, same shall be padlocked at all times when no construction personnel are on Site.

B. Keep toilets clean and in sanitary condition. Provide toilet tissue in suitable holders. Comply with applicable legal, health and OSHA requirements.

2.07 TEMPORARY FIRE PROTECTION:

A. Observe and enforce throughout the work during the whole period of construction all requirements of the local City and State Fire Marshal and Insurance Authorities to minimize the fire hazard during the progress of the work.

PART 3: EXECUTION:

3.01 GENERAL:

A. Comply with applicable requirements specified in Division 15 - Mechanical, and in Division 16 - Electrical.

B. Maintain and operate systems to assure continuous service.

C. Modify and extend systems as work progress requires.

3.02 REMOVAL:

A. Completely remove temporary materials and equipment when their use is no longer required.

B. Clean and repair damage caused by temporary installation or use of temporary facilities.

C. Restore permanent facilities used for temporary services to specified condition.

END OF SECTION

SECTION 01520

CONSTRUCTION AIDS

PART 1: GENERAL:

1.01 SCOPE:

A. Furnish, install and maintain temporary personnel, traffic and materials handling facilities required for construction; remove on completion of Work.

1.02 REQUIREMENTS OF REGULATORY AGENCIES:

A. Comply with Federal, State and local codes and regulations and with utility company and insurance agencies' requirements.

PART 2: PRODUCTS:

2.01 MATERIALS, GENERAL:

A. Materials and equipment may be new or used, but must be adequate in capacity for the required usage, must not create unsafe conditions, and must not violate requirements of applicable codes and standards.

B. Provide and maintain signs to prevent damage or injury. Surround site with signs warning of construction hazards at intervals not greater than 200' apart.

C. Should it become necessary to remove runways, safety handrails, or other safety items it will be that Contractor's responsibility to replace the runway, safety handrails, or other safety items, immediately in keeping with OSHA standards.

D. Pay all costs for installation, maintenance relocation and removal, and service charges for rented equipment.

2.02 SCAFFOLDING:

A. Erect and maintain in a safe manner scaffolding, ramps, runways, platforms, guards, rails, stairs and ladders as necessary for the work.

2.03 LIFTING AND HOISTING:

A. Provide hoists, temporary elevators, lifts, cranes and towers necessary for expediting the handling of materials.

B. Install lifting and hoisting equipment to meet applicable safety requirements.

2.04 PUMPING AND DRAINING:

A. Keep working and storage areas free from water that could cause damage or that would interfere with work.

B. Do not pump or drain water onto adjacent property. Distribute discharge to prevent excessive erosion.

PART 3: EXECUTION:

3.01 GENERAL:

A. Maintain and operate systems to assure continuous service.

B. Modify and extend systems as work progress requires.

3.02 REMOVAL:

A. Completely remove temporary materials and equipment when their use is no longer required.

B. Clean and repair damage caused by temporary installations or use of temporary facilities.

C. Restore permanent facilities used for temporary services to specified condition.

END OF SECTION

SECTION 01530

BARRIERS

PART 1: GENERAL:

1.01 FENCING AND BARRICADES:

A. Provide proper and adequate barricades, runways, safety handrails, fencing or other safety items to protect and provide access in or around the site by other than construction personnel. Non construction personnel must be accompanied by general contractor, architect or architect representative, owner or owner representative.

B. Provide all vertical shafts with safe, temporary railings and supports, adequately braced.

C. Cover trenches and holes when not in use. Erect barriers at sharp changes in plane more than 3 feet high.

1.02 CONSTRUCTION FENCE:

A. Provide a construction fence around the structure and material storage areas to prevent unauthorized entry to the construction site.

B. Install fence at the beginning of excavation operations and maintain in good condition until removal is approved by the Architect.

C. Unless otherwise required by local codes or ordinances, construct wire mesh fence a minimum of 8'-0" high with securely anchored line, corner and gate posts.

D. Provide a minimum number of gates which will be padlocked shut during nonworking hours.

E. Locate pedestrian entrance gates as required to provide controlled personnel entry, in suitable relation to construction parking facilities.

1.03 REMOVAL:

A. Completely remove barricades and other safety barriers including foundations, when construction has progressed to the point that they are no longer needed, and when approved by Architect.

B. Clean and repair damage caused by installation, fill and grade the areas of the Site to required elevations and slopes, and clean the area.

END OF SECTION

SECTION 01580

PROJECT SIGN

PART 1: GENERAL:

1.01 PROJECT SIGN:

A. Install and maintain one (1) project sign, located as directed, 8 feet by 8 feet.

B. Construct sign of metal or 3/4" thick exterior grade plywood.

C. Support sign on a minimum of two 4x4 posts securely embedded and braced to resist wind load.

D. Letter sign with project data, including: ***name of project, Owner representatives, Architect, Engineers and Contractor.***

E. Provide vinyl 3M printed surface, Architect to provide a digital image.

F. The Architect will prepare a Drawing indicating lettering, layout and location of the sign.

G. No other signs or advertising will be permitted on the Site except as noted below.
2 foot x 4 foot signs with contractor's name may be used for directing material delivery or directing of construction traffic or for other safety issues.

H. Maintain sign in good condition for the duration of the job.

END OF SECTION

SECTION 01590

FIELD OFFICES AND SHEDS

PART 1: GENERAL:

1.01 FIELD OFFICE:

A. Provide and maintain a minimum of one field office.

B. Provide means for locking office when work is not in progress.

C. Inform Architects, in writing, of the name, address and telephone of person who will have keys to office at all times.

D. Provide furnishings, lights, telephone, air conditioning, heat and ventilation to permit comfortable use of the office. Field office to be accessible for use by Architect and Owner representatives.

1.02 TRAILERS AND STORAGE:

A. Provide suitable and sufficient enclosed and covered spaces, with raised flooring to protect materials and equipment subject to damage by weather or construction.

END OF SECTION

SECTION 01600

MATERIAL AND EQUIPMENT

PART 1: GENERAL:

1.01 MANUFACTURER'S INSTRUCTIONS:

A. When Contract Documents require that installation of work shall comply with manufacturer's instructions, obtain and distribute copies of such instructions to parties involved in the installation, including three (3) copies to the Architect.
   1. Maintain one set of complete instructions at the job site during installation and until completion.

B. Handle, install, connect, clean, condition and adjust products in strict accord with such instructions and in conformity with specified requirements.
   1. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with Architect for further instructions.
   2. Do not proceed with work without clear instructions.

C. Perform work in accordance with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.

1.02 DELIVERY OF MATERIALS:

A. All materials shall be delivered in their original, unopened, containers which shall bear the seal, trademark or hallmark of the respective associations or councils and the identification label of the manufacturer.

B. The Contractor shall inspect all materials upon their arrival at the job and see that they conform to the requirements of these Specifications and prevent the unloading of unsatisfactory material or promptly remove same from the premises without waiting instruction from the Architect to do so.

C. Time deliveries and unloading to prevent traffic congestion and blocking of access, and to avoid interferences and delays in work.

D. Provide for continuity of any phase of work. Sufficient quantities for completion of a phase shall be on the Project Site before that phase is started.

E. Pack and handle materials to prevent damage during delivery. Store materials at designated locations to avoid interference with work and arrange in order of intended use.

1.03 STORAGE AND PROTECTION:

A. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible.
   1. Store products subject to damage by the elements in weathertight enclosures.
   2. Maintain temperature and humidity within the ranges required by manufacturer's instructions.

B. Exterior Storage:
   1. Store fabricated products above the ground, on blocking or skids, to prevent soiling or staining. Cover products which are subject to deterioration with impervious sheet coverings, provide adequate ventilation to avoid condensation.
   2. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.

C. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to assure that products are maintained under specified conditions, and free from damage or deterioration.

D. After installation provide substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations. Remove when no longer needed.

END OF SECTION

SECTION 01631

SUBSTITUTIONS AND PRODUCT OPTIONS

PART 1: GENERAL:

1.01 SUBSTITUTIONS:

A. Bids or proposals shall be based upon providing the specified materials, processed products, persons or organizations, etc., identified in this Specification and/or indicated on the Drawings.

B. Product substitution requests shall be submitted no later than 72 hours prior to Opening of Bids (Proposals) as noted in Section 00020.

C. The burden of proof of equality rests with the Contractor, and supporting technical literature, samples, drawings and performance data must be submitted with each request for substitutions.

D. The Owner and/or Architect reserve the right to accept or reject proposed substitutions. Each request shall state the amount of savings to the Owner, if the substitution is approved.

E. Cost of any testing required for analysis of proposed substitution shall be paid for by the Contractor at a testing agency selected and approved by the Architect.

F. Should a substitution be accepted, the Contractor shall be responsible to make all necessary adjustments in the Work which may be affected as a result of the substitution at no additional cost to the Owner.

G. Should a substitution be accepted and this substitution prove to be defective within the one year guarantee period, the Contractor shall replace the substituted material with that specified and bear the costs incurred thereby.

1.02 PRODUCT OPTIONS:

A. Contractor's Options:

1. For Products specified only by reference standard, select any product meeting that standard.
2. For Products specified by naming several products or manufacturers, select any one of the products, or manufacturer's names, which complies with the Contract Documents.
3. For Products specified by naming only one Product or manufacturer, Contractor must submit a request as for substitutions for any Product or manufacturer not specifically named.
4. For Products specified by naming only one Product and manufacturer and indicated as "no substitute", there is no option.

B. Submit a separate request for each Product Substitution, supported with complete data, with drawings and samples as appropriate, including:

1. Comparison of the qualities of the proposed substitution with that specified.
   a. Cutsheets & supporting date of specified product.
   b. Cutsheets & supporting data of proposed product substitution.
2. Changes required in other elements of the work because of the substitution.
3. Effect on the Construction Schedule.
4. Cost data comparing the proposed substitution with the Product specified.
5. Any required license fees or royalties.
6. Availability of maintenance service, and source of replacement materials.

C. A request for a substitution constitutes a representation that Contractor:

1. Has investigated the proposed Product and determined that it is equal to or superior in all respects to that specified.
2. Will provide the same warranties or bonds for the substitution as for the Product specified.
3. Will coordinate the installation of an accepted substitution into the Work, and make such other changes as may be required to make the Work complete in all respects.
4. Waives all claims for additional costs, under his responsibility, which may subsequently become apparent.

D. Architect will review requests for substitutions with reasonable promptness, and notify Contractor, in writing, of the decision to accept or reject the requested substitution.

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1: GENERAL:

1.01 REQUIREMENTS:

A. Comply with requirements stated in Conditions of Contract and in Specifications for administrative procedures in closing out the Work.

B. Related requirements in other parts of the Project Manual:

1. Fiscal provisions, legal submittals and additional administrative requirements: Conditions of the Contract.

C. Related requirements specified in other Sections:

1.	CLEANING:	Section 01710.
2.	PROJECT RECORD DOCUMENTS:	Section 01720
3.	OPERATING AND MAINTENANCE DATA:	Section 01730
4.	WARRANTIES AND BONDS:	Section 01740
5.	CONTRACTOR'S ASBESTOS FREE AFFIDAVIT:	Section 01800

D. Provide 5 DVD copies containing PDF files, organized in a PDF portfolio with index, containing all pertinent information in this section and related sections.

1.02 SUBSTANTIAL COMPLETION:

A. When Contractor considers the Work is substantially complete, he shall submit to Architect, written notice that the Work, or designated portion thereof, is substantially complete and include a list of items (Contractor's punchlist) that have already been addressed.

B. Within a reasonable time after receipt of such notice, Architect will review the work to determine the status of completion.

C. Should Architect determine that the work is not substantially complete:
1. Architect will promptly notify the Contractor in writing, giving the reasons therefore including list of items to be completed or corrected.
2. Contractor shall remedy the deficiencies in the Work, and send a second written notice of substantial completion to the Architect.
3. Architect will re-review the Work.

D. When Architect concurs that the Work is substantially complete, the architect will:

1. Prepare a Certificate of Substantial Completion, accompanied by Contractor's list of items to be completed or corrected, as verified and amended by the Architect.
2. Submit the Certificate to Owner and Contractor for their written acceptance of the responsibilities assigned to them in the Certificate.

1.03 CONTRACTOR CERTIFICATION OF FINAL COMPLETION:

A. When Contractor considers the Work is complete, he shall submit **written certification** that:

1. Contract Documents have been reviewed.
2. Work has been inspected for compliance with Contract Documents.
3. Work has been completed in accordance with Contract Documents.
4. Equipment and systems have been tested in the presence of the Owner's representative and are operational.
5. Work is completed.

B. Architect will review the work to verify the status of completion with reasonable promptness after receipt of such certification.

C. Should Architect consider that the Work is incomplete or defective:

1. Architect will promptly notify the Contractor in writing, listing the incomplete or defective work.
2. Contractor shall take immediate steps to remedy the stated deficiencies, and send a second written certification to Architect that the Work is complete.
3. Architect will re-inspect the Work.

D. When the Architect finds that the Work is acceptable under the Contract Documents, the architect shall request the Contractor to make closeout submittals.

1.04 RE-REVIEW FEES:

A. Should Architect perform re-review due to failure of the Work to comply with the claims of status of completion made by the Contractor:

1. Owner will deduct the amount of such compensation from the final payment to the Contractor, for re-review compensation to architect.

1.05 CONTRACTOR'S CLOSEOUT SUBMITTALS:

A. Evidence of compliance with requirements of governing authorities:

1. Certificate of Occupancy.
2. Certificate of Inspection.
   a} Mechanical
   b} Electrical
3. Fire Sprinkler Certificate
4. City County underground approvals for all plumbing and electrical lines.

B. List of all subcontractors and suppliers organized by specification section.

C. Project Record Documents: refer to Requirements of Section 01720.

D. Operating and Maintenance Data, Instructions to Owner's Personnel: Refer to requirements of Section 01730.

E. Warranties and Bonds: Refer to requirements of Section 01740.

F. Keys and Keying Schedule: Refer to requirements of Finish Hardware section.

G. Provide AIA Document G706A, Contractor’s Affidavit of Release of Liens: Refer to requirements of General and Supplementary Conditions.

H. MSDS- Material safety data sheets to be included in close out documents

I. Provide AIA Document G707, Consent of Surety to Final Payment Form.

J. Contractor's asbestos free affidavit: Refer to requirements of Section 01800.

K. HVAC Test and Balance Report.

L. Digital construction photographs organized by date.

1.06 FINAL ADJUSTMENTS OF ACCOUNTS:

A. Submit a final statement of accounting to Architect. Statement shall reflect all adjustments to the Contract sum:

1. The original Contract sum.
2. Additions and deductions resulting from:
   a} Previous change orders.
   b} Allowances.
   c} Unit Prices.
   d} Deductions for uncorrected work.
   e} Deductions for re-review payments.
   f} Other adjustments.
3. Total Contract sum, as adjusted.
4. Previous payments.
5. Sum remaining due.

B. Architect will prepare a final Change Order, reflecting approved adjustments to the Contract sum, which were not previously made by Change Orders.

1.07 FINAL APPLICATION FOR PAYMENT:

A. Contractor shall submit the final Application for Payment, labeled as Final, and in accordance with procedures and requirements stated in the Conditions of the Contract.

END OF SECTION

SECTION 01710

CLEANING

PART 1: GENERAL:

1.01 DESCRIPTION:

A. Execute cleaning, during progress of the Work, and at completion of the Work, as required by General Conditions.

1.02 DISPOSAL REQUIREMENTS:

A. Conduct cleaning and disposal operations to comply with codes, ordinances, regulations, and anti-pollution laws.

PART 2: PRODUCTS:

2.01 MATERIALS:

A. Use only those cleaning materials which will not create hazards to health or property and which will not damage surfaces.

B. Use only those cleaning materials and methods recommended by manufacturer of the surface material to be cleaned.

C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3: EXECUTION:

3.01 DURING CONSTRUCTION:

A. Contractor at all times shall keep the premises free from accumulation of waste materials or rubbish caused by his operations or his subcontractor's operations. Oversee cleaning and ensure that building and grounds are maintained free from accumulations of waste materials and rubbish.

B. At reasonable intervals during progress of work, clean up site, building and access, and dispose of waste materials, rubbish and debris. Provide containers and locate on site for collection of waste materials, rubbish and debris. Do not allow waste materials, rubbish and debris to accumulate and become an unsightly or hazardous condition.

C. Transport waste materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces. Sprinkle dusty debris with water.

D. Burning or burying of rubbish and waste materials on the project site is not permitted. Disposal of volatile fluid wastes (such as mineral spirits, oil, or paint thinner) in storm or sanitary sewer systems is not permitted. Remove waste materials, rubbish and debris from the site and legally dispose of at public or private dumping areas off the Owner's property.

E. Contractor shall coordinate efforts to properly protect new and existing material from damage by ongoing construction work.

3.02 FINAL CLEANING:

A. At completion of construction and just prior to acceptance or occupancy conduct a final inspection of exposed surfaces. Perform final cleaning and maintain cleaning until building, or portion thereof, is accepted by Owner.

B. Remove dirt stains, labels, fingerprints and other foreign materials from surfaces. Repair marred surfaces to match adjacent finishes.

C. Remove all waste materials and rubbish from and about the Project as well as all tools, construction equipment, machinery and surplus materials.

END OF SECTION

SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1: GENERAL:

1.01 GENERAL:

A. Maintain at the site for the Owner one record copy of:

1. Drawings
2. Specifications
3. Addenda
4. Change Orders and other Modifications to the Contract.
5. Architect/Engineer Field Orders or written instructions.
6. Approved Shop Drawings, Product Data and Samples.
7. Field Test records.
8. Construction photographs.
9. Meeting Reports.

B. The Contractor shall use one set of Construction Drawings provided to the Contractor at the time construction is commenced. These Drawings shall be marked-up by each Contractor, throughout the construction period, indicating all changes, revisions and additions to the Work, including field relocations of work concealed from view.

1.02 MAINTENANCE OF DOCUMENTS AND SAMPLES:

A. Store documents and samples in Contractor's field office apart from documents used for construction.

1. Provide files and racks for storage of documents.
2. Provide locked cabinets or secure storage space for storage of samples.

B. File documents and samples in accordance with Data Filing Format of the Uniform Construction Index.

C. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes.

D. Make documents and samples available at all times for view by Architect.

1.03 RECORDING:

A. Label each document "PROJECT RECORD" in neat large printed letters.

B. Record information concurrently with construction progress. Do not conceal any work until required information is recorded.

C. Drawings: Legibly mark to record actual construction:

1. Depths of various elements of foundation in relation to finish first floor datum.
2. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
3. Location of internal utilities and appurtenances concealed in the construction, referenced to visible and accessible features of the structure.
4. Field changes of dimension and detail.

5. Changes made by Field Order, Architectural Supplemental Instructions, Request for Information, Addenda, Construction Change Directive or by Change Order.
6. Details not on original Contract Drawings.

D. Specifications and Addenda: Legibly mark each Section to record:

1. Manufacturer, trade name, catalog number, and supplier of each Product and item of equipment actually installed.
2. Changes made by Field Order, Architectural Supplemental Instructions, Request for Information, Addenda, Construction Change Directive or by Change Order.

1.04 SUBMITTAL:

A. At the completion of work, Contractor shall certify, by endorsement thereof, that each of the revised drawings is complete and accurate. Prior to Contractor's application for final payment, and within forty-five {45} days of final acceptance of all the work by the Owner, unless otherwise modified by the Contract Agreement, and as a condition of acceptance by the Owner, Contractor shall deliver the certified Record Documents to the Architect for transmittal to the Owner.

END OF SECTION

SECTION 01730

OPERATING AND MAINTENANCE DATA

PART 1: GENERAL:

1.01 INFORMATION DATA:

A. Compile Manufacturer's Directions and Manuals, Product Data and related information appropriate for Owner's maintenance and operation of product furnished under the Contract.

1. Furnish operating and maintenance data as specified in other pertinent sections of Specifications.

B. Instruct Owner's personnel in the maintenance of products and in the operation of equipment and systems.

1.02 FORM OF SUBMITTALS:

A. Prepare data in the form of an instructional manual for use by Owner's personnel.

B. Provide indexed tabs fly-leaf for each separate product, or each piece of operating equipment. Provide typed description of product and major component parts of equipment.

C. Identify each volume with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS".

D. Bind in and identify in DVD PDF files, organized in a PDF portfolio with index.

E. When multiple binders are used, correlate the data into related consistent groupings.

1.03 CONTENT OF MANUAL:

A. Neatly typewritten table of contents for each volume, arranged in a systematic order.

1. Contractor, name of responsible principal, address and telephone number.
2. A list of each product required to be included, indexed to the content of the volume.
3. List with each product, the name, address and telephone number of:
   a. Subcontractor or installer.
   b. Maintenance contractor, as appropriate.
   c. Identify the area of responsibility of each.
   d. Local source of supply for parts and replacement.
4. Identify each product by product name and other identifying symbols as set forth in Contract Documents.

B. Product Data: Include only those sheets which are pertinent to the specific product. Annotate each sheet to:

1. Clearly identify the specific product or part installed.
2. Clearly identify the data applicable to the installation.
3. Delete references to inapplicable information.

C. Drawings: Supplement product data with drawings as necessary to clearly illustrate relations of component parts of equipment and systems, and control and flow diagrams.

1. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation.
2. Do not use Project Record Documents as maintenance drawings.

D. Written text, as required to supplement product data for the particular installation:

1. Organize in a consistent format under separate headings for different procedures.
2. Provide a logical sequence of instructions for each procedure.

E. Copy of each warranty, bond and service contract issued. Provide information sheet for Owner's personnel, give:

1. Proper procedures in the event of failure.
2. Instance which might affect the validity of warranties or bonds.

1.04 MANUAL FOR MATERIALS AND FINISHES:

A. Submit in electronic file complete manual in final form and document in respective division.

B. Content, for architectural products, applied materials and finishes:

1. Manufacturer's data, giving full information on products.
2. Instructions for care and maintenance.

C. Content, for moisture-protection and weather-exposed products:

1. Manufacturer's data, giving full information on products.

D. Additional requirements for Maintenance Data: the respective sections of Specifications.

1.05 MANUAL FOR EQUIPMENT AND SYSTEMS:

A. Submit in electronic file complete manual in final form and document in respective division.

B. Content, for each unit of equipment and system, as appropriate:

1. Description of unit and component parts.
2. Operating procedures.
3. Maintenance procedures.
4. Servicing and lubrication schedule.
5. Manufacturer's printed operating and maintenance instructions.
6. Description of sequence of operation by control manufacturer.
7. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.
8. As-installed control diagrams by controls manufacturer.
9. Each contractor's coordination drawings.
10. Charts of valve tag numbers, with the location and function of each valve.
11. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
12. Other data as required under pertinent sections of specifications.

C. Content, for each electric and electronic system, as appropriate:

1. Description of system and component parts.
2. Circuit directories of panelboards.
3. As-installed color coded wiring diagrams.
4. Operating procedures.
5. Maintenance procedures.

6. Manufacturer's printed operating and maintenance instructions.
7. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
8. Other data as required under pertinent sections of specifications.

D. Prepare and include additional data when the need for such data becomes apparent during instruction of Owner's personnel.

E. Additional requirements for Operating and Maintenance Data: the respective sections of specifications.

1.06 INSTRUCTIONS OF OWNER'S PERSONNEL:

A. Prior to final review or acceptance, fully instruct Owner's designated operating and maintenance personnel in the operation, adjustment and maintenance of all products, equipment and systems.

B. Operating and maintenance manual shall constitute the basis of instruction.

C. Review contents of manual with personnel in full detail to explain all aspects of operations and maintenance.

END OF SECTION

SECTION 01740

WARRANTIES AND BONDS

PART 1: GENERAL:

1.01 SUBMITTAL REQUIREMENTS:

A. Assemble warranties, bonds and services and maintenance contracts, executed by each of the respective manufacturers, suppliers, and subcontractors.

B. Review submittals to verify compliance with Contract Documents. Submit to Architect for review and transmittal to Owner.

1.02 TIME OF SUBMITTALS:

A. For equipment or component parts of equipment put into service during progress of construction submit within ten {10} days after review and acceptance.

B. Otherwise make submittals within ten {10} days after Date of Substantial Completion, prior to final request for payment.

C. For items of work, where acceptance is delayed materially beyond the Date of Substantial Completion, provide updated submittal within ten {10} days after acceptance, listing the date of acceptance as the start of the warranty period.

END OF SECTION

SECTION 01800

GENERAL NOTES

PART 1: GENERAL:

1.01 GENERAL NOTES:

A. Contractor shall protect all streets and sidewalks and shall make all necessary repairs at his own expense.

B. Shall at all times protect the excavations, trenches, and/or the building from damage from rain water, ground water, backing up drains or sewers and all other water. He shall provide all pumps and equipment and enclosures to provide this protection.

C. Contractor shall provide all shoring, bracing and sheathing as required for safety and proper execution of the work and remove same when work is completed. Contractor shall be responsible for all scaffolding, shoring, bracing, sheathing, temporary construction and temporary walkways, etc., and shall hold harmless the Owner and Architect from any injury or litigation as a result of causes related to any scaffolding, shoring, bracing, sheathing, temporary construction, temporary walkways, and similar construction technics.

D. Contractor shall comply with the Trench Safety Law Requirements.

2.01 WAIVER OF LIEN:

A. In submitting a Proposal (Bid) Contractor, if awarded the Contract, explicitly warrants that the Owner shall be held free of any claim or lien of any nature resulting from Contractor's pursuance or prosecution of the work. This shall cover any third party lien in any manner whatsoever concerning Contractor's performance or payment on this project.

3.01 PREVAILING WAGES:

A. Article 5159a, Vernon's Annotated Texas Civil Statutes as below noted apply to this project.

"Not less than the general prevailing rate of per diem wages for work of a similar character in the locality in which the work is performed, and not less than the general per diem wages for legal holiday and overtime work, shall be paid to all laborers, workmen and mechanics employed by or on behalf of the State of Texas, or by or on behalf of any county, district or other political subdivision of the State, engaged in the construction of public works, exclusive of maintenance work".

B. See attached.

4.01 CONTRACTOR'S ASBESTOS FREE AFFIDAVIT:

A. In order to protect staff, employees and public in general from any unnecessary exposure to asbestos fibers, the Asbestos Hazard Emergency Response Act prohibits the use of asbestos containing materials in all forms in the construction and operation of this facility.

B. Failure to complete this waiver constitutes non-compliance with the job specifications. This document shall be attached to the Contract between Owner and Contractor.

4.02 AFFIDAVIT:

A. I certify that I am familiar with the materials used in the construction of, and incorporated into, the construction described below. I further certify that to the best of my knowledge and belief no asbestos containing materials, either friable or otherwise were used in the process of constructing or incorporated into the construction.

B. The undersigned, being duly sworn upon his/her oath deposes and says that he/she is the person making the foregoing statements and that they are made in good faith and are true in every respect.

Contractor's signature:

STATE OF

COUNTY OF

I, _____, a Notary Public in and for said County, in the State aforesaid, DO THEREBY CERTIFY THAT _____ personally known to me to be the same person whose name is subscribed to the foregoing instrument, appeared before me this day in person, and acknowledged that he/she signed, sealed, and delivered said instrument as his/her free and voluntary act, for the uses and purposes herein set forth.

GIVEN UNDER MY HAND AND NOTARIAL SEAL THIS _____ DATE OF _____ , 20 .

NOTARY PUBLIC: _____

MY COMMISSION EXPIRES:_____

(NOTARY SEAL)

END OF SECTION

GENERAL DECISION: TX20100006 03/12/2010 TX6

Date: March 12, 2010
General Decision Number: TX20100006 03/12/2010

Superseded General Decision Number: TX20080006

State: Texas

Construction Types: Building and Residential

Counties: Cameron and Hidalgo Counties in Texas.

BUILDING AND RESIDENTIAL CONSTRUCTION PROJECTS (including single family homes and garden apartments up to and including 4 stories).

Modification Number	Publication Date
0	03/12/2010

* SUTX1990-013 05/01/1990

	Rates	Fringes
BOILERMAKER		
RESIDENTIAL CONSTRUCTION ONLY	$ 16.35	2.315
BRICKLAYER		
RESIDENTIAL CONSTRUCTION ONLY	$ 7.25	
CARPENTER (Including Drywall Hanging and Acoustical Ceiling Installation)		
BUILDING CONSTRUCTION ONLY Excluding Batt Insulation	$ 7.25	
CARPENTER		
RESIDENTIAL CONSTRUCTION ONLY	$ 7.25	
CEMENT MASON/CONCRETE FINISHER (Excluding Form Setting)		
BUILDING CONSTRUCTION ONLY	$ 7.25	
CEMENT MASON/CONCRETE FINISHER		
RESIDENTIAL CONSTRUCTION ONLY	$ 7.25	
ELECTRICIAN		
BUILDING CONSTRUCTION ONLY	$ 8.30	
Electricians: (Residential)		
RESIDENTIAL CONSTRUCTION ONLY	$ 7.25	
FLOOR LAYER: CARPET (SOFT)		

FLOOR
BUILDING CONSTRUCTION ONLY..$ 7.25
RESIDENTIAL CONSTRUCTION
ONLY.....$ 7.25

Insulation Installer
RESIDENTIAL CONSTRUCTION
ONLY.....$ 7.25

IRONWORKER, REINFORCING
RESIDENTIAL CONSTRUCTION
ONLY.....$ 7.25

Laborer, common
BUILDING CONSTRUCTION ONLY..$ 7.25

LABORER
RESIDENTIAL CONSTRUCTION
ONLY
Pipelayer.....$ 7.25
Unskilled.....$ 7.25

PAINTER (Including Drywall
Finishing, Taping, and
Bedding)
BUILDING CONSTRUCTION ONLY..$ 7.25

PAINTER
RESIDENTIAL CONSTRUCTION
ONLY.....$ 7.25

PIPEFITTER (Including HVAC
Work)
BUILDING CONSTRUCTION ONLY..$ 7.28 .12

Plasterer tender
BUILDING CONSTRUCTION ONLY..$ 7.25

PLASTERER
BUILDING CONSTRUCTION ONLY..$ 8.41
RESIDENTIAL CONSTRUCTION
ONLY.....$ 7.25

PLUMBER (Excluding HVAC Work)
BUILDING CONSTRUCTION ONLY..$ 7.50 .48

Plumbers and Pipefitters
RESIDENTIAL CONSTRUCTION
ONLY.....$ 8.20

Power equipment operators:
BUILDING CONSTRUCTION ONLY
Backhoe.....$ 7.25 .48
RESIDENTIAL CONSTRUCTION
ONLY
Backhoe.....$ 7.25
Grader.....$ 7.25
Loader.....$ 7.25

ROOFER, Including Built Up,

Composition and Single Ply
Roofs
RESIDENTIAL CONSTRUCTION
ONLY.....$ 7.25

Sheet metal worker
RESIDENTIAL CONSTRUCTION
ONLY.....$ 7.25

Sheet Rock Installer
RESIDENTIAL CONSTRUCTION
ONLY.....$ 7.25

SHEETMETAL WORKER (Including
HVAC duct Work)
BUILDING CONSTRUCTION ONLY..$ 7.25

TILE SETTER
BUILDING CONSTRUCTION ONLY..$ 7.25
RESIDENTIAL CONSTRUCTION
ONLY.....$ 7.25

TRUCK DRIVER
BUILDING CONSTRUCTION ONLY..$ 7.25
RESIDENTIAL CONSTRUCTION
ONLY.....$ 7.25

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

In the listing above, the "SU" designation means that rates listed under the identifier do not reflect collectively bargained wage and fringe benefit rates. Other designations indicate unions whose rates have been determined to be prevailing.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour

Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION

SECTION 02050
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Demolition of designated site structures, retaining walls, foundations and removal of materials from site.

B. Demolition and removal of pavements, curbs and gutters, drainage structures, utilities, signage or landscaping.

C. Disconnecting and capping or removal of identified utilities.

D. Filling or removal of underground tanks and piping.

E. Filling voids in subgrade created as a result of removals or demolition.

F. Hazardous Material Compliance.

1.02 RELATED SECTIONS

A. Section 02100 - Site Preparation: Clearing outside periphery of structures.

B. Section 02227 - Aggregate Materials: Backfill materials.

C. Construction drawings.

1.03 PROJECT RECORD DOCUMENTS

Accurately record actual locations of capped utilities, and subsurface obstructions.

1.04 REGULATORY REQUIREMENTS

A. Conform to applicable local code for demolition of structures, safety of adjacent structures, dust control and runoff control.

B. Obtain required permits and licenses from authorities. Pay associated fees including disposal charges.

C. Notify affected utility companies before starting work and comply with their requirements.

D. Do not close or obstruct roadways, sidewalks or hydrants without permits.

E. Conform to applicable regulatory procedures when discovering hazardous or contaminated materials.

F. Test soils around buried tanks for contamination.

1.05 JOB CONDITIONS

A. Structures to be demolished will be discontinued in use and vacated prior to start of work.

B. Owner assumes no responsibility for condition of structures to be demolished.

C. Conditions existing at time of inspection for bidding purposes will be maintained by Owner in so far as practicable. Variations within structures may occur by Owner's removal and salvage operations prior to start of demolition work.

D. Unless otherwise indicated in the Construction Documents or specified by the Owner's representative, all items of salvageable value to Contractor shall be removed from the site and structure. Storage or sale of removed items on site will not be permitted and shall not interfere with any other work specified in the contract documents.

E. Explosives shall not be brought to site or used without written consent of authorities having jurisdiction. Such written consent will not relieve Contractor of total responsibility for injury to persons or for damage to property due to blasting operations. The performance of any required blasting shall comply with governing regulations.

PART 2 PRODUCTS

2.01 FILL MATERIALS

Aggregate materials specified in Section 02227.

PART 3 EXECUTION

3.01 PREPARATION

A. Provide, erect, and maintain erosion control devices, temporary barriers and security devices at locations indicated

B. Protect existing landscaping materials, appurtenances and structures which are not to be demolished. Repair damage caused by demolition operations at not cost to Owner.

C. Prevent movement or settlement of adjacent structures. Provide bracing and shoring.

D. Mark location of utilities. Protect and maintain in safe and operable condition the utilities to remain. Prevent interruption of existing utility service to occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities as acceptable to governing authorities and the Owner's representative.

3.02 DEMOLITION REQUIREMENTS

A. Conduct demolition to minimize interference with adjacent structures or pavements.

B. Cease operations immediately if adjacent structures appear to be in danger. Notify authority having jurisdiction. Do not resume operations until directed.

C. Conduct operations with minimum interference to public or private access. Maintain access and egress at all times.

D. Obtain written permission from adjacent property owners when demolition equipment will traverse, infringe upon or limit access to their property.

E. Sprinkle Work with water to minimize dust. Provide hoses and water connections for this purpose.

F. Comply with governing regulations pertaining to environmental protection.

G. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing prior to start of work.

3.03 DEMOLITION

A. Demolish buildings completely and remove from site using methods as required to complete work within limitations of governing regulations. Small structures may be removed intact when acceptable to owner and authorities having jurisdiction.

B. Proceed with demolition in systematic manner, from top of structure to ground and complete demolition work above each floor or tier before disturbing supporting members on lower levels.

C. Locate demolition equipment and remove materials so as to prevent excessive loading to supporting walls, floors, or framing.

D. Remove structural framing members and lower to ground by hoists, derricks, or other suitable methods.

E. Demolish concrete and masonry in small sections. Break up concrete slabs-on-grade that are 2 or more feet below proposed subgrade. Remove slabs within 2 feet of proposed subgrade.

F. Demolish and remove below grade construction and concrete slabs on grade to a minimum depth of two feet below proposed subgrade.

3.04 FILLING BASEMENTS AND VOIDS

A. Completely fill below grade areas and voids resulting from demolition or removal of structures (underground fuel storage tanks, wells, cisterns, etc.) using approved select fill materials consisting of stone, gravel, and sand free from debris, trash, frozen materials, roots, and other organic matter.

B. Ensure that areas to be filled are free of standing water, frost, frozen, or unsuitable material, trash, and debris prior to fill placement.

C. Place fill materials in horizontal layers not exceeding 8" in loose depth and compact each layer at optimum moisture content of fill material to proposed density, unless subsequent excavation for new work is required.

D. Grade surface to match adjacent grades and to provide flow of surface drainage after fill placement and compaction.

3.05 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove from site debris, rubbish, and other materials resulting from demolition operations.

B. No burning of any material, debris, or trash on-site or off-site will be allowed, except when allowed by the appropriate governing authority and the Owner's representative. If allowed as stated above, burning shall be performed in manner prescribed by governing authority. Attend burning materials until fires have burned out or have been extinguished.

C. Transport materials removed from demolished structures with appropriate vehicles and dispose off-site to areas which are approved for disposal by governing authorities and appropriate property owners.

END OF SECTION

SECTION 02055

SOILS FOR EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Subsoil materials.
2. Topsoil materials.

B. Related Sections:
1. Section 02060 - Aggregates for Earthwork.
2. Section 02061 - Aggregates for Exterior Improvements.
3. Section 02311 - Rough Grading.
4. Section 02320 - Backfill.
5. Section 02324 - Trenching.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
2. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
3. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

PART 2 PRODUCTS

2.1 SOURCE QUALITY CONTROL

A. Section 01400 - Quality Requirements: Testing and Inspection Services Testing and analysis of soil material.

B. Testing and Analysis of Subsoil Material:Perform in accordance with ASTM D698.

C. Testing and Analysis of Topsoil Material: Perform in accordance with ASTM D698.

D. When tests indicate materials do not meet specified requirements, change material and retest.

E. Furnish materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.1 EXCAVATION

A. Excavate subsoil and topsoil from areas designated. Strip topsoil to full depth of topsoil in designated areas.

B. Stockpile excavated material meeting requirements for subsoil materials and topsoil materials.

C. Remove excess excavated materials subsoil and topsoil not intended for reuse, from site.

D. Remove excavated materials not meeting requirements for subsoil materials and topsoil materials from site.

3.2 STOCKPILING

A. Stockpile materials on site at locations designated by Architect/Engineer.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate differing materials with dividers or stockpile apart to prevent mixing.

D. Prevent intermixing of soil types or contamination.

E. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

3.3 STOCKPILE CLEANUP

A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION

SECTION 02100

SITE PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES:

A. Cleaning site of debris, grass, trees and other plant life in preparation for site or building excavation work.

B. Protection of existing structures, trees or vegetation indicated on the contract documents to remain.

C. Stripping topsoil from areas that are to be incorporated into the limits of the project and where so indicated on the construction drawings.

1.02 RELATED SECTIONS

A. Section 02050 - Demolition

B. Section 02200 - Earthwork

C. Section 02270 - Slope Protection and Erosion Control

D. Construction Drawings

1.03 ENVIRONMENTAL REQUIREMENTS

A. Construct temporary erosion control systems as shown on the plans or as directed by the engineer to protect adjacent properties and water resources from erosion and sedimentation.

B. In the event that site work on this project will disturb five (5) or more acres, the contractor shall **NOT** begin construction without a "National Pollution Discharge Elimination System" (NPDES) permit governing the discharge of storm water from the construction site for the entire construction period. The permit requires a "Storm Water Pollution Prevention Plan" (SWP) to be in place during construction which includes monitoring of storm water flows during construction.

The contractor shall be totally responsible for conducting the storm water management practices in accordance with the NPDES permit and for any enforcement action taken or imposed by Federal or State agencies, including the cost of fines, construction delays and remedial actions resulting from the contractors failure to comply with all provisions of the NPDES permit.

1.04 JOB CONDITIONS

A. Conditions existing at time of inspection for bidding purposes will be maintained by owner in so far as practical.

B. Variations to conditions or discrepancy in actual conditions as they apply to site preparation operations are to be brought to the attention of the owner prior to the commencement of any site work.

PART 2 PRODUCTS

Not applicable.

PART 3 EXECUTION

3.01 PREPARATION

Verify that existing plant life and clearing limits are clearly tagged, identified and marked in such a manner as to insure their safety throughout construction operations.

3.02 PROTECTION

A. Locate and identify existing utilities that are to remain and protect them from damage.

B. Protect trees, plant growth and features designated to remain as final landscape.

C. Conduct operations with minimum interference to public or private accesses and facilities. Maintain access and egress at all times and clean or sweep any roadways daily or as required by the governing authority. At such times as deemed necessary by the owner, dust control shall be provided with sprinkling systems or equipment provided by the contractor.

D. Protect benchmarks, property corners and all other survey monuments from damage or displacement. If a marker needs to be removed it shall be referenced by a licensed land surveyor and replaced, as necessary, by the same.

E. Provide traffic control as required, in accordance with the U.S. Department of Transportation "Manual of Uniform Traffic Control Devices" and the state highway department requirements.

3.03 CLEARING

A. Clear areas required for access to site and execution of work.

B. Unless otherwise indicated on the drawings, remove trees, shrubs, grass, other vegetation, improvements, or obstructions interfering with installation of new construction. Removal includes digging out stumps and roots. Depressions caused by clearing and grubbing operations are to be filled to subgrade elevation to avoid water ponding. Satisfactory fill material shall be placed in horizontal layers not exceeding 8" loose depth, and thoroughly compacted per fill requirements of this section and Section 02200.

C. Remove grass, trees, plant life, stumps and all other construction debris from the site to a dump site that is suitable for handling such material according to state laws and regulations.

3.04 TOPSOIL EXCAVATION

A. Strip topsoil from areas that are to be filled, excavated, landscaped or re-graded to such a depth that it prevents intermingling with underlying subsoil or questionable material.

B. Cut heavy growths of grass from areas before stripping and remove with the rest of the cleared vegetative material.

C. Topsoil shall consist of organic surficial soil found in depth of not less than 6". Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones and other objects over 2" in diameter, weeds, roots, and other objectionable material.

D. Stockpile topsoil in storage piles in areas shown or where directed. Construct storage piles to freely drain surface water. Cover storage piles as required to prevent windblown dust. Dispose of unsuitable topsoil as specified for waste material, unless otherwise specified by owner. Excess topsoil shall be removed from the site by the Contractor unless specifically noted otherwise on the Drawings.

END OF SECTION 02100

SECTION 02200

EARTHWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Protection, modification and/or installation of utilities as sitework progresses paying particular attention to grade changes and any necessary staging of work.

B. Cutting, filling and grading to required lines, dimensions, contours and proposed elevations for proposed improvements.

C. Scarifying, compaction, drying and removal of unsuitable material to ensure proper preparation of areas for fills or proposed improvements.

1.02 RELATED SECTIONS

A. Section 02050 - Demolition

B. Section 02100 - Site Preparation

C. Section 02221 - Excavation, Backfill and Compaction for Structures

D. Section 02222 - Excavation, Backfill and Compaction for Utilities

E. Section 02223 - Excavation, Backfill and Compaction for Pavement

F. Section 02227 - Aggregate Materials

G. Section 02229 - Rock Removal

H. Section 02245 - Soil Stabilization

I. Section 02900 - Landscaping

J. Geotechnical Report (if available) for boring locations and findings of subsurface materials and conditions.

K. Construction Drawings

L. Architectural Plans and Specifications as they relate specifically to the earthwork beneath the buildings, where the architectural requirements are more stringent than the civil requirements

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM) latest edition.

D 422	Method for Particle Size Analysis of Soils
D 698	Test for Moisture-Density Relations of Soils Using 5.5 lb. (2.5 kg) Rammer and 12-inch (304.8 mm) Drop (Standard Proctor)
D 1556	Test for Density of soil in Place by the Sand Cone method
D 1557	Test for Moisture-Density Relations of Soils Using 10-lb (4.5 Kg) Rammer and 18-inch (457 mm) Drop (Modified Proctor)

D 1559	Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
D 2167	Test for Density of Soil in Place by the Rubber Balloon Method
D 2216	Laboratory Determination of Moisture content of Soil
D 2487	Classification of Soils for Engineering Purposes
D 2922	Tests for Density of Soil and Soil- Aggregate in Place by Nuclear Methods (Shallow Depth)
D 3017	Test for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
D 4318	Test for Plastic Limit, Liquid Limit, and Plasticity Index of Soils
C 25	Chemical Analysis of Limestone, Quicklime and Hydrate Lime
C 110	Physical Testing for Quicklime and Hydrated Lime, Wet Sieve Method
C 618	Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
C 977	Quicklime and Hydrated Lime for Soil Stabilization

B. American Association of State Highway and Transportation Officials (AASHTO) latest edition

T 88	Mechanical Analysis of Soils

1.04 QUALITY ASSURANCE

A. Independent Testing Laboratory selected and paid by owner, shall be retained to perform construction testing on site based on the following:

1. Building Subgrade Areas, <u>including</u> 10' –0" Outside Exterior Building Lines: In cut areas, not less than one compaction test for every 2,500 square feet. In fill areas, same rate of testing for each 8" lift (measured loose).

2. Areas of Construction <u>exclusive</u> of building subgrade: In cut areas, not less than one compaction test for every 10,000 square feet. In fill areas, same rate of testing for each 8" lift (measured loose).

B. If compaction requirements are not complied with at any time during construction process, remove and recompact deficient areas until proper compaction is obtained at <u>no</u> additional expense to owner.

C. In all areas to receive pavement, a CBR (or LBR) test shall be performed for each type of material imported from off-site.

D. The following tests shall be performed on each type of on-site or imported soil material used as compacted fill as part of construction testing requirements.

1. Moisture and Density Relationship: ASTM D 698 or ASTM D1557.

2. Mechanical Analysis: AASHTO T-88

3. Plasticity Index: ASTM D 4318

E. Field density tests for in-place materials shall be performed according to one of the following standards as part of construction testing requirements.

1. Sand-Cone Method: ASTM D 1556

2. Balloon Method: ASTM D 2167

3. Nuclear method: ASTM D 2922 (Method B-Direct Transmission)

F. Independent Testing Laboratory shall prepare test reports that indicate test location, elevation data, and test results. Owner, architect, and contractor shall be provided with copies of reports within 96 hours of time test was performed. In event that any test performed fails to meet these Specifications, owner and contractor shall be notified immediately by independent testing laboratory.

G. All costs related to retesting due to failures shall be paid for by the contractor at no additional expense to owner. Owner reserves the right to employ an Independent Testing Laboratory and to direct any testing that is deemed necessary. Contractor shall provide free access to site for testing activities.

1.05 SUBMITTALS

A. Submit a sample of each type of off-site fill materials that is to be used at the site in an air tight, 10 lb container for the testing laboratory.

B. Submit the name of each material supplier and specific type and source of each material. Any change in source throughout the job requires approval of the owner or engineer.

C. For use of fabrics or geogrids, a design shall be submitted for approval by the Owner.

PART 2 PRODUCTS

2.01 MATERIALS

A. Excavated and re-used material for subsoil fill as specified herein.

B. Aggregate fill as specified in Section 02227.

C. Imported subsoil material approved by the owner and specified herein.

D. Topsoil fill as specified in Section 02100.

E. Acceptable stabilization fabrics and Geogrids:

1. Mirafi 50OX or 60OX

2. Phillips 66 Supac 6WS

3. Dupont Typar 3401 and 3601

4. Trevira S1114 and S1120

5. Tensar SS-1 and SS-2

6. Exxon GTF-200 or 350

F. Filter/Drainage Fabrics

1. Mirafi 14ONS

2. Phillips 66 Supac 4NP

3. Dupont Typar 3341

PART 3 EXECUTION

3.01 PREPARATION

A. Identify required lines, levels, contours and datum.

B. Locate and identify existing utilities that are to remain and protect them from damage.

C. Notify utility companies to remove and/or relocate any utilities that are in conflict with the proposed improvements.

D. Protect plant life, lawns, fences, existing structures, sidewalks, paving and curbs from excavating equipment and vehicular traffic.

E. Protect benchmarks, property corners and all other survey monuments from damage or displacement. If a marker needs to be removed it shall be referenced by a licensed land surveyor and replaced, as necessary, by the same.

F. Remove from site material encountered in grading operations that, in opinion of owner or owners representative, is unsuitable or undesirable for backfilling, subgrade or foundation purposes. Dispose of in a manner satisfactory to owner. Backfill areas with layers of suitable material and compact as specified.

G. Prior to placing fill in low areas, such as previously existing creeks, ponds, or lakes, perform following procedures:

1. Drain water out by gravity with ditch having flow line lower than lowest elevation in low area. If drainage cannot be performed by gravity ditch, use adequate pump to obtain same results.

2. After drainage of low area is complete, remove mulch, mud, debris, and other unsuitable material by using acceptable equipment and methods that will keep natural soils underlying low areas dry and undisturbed.

3. If proposed for fill, all muck, mud, and other materials removed from above low areas shall be dried on-site by spreading in thin layers for observation by owner or owners representative. Material shall be inspected and, if found to be suitable for use as fill material, shall be incorporated into lowest elevation of site filling operation, but not under the building area or within 10' – 0" of perimeter of building pad or paving subgrade. If, after observation by owner or owners representative, material is found to be unsuitable, all unsuitable material shall be removed from site.

3.02 EXCAVATION FOR FILLING AND GRADING

A. Classification of Excavation: Contractor by submitting bid acknowledges that he has investigated the site to determine type, quantity, quality, and character of excavation work to be performed. Excavation shall be considered unclassified excavation, except as indicated by "Article 4 - Administration of the Contract" in the "Supplementary Conditions" portion of the specification.

B. Perform excavation using capable, well maintained equipment and methods acceptable to owner and governing agencies.

C. When performing grading operations during periods of wet weather, provide adequate drainage and ground water management to control moisture of soils.

D. Shore, brace, and drain excavations as necessary to maintain safe, secure, and free of water at all times.

E. Excavated material containing rock or stone greater than 6" in largest dimension is unacceptable as fill to within the proposed building and paving area.

F. Rock or stone less than 6" in largest dimension is acceptable as fill to within 24" of surface of proposed subgrade when mixed with suitable material.

G. Rock or stone less than 2" in largest dimension and mixed with suitable material is acceptable as fill within the upper 24" of proposed subgrade.

3.03 FILLING AND SUBGRADE PREPARATION

A. Fill areas to contours and elevations shown with unfrozen materials.

B. Place fill in continuous lifts specified herein.

C. Refer to Section 02221 for filling requirements for structures.

D. Refer to Section 02223 for filling requirements for pavements.

E. Areas exposed by excavation or stripping and on which subgrade preparations are to be performed shall be scarified to minimum depth of 8" and compacted to minimum of 95% of optimum density, in accordance with ASTM D 698 (or 92% of optimum density, in accordance with ASTM D 1557), at a moisture content of not less than 1% below and not more than 3% above the optimum moisture content. These areas shall then be proofrolled to detect any areas of insufficient compaction. Proofrolling shall be accomplished by making a minimum of two (2) complete passes with a fully-loaded tandem-axle dump truck, or approved equivalent, in each of the two perpendicular directions under the supervision and direction of a field geotechnical engineer. Areas of failure shall be excavated and recompacted as stated above.

F. Fill materials used in preparation of subgrade shall be placed in lifts or layers not to exceed 8" loose measure and compacted to a minimum density of 95% of optimum density, in accordance with ASTM D 698, (or 92% of the optimum density, in accordance with ASTM D 1557) at a moisture content of not less than it below and not more than 3% above the optimum moisture content.

G. Material imported from off-site shall have a CBR (California Bearing Ratio) or LBR (Limerock Bearing Ratio) value equal to or above the pavement design subgrade CBR or LBR value indicated on the Drawings.

3.04 MAINTENANCE OF SUBGRADE

A. Finished subgrades shall be verified to ensure proper elevation and conditions for construction above subgrade.

B. Protect subgrade from excessive wheel loading during construction, including concrete trucks and dump trucks.

C. Remove areas of finished subgrade found to have insufficient compaction density to depth necessary and replace in a manner that will comply with compaction requirements by use of material equal to or better than best subgrade material on site. Surface of subgrade after compaction shall be hard, uniform, smooth, stable, and true to grade and cross-section.

3.05 RIP RAP

A. Place rip-rap in all areas where indicated on the Drawings. The stone for rip-rap shall consists of field stone or rough unhewn quarry stone as nearly uniform, in section as is practical. The stones shall be dense, resistant to the action of air and water, and suitable in all aspects for the purpose intended. Unless otherwise specified, all stones used as rip-rap shall weigh between 50 and 150 pounds each, and at least 60 percent of the stones shall weigh more than 100 pounds each.

B. Slopes and other areas to be protected shall be dressed to the line and grade shown on the plans prior to the placing of rip-rap. Contractor shall undercut the areas to receive rip-rap to an elevation equal to the final elevation less the average diameter of the stones before placing the rip-rap.

C. Filter fabric and bedding stone shall be installed prior to the placement of the stones if so indicated on the drawings. The bedding stone shall be quarried and crushed angular limestone in accordance with Section 02227 and shall be 6" in depth. Filter fabric shall be as specified herein and as detailed on the plans.

D. Stones shall be placed so that the greater portion of their weight is carried by the earth and not by the adjacent stones. The stones shall be placed in a single layer with close joints. The upright areas of the stone shall make an angle of approximately 90 degree with the embankment slope. The courses shall be placed from the bottom of the embankment upward, the larger stones being placed in the lower courses. Open joints shall be filled with spalls. Stones shall be embedded in the embankment as necessary to present a uniform top surface such that the variation between tops of adjacent stones shall not exceed three inches.

3.06 FINISH GRADING

A. Grade all areas where finish grade elevations or contours are indicated on Drawings, other than paved areas and buildings, including excavated areas, filled and transition areas, and landscaped areas. Graded areas shall be uniform and smooth, free from rock, debris, or irregular surface changes. Finished subgrade surface shall not be more than 0.10 feet above or below established finished subgrade elevation, and all ground surfaces shall vary uniformly between indicated elevations. Finish ditches

shall be graded to allow for proper drainage without ponding and in a manner that will minimize erosion potential. For topsoil application, refer to Section 02900 Landscaping.

B. Correct all settlement and eroded areas within one year after date of completion at no additional expense to owner. Bring grades to proper elevation. Replant or replace any grass, shrubs, bushes, or other vegetation that appears dead, dying or disturbed by construction activities. Refer to Section 02270 for slope protection and erosion control.

C. Refer to Section 02245 for soil stabilization using lime, cement, fly ash and geotextile fabric methods for subbase materials.

3.07 ROCK EXCAVATION (See Section 02229 Rock Removal)

END OF SECTION 02200

SECTION 02221

EXCAVATION, BACKFILLING AND COMPACTING FOR STRUCTURE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavate to line, grade and configuration as shown in the plans and specifications for proposed structures and expansion areas.

B. Fill to line, grade and configuration as shown in the plans and specifications for proposed structures and expansion areas.

C. Compacting for materials in an acceptable manner as stated herein.

1.02 RELATED SECTIONS

A. Section 02200 - Earthwork

B. Section 02227 - Aggregate material

C. Section 02229 - Rock Removal

D. Section 02245 - Soil Stabilization

E. Section 02511 - Asphaltic Concrete Paving

F. Section 02520 - Portland Cement Concrete Paving

G. Geotechnical report (if available) for boring locations and findings of subsurface materials and conditions.

H. Construction drawings.

I. Architectural plans and specifications as they relate specifically to earthwork beneath the buildings, where the architectural requirements are more stringent than the civil requirements.

1.03 REFERENCE STANDARDS

A. American society for testing and materials (ASTM) latest edition.
D 422 Method for particle size analysis of soils.
D 698 Test for moisture-density relations of soils using 5.5 lb. (2.5 kg) Rammer and 12 inch (304.8 mm) drop (Standard Proctor).
D 1556 Test for density of soil in place by the sand cone method.
D 1557 Test for moisture-density relations of soils using 10-lb (4.5 kg) Rammer and 18-inch (457 mm) drop (Modified Proctor).
D 1559 Test method for resistance to plastic flow of bituminous mixtures using Marshall Apparatus.
D 2167 Test for density of soil in place by the Rubber Balloon Method.
D 2216 Laboratory determination of moisture content of soil.
D 2487 Classification of soils for engineering purposes.
D 2922 Tests for density of soil and soil-aggregate in place by nuclear methods (shallow depth).
D 3017 Test for moisture content of soil and soil aggregate in place by nuclear methods (shallow depth).

D 4318 Test for plastic limit, liquid limit, & plasticity index of soils.
C 25 Chemical analysis of limestone, quicklime and hydrated lime.
C110 Physical testing for quicklime and hydrated lime, wet sieve method.
C 618 Specification for fly ash and raw or calcined natural pozzolan for use as a mineral admixture in portland cement concrete.
C 977 Quicklime and hydrated lime for soil stabilization.

B. American Association of State Highway and Transportation Officials (AA,SHTO) latest edition.
T88 Mechanical Analysis of Soils.

1.04 QUALITY ASSURANCE

Independent testing laboratory selected and paid by owner shall be retained to perform construction testing on filling operations and subgrade analysis as specified in section 02200 and as stated herein.

1.05 SUBMITTALS

A. Shop drawings or details pertaining to excavating and filling for structures are not required unless otherwise shown on the drawings or specifications or if contrary procedures to the project documents are proposed.

B. Submit a sample of each type of off-site fill material that is to be used in backfilling in an air-tight, 10 lb. container for the testing laboratory or submit a gradation and certification of the aggregate material that is to be used to the testing laboratory for review.

PART 2 PRODUCTS

2.01 MATERIALS

A. Fill material from on-site as specified in section 02200 and approved by the owner or owner' s representative.

B. Fill material from off-site as specified in section 02200 and approved by the owner or owner' s representative.

C. Aggregate material as specified in section 02227.

PART 3 EXECUTION

3.01 PREPARATION

A. Identify all lines, elevations and grades necessary to construct building subgrades as shown in the plans and specifications.

B. Carefully protect benchmarks, property corners, monuments or other reference points.

C. Locate and identify all site utilities that have previously been installed and may be in danger of damage by grading operations.

D. Locate and identify all existing utilities that are to remain and protect them from damage.

E. Over excavate and properly prepare areas of subgrade that are not capable of supporting the proposed systems. These areas shall be stabilized by using acceptable filter fabrics and/or aggregate materials placed and compacted as specified.

3.02 EXCAVATION

A. Excavate building areas to line and grade as shown in the plans and specifications being careful not to over excavate beyond the elevations needed for building subgrades.

B. Engage all suitable material into the project fill areas as specified in Section 02200.

C. Unsuitable excavated material is to be disposed of in a manner and location that is acceptable to the owner and local governing agencies.

D. Perform excavation using capable, well maintained equipment and methods acceptable to the owner and the project document requirements.

3.03 FILLING AND SUBGRADE PREPARATION

A. Building area subgrade pad shall be that portion of site directly beneath and ten feet (10') beyond the building and appurtenances including the limits of any future building expansion areas as shown on the civil site drawings.

B. The building area subgrade pad shall be prepared in strict accordance with the "foundation subsurface preparation" as shown on the civil-site drawings and/or the architectural-structural drawings whichever is more stringent. Rock larger than six inches (6") shall not be part of building subgrade fill.

C. Areas exposed by excavation or stripping and on which building subgrade preparations are to performed shall be scarified to a minimum depth of 8" and compacted to a minimum of 95% of the optimum density, in accordance with ASTM D 698, (or 92% of the optimum density, in accordance with ASTM D1557) at a moisture content of not less than 1% below and not more than 3% above the optimum moisture content. These areas shall then be proofrolled to detect any areas of insufficient compaction. Proofrolling shall be accomplished by making a minimum of two (2) complete passes with a fully-loaded tandem-axle dump truck, or approved equivalent, in each of the two perpendicular directions under the supervision and direction of a field geotechnical engineer. Areas of failure shall be excavated and recompacted as stated above.

D. Fill materials used in preparation-of building subgrade shall be placed in lifts or layers not to exceed 8" loose measure and compacted to a minimum density of 95% of optimum density, in accordance with ASTM D 698 (or 92% of the optimum density, in accordance with ASTM D 1557), at a moisture content of not less than it below and not more than 3% above the optimum moisture content. Unless specifically stated otherwise in the "foundation subsurface preparation" on the Drawings, the following table stipulates maximum allowable values for plasticity index (PI) and liquid limit (LL) of suitable materials to be used as fill in the specified areas:

Location	PI	LL
*Building area, below upper four feet	20	50
*Building area, upper four feet	12	40

(*References to depth are to proposed subgrade elevations)

3.04 COMPACTION

A. Maintain optimum moisture content of fill materials to attain required compaction density.

B. All materials shall be tested in accordance with Section 02200.

C. An independent testing laboratory selected and paid by the owner, shall be retained to perform testing on site.

D. Compaction tests will be as specified in Section 02200 together with the following for building subgrade areas including 10'-0" outside exterior building lines:

In cut areas, not less than one compaction test for every 2,500 square feet. In fill areas, same rate of testing for each 8" lift (measured loose).

E. If compaction requirements are not complied with at any time during construction process, remove and recompact deficient areas until proper compaction is obtained at no additional expense to the Owner.

3.05 MAINTENANCE OF SUBGRADE

A. Finished subgrades shall be verified to ensure proper elevation and conditions for construction above subgrade.

B. Protect subgrade from excessive wheel loading during construction, including concrete trucks and dump trucks.

C. Remove areas of finished subgrade found to have insufficient compaction density of depth necessary and replace in a manner that will comply with compaction requirements by use of materials equal to or better than best subgrade material on site. Surface of subgrade after compaction shall be hard, uniform, smooth, stable, and true to grade and cross-section.

3.06 FINISH GRADING

A. Finish grading shall be in accordance with Section 02200 and as more specifically stated herein.

B. Grading of building areas shall be checked by string line from grade stakes (blue tops) set at not more than 50' centers. Tolerance of 0.10 feet, more or less, will be permitted. Contractor to provide engineering and field staking necessary for verification of lines, grades, and elevations.

3.07 ROCK EXCAVATION (SEE SECTION 02229 ROCK REMOVAL)

END OF SECTION 02221

SECTION 02222

EXCAVATION, BACKPILLING AND COMPACTING FOR UTILITIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavating trenches for the installation of utilities

B. Backfilling trench with bedding material as specified and indicated and finishing filling trench with suitable material to proposed subgrade.

C. Compacting backfill materials in an acceptable manner

D. Borings and casings under roads

1.02 RELATED SECTIONS

A. Section 02200 - Earthwork

B. Section 02227 - Aggregate Materials

C. Section 02229 - Rock Removal

D. Section 02605 - Sewer Structures

E. Section 02660 - Water Distribution Systems

F. Section 02687 - Site Gas Lines

G. Section 02720 - Storm Sewer Systems

H. Section 02730 - Sanitary Sewer Systems

I. Section 02810 - Landscape Irrigation

J. Geotechnical report (if available) for boring locations and findings of subsurface materials and conditions

K. Construction Drawings

1.03 REFERENCE STANDARDS

A. American society for testing and materials (ASTM) Latest Edition
D 422 Method for Particle Size Analysis
D 698 Test for Moisture-Density Relations of Soils Using 5.5-lb. (2.5 Kg) Rammer and 12-inch (304.8mm) Drop (Standard Proctor)
D 1556 Test for Density of Soil in Place by the Sand Cone Method
D 1557 Test for Moisture-Density Relations of Soils Using 10-lb. (4.5 Kg) Rammer and 18-inch (457 mm) Drop (Modified Proctor)
D 1559 Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
D 2216 Laboratory Determination of Moisture Content of Soil
D 2487 Classification of Soils for Engineering Purposes
D 2922 Tests for Density of Soil and Soil-Aggregate in Place by Nuclear methods (Shallow Depth)

D 3017 Test for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
D 4318 Test for Plastic Limit, Liquid Limit, & Plasticity Index of Soils
C 25 Chemical Analysis of Limestone, Quicklime and Hydrated Lime.
C 110 Physical Testing for Quicklime and Hydrated Lime, Wet Sieve Method
C 618 Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
C 977 Quicklime and Hydrated Lime for Soil Stabilization

B. American Association of State Highway and Transportation Officials (AASHTO) latest edition
T88 Mechanical Analysis of Soils

1.04 QUALITY ASSURANCE

Independent testing laboratory selected and paid by owner, shall be retained to perform construction testing on backfilling operations as specified in Section 02200 and as stated herein.

1.05 SUBMITTALS

A. Shop Drawings or details pertaining to Site Utilities are not required unless required by regulatory authorities or unless use of materials, methods, equipment, or procedures are contrary to Drawings or these specifications are proposed. Do not perform work until required shop drawings have been accepted by Owner.

B. The Contractor shall contact all utility companies and determine if additional easements will be required to complete the project. Contractor shall provide written confirmation of the status of all easements to the Owner's Construction Manager at the time of the pre-construction conference or no later than 90 days prior to the project possession date.

C. Submit a sample of each type of offsite fill material that is to be used in backfilling in an air-tight, 10 lb container for the testing laboratory or submit a gradation and certification of the aggregate material that is to be used to the testing laboratory for review.

1.06 PROJECT RECORD DOCUMENTS

Accurately record actual locations of all subsurface utilities, structures and obstructions encountered.

PART 2 PRODUCTS

2.01 MATERIALS

A. Bedding Material: Processed sand and gravel free from clay lumps, organic, or other deleterious material, and complying with following gradation requirements:

U. S. Sieve Size	Percent Passing (by weight)
1 Inch	100
3/4 Inch	90-100
3/8 Inch	20- 55
No. 4	0- 10
No. 8	0- 5

B. Backfill material from site as specified in Section 02200 and approved by the owner or owner's representative.

C. Backfill material from offsite as specified in Section 02200 and approved by the owner or owner's representative.

D. Steel Casing Pipe: Comply with AWWA C-201 or C-202, minimum grade B, size and wall thickness as indicated on Drawings.

E. Acceptable Stabilization Fabrics and Geogrids

1. Mirafi 50OX or 60OX

2. Phillips 66 Supac 6WS

3. Dupont Typar 3401 and 3601

4. Trevira S1114 and S1120

5. Tensar SS-1 and SS-2

6. Exxon GTF-200 or 350

F. Filter/Drainage Fabrics

1. Mirafi 140 *NS*

2. Phillips 66 Supac 4NP

3. Dupont Typar 3341

PART 3 EXECUTION

3.01 PREPARATION

A. Set all lines, elevations, and grades for utility and drainage system work and control system for duration of work, including careful maintenance of bench marks, property corners, monuments, or other reference points.

B. Maintain in operating condition all existing utilities, active utilities and drainage systems encountered in utility installation. Repair any surface or subsurface improvements shown on Drawings.

C. Verify location, size, elevation, and other pertinent data required to make connections to existing utilities and drainage systems as indicated on Drawings. Contractor shall comply with local codes and regulations.

D. Over excavate and properly prepare areas of subgrade that are not capable of supporting the proposed systems. These areas shall be stabilized by using acceptable filter fabrics and/or additional bedding material placed and compacted as specified.

E. Install dewatering systems that will be required to construct the proposed utilities in a manner that is described herein.

3.02 EXCAVATION

A. The local utility companies shall be contacted before excavation shall begin. Dig trench at proper width and depth for laying pipe, conduit, or cable. Cut trench banks vertical if possible and remove stones from bottom of trench as necessary to avoid point-bearing. Over excavate wet or unstable soil, if encountered, from trench bottom as necessary to provide suitable base for continuous and uniform bedding.

B. All trench excavation side walls greater than 5 feet in depth shall be sloped, shored, sheeted, braced or otherwise supported by means of sufficient strength to protect the workmen within them in accordance with the applicable rules and regulations established for construction by the Department of Labor, Occupational Safety and Health Administration (OSHA), and by local ordinances. Lateral travel distance to an exit ladder or steps shall not be greater than 25 feet in trenches 4 feet or deeper.

C. Perform excavation as indicated for specified depths. During excavation, stockpile materials suitable for backfilling in orderly manner far enough from bank of trench to avoid overloading, slides, or cave-ins.

D. Remove excavated materials not required or not suitable for backfill or embankments and waste as specified. Any structures discovered during excavation(s) shall be disposed of as specified.

E. Prevent surface water from flowing into trenches or other excavations by temporary grading or other methods, as required. Remove accumulated water in trenches or other excavations by pumping or other acceptable methods.

F. Open cut excavation with trenching machine or backhoe. Where machines other than ladder or wheel-type trenching machines are used, do not use clods for backfill. Dispose of unsuitable material and provide other suitable material at no additional cost to Owner.

G. Accurately grade trench bottom to provide uniform bearing and support for each section of pipe on bedding material at every point along entire length, except where necessary to excavate for bell holes, proper sealing of pipe joints, or other required connections. Dig bell holes and depressions for joints after trench bottom has been graded. Dig no deeper, longer, or wider than needed to make joint connection properly.

H. Trench width requirements below the top of the pipe shall not be less than 12" nor more than 18", wider than outside surface of any pipe or conduit that is to be installed to designated elevations and grades. All other trench width requirements for pipe, conduit, or cable shall be the least practical width that will allow for proper compaction of trench backfill.

I. Trench depth requirements measured from finished grade or paved surface shall meet the following requirements or applicable codes and ordinances:

1. Water Mains: 30" to top of pipe barrel or 6", below the frost line (established by the local building official), whichever is deeper.

2. Sanitary Sewer: Elevations, and grades as indicated on Drawings.

3. Storm Sewer: Depths, elevations, and grades as shown on Drawings.

4. Electrical Conduits: 24" minimum to top of conduit or as required by NEC 300-5, NEC 710-36 codes, or the local utility company requirements, whichever is deeper.

5. TV Conduits: 18" minimum to top of conduit or as required by the local utility company, whichever is deeper.

6. Telephone Conduits: 18" minimum to top of conduit, or as required by the local utility company, whichever is deeper.

7. Gas Mains and Service: 30" minimum to top of pipe, or as required by the local utility company, whichever is deeper.

J. Provide sheeting and bracing, when necessary, in trenches and other excavations where protection of workmen required. Sheeting may be removed after sufficient backfilling to protect against damaging or injurious caving.

3.03 PIPE BEDDING

A. Accurately cut trenches for pipe or conduit that is installed to designated elevations 4" below bottom of pipe and to width as specified. Place 4" of bedding material, compact in bottom of trench, and accurately shape to conform to lower portion of pipe barrel. After pipe installation, place backf ill as specified and compact in maximum 8" layers measured loose to the top of the trench.

B. Place geotextile fabric as specified on the plans and specifications.

3.04 BACKFILLING

A. Criteria: Trenches shall not be backfilled until required tests are performed and the utility systems comply with and are accepted by applicable governing authorities. Backfill trenches as specified. If improperly backfilled, reopen to depth required to obtain proper compaction. Backfill and compact, as specified, to properly correct condition in an acceptable manner.

B. Backfilling: After pipe or conduit has been installed, bedded, and tested as specified, backfill trench or structure excavation with specified material placed in 8" maximum loose lifts.

C. Backfill trenches to the contours and elevations shown on the plans with unfrozen materials.

D. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.

3.05 COMPACTION

A. Exercise proper caution when compacting immediately over top of pipes or conduits. Water jetting or flooding is not permitted as a method of compaction.

B. Maintain optimum moisture content of fill materials to attain required compaction density.

C. An independent testing laboratory shall perform testing at intervals not exceeding 200' of trench for the first and every other eight-inch (8") lift of compacted trench backfill and furnish copies of test results as specified. Compact to minimum density of 95% of optimum density in accordance with ASTM D 698 or 92% of optimum density in accordance with ASTM D1557.

D. All materials used for backfill shall comply with the requirements of Section 02200.

3.06 BORINGS AND CASINGS UNDER ROADS, HIGHWAYS AND RAILROAD CROSSINGS

A. When indicated by Drawings and specifications, all street, road, highway, or railroad crossings for utility mains installed by the jacking and boring method shall be in accordance with area specifications and governing authorities.

B. Excavation of approach pits and trenches within right-of-way of street, road, highway, or railroad shall be of sufficient distance from paving or railroad tracks to permit traffic to pass without interference. Tamp backfill for approach pits and trenches within right-of-way in layers not greater than 6", thick for entire length and depth of trench or pit. Compact backfill to 95% of maximum density obtained at optimum moisture as determined by AASHO T 180-57, Method A. Mechanical tampers may be used after cover of 6" has been obtained over top of barrel of pipe.

C. Accomplish boring operation using commercial type boring rig and hole shall be bored to proper alignment and grade and within 2" of same diameter as largest outside joint diameter of pipe installed. Install pipe in hole immediately after bore has been made, and in no instance shall hole be left open while unattended.

D. In event subsurface operations result in failure or damage to pavement within one year of construction, Contractor shall make necessary repairs to pavement at no additional cost to Owner. In event paving cracks on either side of pipe line or is otherwise disturbed or broken due to construction operations, Contractor shall repair or replace disturbed or broken area at no additional expense to the Owner.

E. Clean and prime interior and exterior of casing pipe; and line with two coats of asphalt in accordance with area specifications and governing authorities.

F. Butt weld steel casing. Welds shall be full penetration single butt-welds in accordance with AWWA C- 205 and AWS D7-0-62.

G. Install casing and utility pipe with end seals, vent pipe, and other special equipment in accordance with area specifications and governing authorities.

3.07 ROCK EXCAVATION (See Section 02229 Rock Removal)

END OF SECTION 02222

SECTION 02223

EXCAVATION, BACKFIILING AND COMPACTING FOR PAVEMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavate to line, grade and configuration as shown in the plans and specifications for proposed and future pavement areas.

B. Fill to line, grade and configuration as shown in the plans and specifications for proposed and future pavement areas.

C. Compacting fill materials in an acceptable manner as stated herein.

1.02 RELATED SECTIONS

A. Section 02200 - Earthwork

B. Section 02227 - Aggregate Materials

C. Section 02229 - Rock Removal

D. Section 02245 - Soil Stabilization

E. Section 02505 - Paving Base Course

F. Section 02511 - Asphaltic Concrete Paving

G. Section 02520 - Portland Cement Concrete Paving

H. Section 02525 - Curbs and Sidewalks

I. Geotechnical Report (if available) for Boring Locations and Findings of Subsurface Materials and Conditions.

J. Construction Drawings

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM) latest edition.

D 422	Method for Particle Size Analysis of Soils
D 698	Test for Moisture-Density Relations of Soils Using 5.5 lb. (2.5 kg) Rammer and 12-inch (304.8 mm) Drop (Standard Proctor)
D 1556	Test for Density of Soil in Place by the Sand Cone Method
D 1557	Test for Moisture-Density Relations of Soils Using 10-lb (4.5 Kg) Rammer and 18-inch (457 mm) Drop (Modified Proctor)
D 1559	Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
D 2167	Test for Density of Soil in Place by the Rubber Balloon Method
D 2216	Laboratory Determination of Moisture Content of Soil
D 2487	Classification of Soils for Engineering Purposes

D 2922 Tests for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
D 3017 Test for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
D 4318 Test for Plastic Limit, Liquid Limit, and Plasticity Index of Soils
C 25 Chemical Analysis of Limestone, Quicklime and Hydrated Lime
C 110 Physical Testing for Quicklime and Hydrated Lime, Wet Sieve Method
C 618 Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
C 977 Quicklime and Hydrated Lime for Soil Stabilization

B. American Association of State Highway and Transportation Officials (AASHTO) latest edition
T 88 Mechanical Analysis of Soils

1.04 QUALITY ASSURANCE

Independent testing laboratory selected and paid by owner shall be retained to perform construction testing on filling operations and subgrade analysis as specified in Section 02200 and as stated herein.

1.05 SUBMITTALS

A. Shop drawings or details pertaining to excavating and filling for pavement are not required unless otherwise shown on the drawings or specifications or if contrary procedures to the project documents are proposed.

B. Submit a sample of each type of off-site fill material that is to be used in backfilling in an air-tight, 10 lb. container for the testing laboratory or submit a gradation and certification of the aggregate material that is to be used to the testing laboratory for review.

PART 2 PRODUCTS

2.01 MATERIALS

A. Fill material from on-site as specified in Section 02200 and approved by the owner or owner's representative.

B. Fill material from off-site as specified in Section 02200 and approved by the owner or owner's representative.

C. Aggregate material as specified in Section 02227.

D. Acceptable stabilization fabrics and geogrids:

1. Mirafi 500X or 600X

2. Phillips 66 Supac 6WS

3. Dupont Typar 3401 and 3601

4. Trevira S1114 and S1120

5. Tensar SS-1 and SS-2

6. Exxon GTF-200 or 350

PART 3 EXECUTION

3.01 PREPARATION

A. Identify all lines, elevations and grades necessary to construct pavements, curb and gutter, bases, walkways and roadways as shown in the plans and specifications.

B. Carefully protect benchmarks, property corners, monuments or other reference points.

C. Locate and identify all site utilities that have previously been installed and may be in danger of damage by grading operations.

D. Locate and identify all existing utilities that are to remain and protect them from damage.

E. Over excavate and properly prepare areas of subgrade that are not capable of supporting the proposed systems. These areas shall be stabilized by using acceptable filter fabrics and/or aggregate material placed and compacted as specified.

3.02 EXCAVATION

A. Excavate roadway and pavement areas to line and grade as shown in the plans and specifications.

B. Engage all suitable material into the project fill areas as specified in Section 02200.

C. Unsuitable excavated material is to be disposed of in a manner and location that is acceptable to the owner and local governing agencies.

D. Perform excavation using capable, well maintained equipment and methods acceptable to the owner and the project document requirements.

3.03 FILLING AND SUBGRADE PREPARATION

A. Areas exposed by excavation or stripping and on which subgrade preparations for paving are to be performed, including future pavement areas, shall be scarified to minimum depth of 8", and compacted to minimum of 95% of optimum density, in accordance with ASTM D 698 (or 92% of optimum density, in accordance with ASTM D 1557), at a moisture content of not less than 1% below and not more than 3% above the optimum moisture content. These areas shall then be proofrolled to detect any areas of insufficient compaction. Proofrolling shall be accomplished by making a minimum of two (2) complete passes with a fully-loaded tandem-axle dump truck, or approved equivalent, in each of the two perpendicular directions under the supervision and direction of a field geotechnical engineer. Areas of failure shall be excavated and recompacted as stated above.

B. Fill materials used in preparation of subgrade shall be placed in lifts or layers not to exceed 8" loose measure and compacted to a minimum density of 95% of optimum density, in accordance with ASTM D 698, (or 92% of the optimum density, in accordance with ASTM D 1557) at a moisture content of not less than 1% below and not more than 3% above the optimum moisture content.

C. The following table stipulates maximum allowable values for plasticity index (PI) and liquid limit (LL) of suitable fill materials to be used in the specified areas, unless specifically stated otherwise on the Drawings:

	PI	LL
*Paving Area, below upper two feet	20	50
*Paving Area, upper two feet	15	40

(*References to Depth are to Proposed Subgrade Elevations)

D. Material imported from off-site shall have a CBR (California Bearing Ratio) or LBR (Limerock Bearing Ratio) value equal to or above the pavement design subgrade CBR or LBR value indicated on the Drawings.

3.04 COMPACTION

A. Maintain optimum moisture content of fill materials to attain required compaction density.

B. All materials shall be tested in accordance with Section 02200.

C. An independent testing laboratory selected and paid by the owner, shall be retained to perform testing on-site.

D. Compaction test will be as specified in Section 02200 together with the following for paving areas:

1. In cut areas not less than one compaction test for every 10,000 square feet.

2. In fill areas, same rate of testing for each 8" lift (measured loose).

E. If compaction requirements are not complied with at any time during construction process, remove and recompact deficient areas until proper compaction is obtained at no additional expense to owner.

3.05 MAINTENANCE OF SUBGRADE

A. Finished subgrades shall be verified to ensure proper elevation and conditions for construction above subgrade.

B. Protect subgrade from excessive wheel loading during construction including concrete trucks and dump trucks.

C. Remove areas of finished subgrade found to have insufficient compaction density to depth necessary and replace in a manner that will comply with compaction requirements by use of material equal to or better than best subgrade material on-site. Surface of subgrade after compaction shall be hard, uniform, smooth, stable, and true to grade and cross-section.

3.06 FINISH GRADING

A. Finish grading shall be in accordance with Section 02200 and as more specifically stated herein.

B. Grading of paving areas shall be checked by string line from grade stakes (blue tops) set at not more than 50' centers. Tolerances of .10 feet, more or less, will be permitted. Contractor to provide engineering and field staking necessary for verification of lines, grades, and elevations.

3.07 ROCK EXCAVATION (See Section 02229 Rock Removal)

END OF SECTION 02223

SECTION 02227

AGGREGATE MATERIALS

PART 1 GENERAL

1.01 SECTION INCLUDES

Aggregate Materials

1.02 RELATED SECTIONS

A. Section 02050 - Demolition

B. Section 02100 - Site Preparation

C. Section 02200 - Earthwork

D. Section 02221 - Excavation, Backfill and Compaction for Structures

E. Section 02222 - Excavation, Backfill and Compaction for Utilities

F. Section 02223 - Excavation, Backfill and Compaction for Pavement

G. Section 02245 - Soil Stabilization

H. Section 02270 - Slope Protection and Erosion Control

I. Construction Drawings

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM) latest edition.

ANSI/ASTM C136	- Method for Sieve Analysis of Fine and Coarse Aggregates.
ANSI/ASTM D698	- Test Methods for Moisture-Density Relations of Soils and Soil-aggregate Mixtures, Using 5.5 lb (2.49 Kg) Rammer and 12 inch (304.8 mm) Drop.
ANSI/ASTM D1557	- Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb (4.54 Kg) Rammer and 18 inch (457 mm) Drop.
ASTM D2167	- Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
ASTM D2487	- Classification of Soils for Engineering Purposes.
ASTM D2922	- Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
ASTM D3017	- Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.
ASTM D4318	- Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

B. American Association of State Highway and Transportation Officials (AASHTO) latest edition.

AASHTO T180	- Moisture-Density Relations of Soils Using a 10-lb (4.54 Kg) Rammer and an 18 inch (457 mm) Drop.
AASHTO M147	- Materials for Aggregate and Soil-Aggregate.

1.04 QUALITY ASSURANCE

Tests and analysis of aggregate material will be performed in accordance with standard ASTM and AASHTO procedures listed herein.

1.05 SUBMITTALS

A. Submit in air-tight containers a 10 pound sample of each aggregate or mixture that is to be incorporated into the project to the testing laboratory designated by the owner.

B. Submit the name of each material supplier and specific type and source of each material. Any change in source throughout the job requires approval of the owner and engineer.

C. Submit materials certificate to on-site independent testing laboratory which is signed by material producer and Contractor, certifying that materials comply with, or exceed, the requirements herein.

PART 2 PRODUCTS

2.01 MATERIALS

A. All construction and materials shall meet or exceed the requirements of this section and any state highway department specification section referred to or noted on the drawings which pertain to paving base course design, materials, preparation, and/or execution. All materials shall be as indicated on Drawings and shall comply with applicable state highway specification regarding source, quality, gradation, liquid limit, plasticity index, and mix proportioning.

PART 3 EXECUTION

3.01 STOCKPILING

Stockpile on-site at locations indicated by the owner in such a manner that there will be no standing water or mixing with other materials.

3.02 BORROW SITES

Upon completion of borrow operations, clean up borrow areas as indicated on the plans in a neat and reasonable manner to the satisfaction of the property owner, the owner and the engineer.

3.03 TRANSPORTATION

Off-site materials shall be transported to the project using well maintained and operating vehicles. Once on the job site, all transporting vehicles shall stay on designated haul roads and shall at no time endanger any of the improvements by rutting, overloading or pumping the haul road.

END OF SECTION 02227

SECTION 02229

ROCK REMOVAL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal of identified and discovered rock during excavation.

B. Use of explosives to assist rock removal.

C. Incorporating removed rock into fills and embankments.

1.02 RELATED SECTIONS

A. Section 02200 - Earthwork

B. Section 02221 - Excavation, Backfill and Compacting for Structures

C. Section 02222 - Excavation, Backfill and Compacting for Utilities

D. Section 02223 - Excavation, Backfill and Compacting for Pavement

E. Geotechnical report (if available) for boring locations and findings of subsurface materials and conditions.

F. Construction Drawings

1.03 REFERENCE STANDARDS

NFPA 495 - Code For Explosive Materials

1.04 ENVIRONMENTAL REQUIREMENTS

Determine all environmental effects associated with proposed work and safeguard those concerns as regulated by law and all others by reasonable and practiced methods.

1.05 JOB CONDITIONS

Any discrepancy with plans and specifications regarding amount and type of rock to be removed shall immediately be brought to the attention of the Owner and the Engineer. A revised removal plan and schedule shall subsequently be provided and followed by the Contractor.

1.06 QUALIFICATIONS

Contractor shall submit records of documented experience to the Owner and the Engineer prior to removal of rock by blasting.

PART 2 PRODUCTS

2.01 MATERIALS

Explosives, detonator/delay device and blast mat materials shall be the type recommended by the explosive supplier and shall comply with the requirements of this section.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify site conditions and note subsurface conditions affecting work of this section.

B. Identify required lines, levels and elevations that will determine the extent of the proposed removals.

3.02 ROCK EXCAVATION

A. Rock Excavation is defined as igneous, metamorphic or sedimentary rock that cannot be removed by rippers or other mechanical methods and; therefore, requires drilling and blasting. Cut rock to form level bearing at bottom of footing and trench excavations. In utility trenches, excavate rock to 6" below invert elevation of pipe. Remove shaled layers to provide sound and unshattered base for footings or foundations. Reuse excavated materials on-site in accordance with section 02200, if applicable.

B. Comply with all laws, rules, and regulations of Federal, State and local authorities and insurer which govern storage, use, manufacture, sale, handling, transportation, licensing, or other disposition of explosives. Take special precautions for proper use of explosives to prevent harm to human life and damage to surface structures, all utility lines, or other subsurface structures. Do not conduct blasting operations until persons in vicinity have had ample notice and have reached positions of safety.

C. Contractor shall save harmless the Owner, Architect, Engineer and Owner's representative from any claim growing out of use of such explosives. Removal of materials of any nature by blasting shall be done in such a manner and such time as to avoid damage affecting the integrity of design and to avoid damage to any new
or existing structure included in or adjacent to work. It shall be contractor's responsibility to determine method of operation to ensure desired results and integrity of completed work.

D. Perform rock excavation in a manner that will produce material of such size as to permit it being placed in embankments in accordance with Section 02200. Remove rock to limits as indicated. Remove loose or shattered rock, overhanging ledges and boulders which might dislodge.

E. Use lean concrete or suitable materials to replace rock overblast or over excavation in building area and in expansion area to facilitate placement of utilities and future footings.

END OF SECTION 02229

SECTION 02230

SITE CLEARING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Removing surface debris.
2. Removing designated trees, shrubs, and other plant life.
3. Removing abandoned utilities.
4. Excavating topsoil.

B. Related Sections:
1. Section 02311 - Rough Grading.
2. Section 02316 - Rock Removal.

PART 2 EXECUTION

2.1 EXAMINATION

A. Section 01300 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify existing plant life designated to remain is tagged or identified.

C. Identify waste area for placing removed materials.

2.2 PREPARATION

A. Call Local Utility Line Information not less than three working days before performing Work.
1. Request underground utilities to be located and marked within and surrounding construction areas.

2.3 PROTECTION

A. Locate, identify, and protect utilities indicated to remain, from damage.

B. Protect trees, plant growth, and features designated to remain, as final landscaping

C. Protect bench marks, survey control points, and existing structures from damage or displacement.

2.4 CLEARING

A. Clear areas required for access to site and execution of Work.

B. Remove trees and shrubs within marked areas. Remove stumps.

C. Clear undergrowth and deadwood, without disturbing subsoil.

D. Apply herbicide to remaining stumps to inhibit growth.

2.5 REMOVAL

A. Remove debris, rock, and extracted plant life from site.

B. Remove abandoned utilities. Indicated removal termination point for underground utilities on Record Documents.

C. Continuously clean-up and remove waste materials from site. Do not allow materials to accumulate on site.

D. Do not burn or bury materials on site. Leave site in clean condition.

2.6 TOPSOIL EXCAVATION

A. Excavate topsoil from areas to be further excavated, relandscaped, or regraded, without mixing with foreign materials for use in finish grading.

B. Do not excavate wet topsoil.

C. Stockpile in area designated on site to depth not exceeding 8 feet and protect from erosion.

D. Remove excess topsoil not intended for reuse, from site.

END OF SECTION

SECTION 02245

SOIL STABILIZATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Lime Stabilized Subgrade

B. Cement Stabilized Subgrade

C. Fly Ash Stabilized Subgrade

D. Geotextile Fabric Stabilized Subgrade

1.02 RELATED SECTIONS

A. Section 02200 - Earthwork

B. Section 02223 - Excavation, Backfill and Compacting for Pavement

C. Section 02227 - Aggregate Materials

D. Construction Drawings

E. Geotechnical Report (if available) for boring locations and findings of subsurface materials and conditions.

1.03 REFERENCE STANDARDS

A. American Society for Testing Materials (ASTM) latest edition.
C 150 - Portland Cement
C 618 - Fly Ash for Soil Stabilization
C 977 - Quicklime and Hydrated Lime for Soil Stabilization
D 1633 - Test method for compressive strength of molded soil cement cylinders

B. American Association of State Highway and Transportation 6fficials (AASHTO) latest edition.
M 216 - Lime for Soil Stabilization

C. National Lime Association (NLA)
Bulletin 326 - Lime Stabilization Construction Manual

1.04 ENVIRONMENTAL REQUIREMENTS

Do not install mixed materials in wind in excess of 10 mph or when temperature is below 40 °F.

1.05 QUALITY ASSURANCE

Perform work in accordance with state and local standards in conjunction with requirements specified herein.

1.06 SUBMITTALS

A. Submit a sample of each material to be used in a 10 pound air tight container to the testing laboratory.

B. Submit the name of each materials supplier and specific type and source of each material. Any change in source throughout the job requires approval of the owner or engineer.

C. Submit mix design and materials mix ratio that will achieve specified requirements for soil stabilization of state and local agencies.

PART 2 PRODUCTS

2.01 MATERIALS

A. Quicklime or Hydrated Lime

B. Portland Cement

C. Fly Ash

D. Coarse Aggregate

E. Fine Aggregate

F. Subsoil: Existing Reused

G. Geotextile Fabric for Stabilization

1. Mirafi 500X or 600X
2. Phillips 66 Supac 6WS
3. Dupont Typar 3401 and 3601
4. Trevira S1114 and S1120
5. Tensar SS-1 and SS-2
6. Exxon GTF-200 or 350

2.02 EQUIPMENT

Perform operations using suitable, well maintained equipment capable of excavating subsoil, mixing and placing materials, wetting, consolidation and compaction of material.

PART 3 EXECUTION

3.01 PREPARATION

A. Obtain Engineers approval of the mix design before proceeding with the placement.

B. Do not start stabilization without weather and soil conditions being favorable for the successful application of the proposed material.

C. Proof roll subgrade to identify areas in need of stabilization.

3.02 EXCAVATION

A. Excavate subsoil to a depth sufficient to accommodate soil stabilization.

B. Remove lumped subsoil, boulders and rock that interferes with achieving uniform subsoil conditions.

3.03 SOIL TREATMENT AND BACKFILLING

A. Lime Stabilized Subgrade: Where indicated on Drawings, treat prepared subgrade with hydrated lime in accordance with applicable state highway specification. Compact to not less than 95% of optimum density as determined by ASTM D 698 (or 92% of the optimum density, in accordance with ASTM D 1557).

B. Cement Stabilized Subgrade: where indicated on Drawings, treat prepared subgrade with portland cement in accordance with applicable state highway specification. Compact to not less than 95% of optimum density as determined by ASTM D 698 (or 92% of the optimum density, in accordance with ASTM D 1557).

C. Fly Ash Stabilized Subgrade: where indicated on Drawings, treat prepared subgrade with fly ash in accordance with applicable state highway specification. Compact to not less than 95% of optimum density as determined by ASTM D 698 (or 92% of the optimum density, in accordance with ASTM D 1557).

D. Maintain optimum moisture of mix materials to attain required stabilization and compaction.

E. Finish subgrade surface in accordance with Section 02200.

3.04 GEOTEXTILE FABRIC

A. Place fabric in those areas that are shown on the plans or in those areas that need additional stabilization prior to the placement of the base course.

B. Place fabric specified in the plans and specifications in accordance with the manufacturers recommendations.

END OF SECTION 02245

SECTION 02270

SLOPE PROTECTION AND EROSION CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary and permanent erosion control systems.

B. Slope Protection Systems.

1.02 RELATED SECTIONS

A. Section 02100 - Site Preparation

B. Section 02200 - Earthwork

C. Section 02900 - Landscaping

D. Erosion Control Plan

E. Construction Drawings

1.03 ENVIRONMENTAL REQUIREMENTS

A. The contractor shall protect adjacent properties and water resources from erosion and sediment damage throughout the life of the contract.

PART 2 PRODUCTS

2.01 MATERIALS

A. Quick growing grasses such as wheat, rye or oats (See Section 02900).

B. Hay or straw bales.

C. Fencing for siltation control as specified on the plans.

D. Curlex blankets by American Excelsior Company or approved equal.

E. Bale stakes for each bale shall be a minimum of 4 feet in length and shall be either 2 #4 rebars, 2 steel pickets or 2-2"x2" hardwood stakes driven 1'-6" to 2'-0" into ground.

F. Temporary mulches such as loose hay, straw, netting, wood cellulose or agricultural silage.

G. Fence stakes shall be metal stakes a minimum of 8 feet in length.

H. RipRap (See Section 02200)

PART 3 EXECUTION

3.01 PREPARATION

A. Review site erosion control plan.

B. Deficiencies or changes in the erosion control plan as it is applied to current conditions will be brought to the attention of the Owner and the Engineer for remedial action.

3.02 EROSION CONTROL AND SLOPE PROTECTION IMPLEMENTATION

A. Place erosion control systems in accordance with the erosion control plan.

B. The Owner has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and embankment operations and to direct the contractor to provide immediate permanent or temporary pollution control measures. The contractor will be required to incorporate all permanent erosion control features into the project at the earliest practical time to minimize the need for temporary controls. Cut slopes shall be permanently seeded and mulched as the excavation proceeds to the extent considered desirable and practical.

C. The temporary erosion control systems installed by the contractor shall be maintained as directed by the Owner to control siltation at all times during the life of the contract. The contractor must respond to any maintenance or additional work ordered by the Owner within a 48 hour period.

D. Any additional material and work required and authorized by the Owner which is beyond the extent of the erosion control plan shall be paid for by the owner.

E. Slopes that erode easily shall be temporary seeded as the work progresses with a wheat, rye or oats application (See Section 02900).

END OF SECTION 02270

SECTION 02276

RETAINAGE SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Furnishing and installing modular retaining wall units to the lines and grades designated on the construction drawings and as specified herein.

B. Preparing foundation soil, furnishing and installing leveling pad or footing, unit fill and backfill to the lines and grades designated on the construction drawings.

C. Furnishing and installing all appurtenant materials required for construction of the retaining wall (s) as shown on the construction drawings.

D. Submission of the proprietary design information, engineering calculations, materials lists and design certifications as required herein, on the construction drawings or in the Special Conditions to the contract.

1.02 RELATED SECTIONS

A. Section 02100 Site Preparation

B. Section 02200 Earthwork

C. Section 03300 Cast In Place Concrete (See Architectural/Building Specifications)

D. Construction Drawings

1.03 REFERENCE STANDARDS

American Society for Testing and Materials (ASTM)

C 90-85 Hollow Load Bearing Masonry Units
C140-75 Sampling and Testing Concrete Masonry Units
C145-85 Solid Load Bearing Concrete Masonry Units

1.04 SUBMITTALS

A. Samples of all products used in the work of this section. If units are of such size to make submission impractical, adequate examples of finish and material shall be provided.

B. Latest edition of manufacturer's specifications for proposed materials, and method of installation and list of materials proposed for use.

C. Four copies of shop drawings for all walls showing overall dimensions, reinforcing, foundations, soil reinforcement, drainage systems, backfill, appurtenances to be provided and coordination with items not provided as part of the wall system.

D. Submit required materials and drawings directly to the Owners Consulting Civil Engineer, within fifteen (15) days of the Contract Date, with a copy of the transmittal to the owner's Construction department. Prior to submittal, the design shall be certified by a professional engineer registered in the state where the project is located.

The design shall incorporate factors of safety for Sliding, Bearing, Overturning, Slope Stability and Design Uncertainties as recommended in the geotechnical investigation unless specifically waived or modified in writing by Owner's Construction Department and the Owner's Consulting Civil Engineer.

1.05 QUALITY ASSURANCE

A. Soil testing and associated testing for quality control during earthwork operations will be supplied by the Owner (see Section 02200). Any specific testing or inspection services required by the retaining wall design shall be clearly delineated in the submission.

B. Construction of a mockup of adequate size to illustrate the finish and construction techniques may be required, at a location acceptable to the Owner, for any wall system with which the Owner is not familiar or for which unique design modifications are proposed.

PART 2 PRODUCTS

2.01 MANUFACTURED UNITS

A. Retaining wall units, reinforcing and accessories shall be supplied as specified in the manufacturer's submissions. Units produced under a license from an approved proprietary system shall be manufactured in a facility meeting all requirements of the licensing system with adequate capacity to supply the product to the site in a timely manner. Materials shall be stored as required to prevent damage and staining.

B. Acceptable retainage systems which will be allowed based on shop drawings and calculations:

"Reinforced Earth" retaining wall units - as manufactured by a licensed distribute for The Reinforced Earth Company, Bedford, Texas.

Keystone Retaining Wall Units as manufactured by a licensed distribute for Keystone Retaining Wall Systems, Inc., Minneapolis, Minnesota.

C. Geogrids as listed in Section 02200 and specified in the approved shop drawings. Material shall be stored as required to protect from damage until used.

2.02 LEVELING PAD

Leveling pad material shall consist of compacted sand, gravel, crushed rock or leveling concrete as shown on the construction drawings and/or shop drawings.

2.03 FILL AND BACKFILL

Unit fill (if required) and backfill materials, shall be as specified and shown on the construction drawings and/or shop drawings.

PART 3 EXECUTION

3.01 EXCAVATION

The contractor shall excavate to the lines and grades required. overexcavation and/or recompaction shall be performed as required to produce the specified bearing conditions.

3.02 LEVELING PADS

Leveling pads and foundations, unit installation, cap installation, installation of geogrid and/or other anchor materials and installation of accessories and appurtenances shall be carried out according to the manufacturer's recommendations and the approved drawings.

3.03 FIELD QUALITY CONTROL

A. Testing for compaction of subgrade and fill materials shall be performed by an Independent Testing Laboratory selected and paid by Owner.

B. If compaction requirements, embedment of reinforcing or other conditions are not met at any time during the construction process, Contractor shall remove and reconstruct deficient areas to obtain proper conditions at no additional cost to owner.

C. Independent Testing Laboratory shall promptly prepare test reports and distribute to Owner, Owner's Consulting Civil Engineer and Contractor for all testing required by the certified and approved design documents. In the event any test performed fails to meet these requirements, Owner and Contractor shall be notified immediately by Independent Testing Laboratory.

All costs related to retesting due to failures shall be paid for by the Contractor at no additional expense to Owner. Owner reserves the right to employ an Independent Testing Laboratory and to direct any testing that is deemed necessary. Contractor shall provide free access to site for testing activities.

END OF SECTION 02276

SECTION 02311

ROUGH GRADING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Excavating topsoil.
2. Excavating subsoil.
3. Cutting, grading, filling, compacting site for site structures, building pads.

B. Related Sections:
1. Section 02055 - Soils for Earthwork: Soils for fill.
2. Section 02060 - Aggregates for Earthwork: Aggregates for fill.
3. Section 02230 - Site Clearing: Excavating topsoil.
4. Section 02315 - Excavation and Fill: Building excavation.
5. Section 02316 - Rock Removal.
6. Section 02320 - Backfill: General building area backfilling.
7. Section 02324 - Trenching: Trenching and backfilling for utilities.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
3. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
4. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
5. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
6. ASTM D2419 - Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
7. ASTM D2434 - Standard Test Method for Permeability of Granular Soils (Constant Head).

8. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
9. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

PART 2 EXECUTION

2.1 PREPARATION

A. Call Local Utility Line Information service not less than three working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Identify required lines, levels, contours, and datum.

C. Protect utilities indicated to remain from damage.

D. Protect bench marks, survey control point, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

2.2 FILLING

A. Fill areas to contours and elevations with unfrozen materials.

B. Place fill material in continuous layers and compact as required.

C. Maintain optimum moisture content of fill materials to attain required compaction density.

D. Slope grade away from building minimum 2 percent slope for minimum distance of 10 ft, unless noted otherwise.

E. Make grade changes gradual. Blend slope into level areas.

2.3 FIELD QUALITY CONTROL

A. Perform in place compaction tests in accordance with the following:
   1. As required by geotechnical engineer.

END OF SECTION

SECTION 02315

EXCAVATION AND FILL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Soil densification.
2. Excavating for building foundations.
3. Excavating for slabs-on-grade.
4. Excavating for site structures.

B. Related Sections:
1. Section 02055 - Soils for Earthwork: Stockpiling excavated materials.
2. Section 02060 - Aggregates for Earthwork: Stockpiling excavated materials.
3. Section 02311 - Rough Grading: Topsoil and subsoil removal from site surface.
4. Section 02316 - Rock Removal: Removal of rock during excavating.
5. Section 02320 - Backfill.
6. Section 02324 - Trenching: Excavating for utility trenches.

1.2 REFERENCES

A. ASTM International:
1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
2. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
3. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
4. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

B. Local utility standards when working within 24 inches of utility lines.

PART 2 EXECUTION

2.1 EXCAVATION

A. Underpin adjacent structures which may be damaged by excavation work.

B. Excavate subsoil to accommodate building foundations, slabs-on-grade.

C. Excavate to working elevation for piling work.

D. Compact disturbed load bearing soil in direct contact with foundations to original bearing capacity; perform compaction in accordance with Section 02320 and Section 02324.

E. Grade top perimeter of excavation to prevent surface water from draining into excavation.

F. Trim excavation. Remove loose matter.

G. Notify Architect/Engineer of unexpected subsurface conditions.

H. Correct areas over excavated with structural fill.

I. Remove excess and unsuitable material from site.

J. Repair or replace items indicated to remain damaged by excavation.

2.2 PROTECTION

A. Prevent displacement or loose soil from falling into excavation; maintain soil stability.

B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

C. Protect structures, utilities and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth operations.

END OF SECTION

SECTION 02316

TERMITE CONTROL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Soil treatment for termite control.

B. Related Sections:
1. Section 02055 - Soils for Earthwork: Backfill materials.
2. Section 02315 - Excavation and Fill: Subgrade preparation.
3. Section 03300 - Cast-In-Place Concrete: Slabs on grade and foundations placed over treated soil.

1.2 REFERENCES

A. Environmental Protection Agency:
1. EPA FIFRA - Federal Insecticide, Fungicide and Rodenticide Act.

B. National Pest Management Association:
1. NPMA WDO - Wood Destroying Organism Library.

1.3 SUBMITTALS

A. Product Data: Submit toxicants to be used, composition by percentage, dilution schedule, intended application rate. Include product label information.

B. Test Reports: Indicate regulatory agency approval reports.

C. Manufacturer's Application Instructions: Indicate caution requirements and in accordance with current product label of chosen pesticide.

D. Certify applications followed NPMA WDO for termite control or other regional location guidance.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record moisture content of soil before application, date and rate of application, areas of application, diary of toxicity meter readings and corresponding soil coverage.

B. Operation and Maintenance Data: Indicate re-treatment schedule.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

B. Applicator: Company specializing in performing the Work of this sectionand licensed in State of Texas.

1.6 SEQUENCING

A. Section 01100 - Summary: Work sequence.

B. Apply toxicant immediately prior to installation of vapor barrier under slabs-on-grade in accordance with product label supplemented by the NPCA's ARP for termiticiding or local requirements.

1.7 WARRANTY

A. Warranty: Include coverage for damage and repairs to building and building contents caused by termites. Repair damage. Re-treat where required.

PART 2 PRODUCTS

2.1 MATERIALS

A. Toxicant Chemical: EPA FIFRA approved; synthetically color dyed to permit visual identification of treated soil.

B. Diluent: Recommended by toxicant manufacturer.

2.2 MIXES

A. Mix toxicant to manufacturer's instructions.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01300 - Administrative Requirements:Verification of existing conditions before starting work.

B. Verify soil surfaces are unfrozen, sufficiently dry to absorb toxicant, and ready to receive treatment.

C. Verify final grading and excavation are complete.

3.2 APPLICATION

A. Apply toxicant at locations indicated in Schedule at end of section.

B. Apply extra treatment to structure penetration surfaces including pipe or ducts, and soil penetrations including grounding rods or posts.

C. Re-treat disturbed treated soil with same toxicant as original treatment.

D. When inspection or testing identifies presence of termites, re-treat soil and re-test.

3.3 PROTECTION OF FINISHED WORK

A. Section 01700 - Execution Requirements: Protecting finished Work.

B. Do not permit soil grading over treated work.

END OF SECTION

SECTION 02505

PAVING BASE COURSE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Granular Base

B. Caliche Base

C. Full Depth Asphalt sage

D. Hot-Mix Sand Asphalt Base

E. Soil Cement Stabilized Base

1.02 RELATED SECTIONS

A. Section 02100 - Site Preparation

B. Section 02200 - Earthwork

C. Section 02227 - Aggregate Materials

D. Section 02245 - Soil Stabilization

E. Section 02511 - Asphaltic Concrete Paving

F. Section 02520 - Portland Cement Concrete Paving

G. Section 02525 - Curbs and Sidewalks

H. Section 02900 - Landscaping

I. Construction Drawings

1.03 REFERENCES

A. ANSI/ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49 Kg) Rammer and 12 inch (304.8 mm) Drop.

B. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures using 10 lb (4.54 Kg) Rammer and 18 inch (457 mm) Drop.

C. ASTM D2167 - Test Method for Density and Unit Weight of Soil in-place by the Rubber Balloon Method.

D. ASTM D1556 - Test Method for Density of Soil in-place by the Sand-Cone Method.

E. ASTM D2922 - Test Methods for Density of Soil and Soil- Aggregate in-place by Nuclear Methods (Shallow Depth), Method 8 (Direct Transmission).

F. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. Submit materials certificate to on-site independent testing laboratory which is signed by material producer and Contractor, certifying that materials comply with, or exceed, the requirements herein.

PART 3 EXECUTION

3.01 EXAMINATION

Contractor shall verify that the subgrade has been inspected, tested and the gradients and elevations are correct, dry and properly prepared.

3.02 CONSTRUCTION

A. Perform base course construction in a manner that will drain surface properly at all times and at the same time prevent runoff from adjacent areas from draining onto base course construction.

B. Compact base material to not less than 98% of optimum density as determined by ASTM D 698 or 95% of optimum density, as determined by ASTM D 1557, unless otherwise indicated on the Drawings.

C. Granular Base: Construct to thickness indicated on Drawings. Apply in lifts or layers not exceeding 8", measured loose.

D. Caliche Base: Construct to thickness indicated on Drawings. Use 'Type F, Grade 3 Caliche per TXDOT Spec. Item 232.

E. Asphalt Institute Type IV Mix for Full Depth Asphalt Base: Construct to thickness indicated on Drawings in lifts or layers not exceeding 3", measured loose.

F. Asphalt Institute Type VI, VII, or VIII Mixes for Hot-mix Sand Asphalt Bases: Construct to thickness indicated on Drawings. Apply in lifts or layers not exceeding 3", measured loose.

G. Soil Cement Stabilized Base: Construct to thickness and strength as indicated on Drawings and in accordance with applicable state highway specifications. If not indicated on the Drawings, the minimum compressive strength shall be 500 p.s.i., tested at 28 days.

3.03 FIELD QUALITY CONTROL

A. An Independent Testing Laboratory, selected and paid by owner, shall be retained to perform construction testing of in-place base courses for compliance with requirements for thickness, compaction, density and tolerance. Paving base course tolerances shall be verified (by rod and level readings on not more than fifty-foot centers) to be not more than 0.05 feet above design elevation which will allow for paving thicknesses as shown in the Drawings. Contractor shall provide instruments and a suitable benchmark.

B. The following tests shall be performed on each type of material used as base course material:

1. Moisture and Density Relationship: ASTM D 698 or ASTM D 1557.

2. Mechanical Analysis: AASHTO T-88.

3. Plasticity Index: ASTM D-4318.

4. Base material thickness: Perform one test for each 20,000 square feet of in-place base material area.

5. Base material compaction: Perform one test in each lift for each 20,000 square feet of in-place base material area.

6. Test each source of base material for compliance with applicable state highway specifications.

C. Field density tests for in-place materials shall be performed according to one of the following standards as part of construction testing requirements:

1. Sand-Cone Method: ASTM D 1556.

2. Balloon Method: ASTM D 2167.

3. Nuclear Method: ASTM D 2922, Method B (Direct Transmission).

D. Independent Testing Laboratory shall prepare test reports that indicate test location, elevation data, and test results. The Owner, Engineer, and Contractor shall be provided with copies of reports within 96 hours of time test was performed. In event that any test performed fails to meet these Specifications, the Owner, Engineer and Contractor shall be notified immediately by Independent Testing Laboratory. The Owner reserves right to employ Independent Testing Laboratory and to direct any testing that is deemed by them to be necessary. Contractor shall provide free access to site for testing activities.

END OF SECTION 02505

SECTION 02511

ASPHALTIC CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Asphaltic concrete paving; surface course, binder course and base course.

1.02 RELATED SECTIONS

A. Section 02223 - Excavation, Backfill and Compacting for Pavement

B. Section 02500 - Paving and Surfacing

C. Section 02505 - Paving Base Course

D. Section 02520 - Portland Cement Concrete Paving

E. Section 02525 - Curbs

F. Section 02584 - Parking Lot and Roadway Marking

G. Construction Drawings

H. State Highway Department Standard Specifications

1.03 SUBMITTALS

A. Design Mix: Before any asphaltic concrete paving is constructed, submit actual design mix to the Owner's Construction Department for review and/or approval. Design mix submittal shall follow the format as indicated in the Asphalt Institute Manual MS-2, Marshall Stability Method; and shall include the type/name of the mix, gradation analysis, grade of asphalt cement used, Marshall Stability (lbs.), flow, effective asphalt content (percent), and direct references to the applicable highway department specifications sections for each material. The design shall be for a mixture listed in the current edition of the applicable state roadway specifications. Mix designs over three (3) years old will not be accepted by the owner.

B. Material Certificates: Submit materials certificate to on-site independent testing laboratory which is signed by material producer and Contractor, certifying that materials comply with, or exceed, the requirements herein.

1.04 JOB CONDITIONS

A. Weather Limitations:

1. Apply prime and tack coats when ambient temperature is above 40°F, and when temperature has been above 35°F for 12 hours immediately prior to application. Do not apply when base is wet, contains excess moisture, or during rain.

2. Construct asphaltic concrete paving when atmospheric temperature is above 40°F.

1.05 REFERENCES

A. MS-2-Mix design methods for asphaltic concrete and other hot mix types per The Asphalt Institute (AI)

B. MS-3-Asphalt Plant Manual per The Asphalt Institute (AI)

C. Hot Mix Asphalt Paving Handbook per US Army Corp of Engineers, UN-13 (CE MP-ET)

D. MS-19-Basic Asphalt Emulsion Manual per The Asphalt Institute (AI)

E. ASTM D946 - Penetration - Graded Asphalt Cement for use in Pavement Construction

F. AASHTO M-226/ASTM D3381 Asphalt Cement

G. AASHTO M-140/ASTM D997 or AASHTO M-208/ASTM D-2397 Tack Coat

H. AASHTO M-117/ASTM D242 Mineral Filler

I. AASHTO T-245/ASTM D1559 Marshall Mix Design

PART 2 PRODUCTS

2.01 MATERIALS

A. Provide asphalt-aggregate mixture as recommended by local or state paving authorities to suit project conditions. Use locally available materials and gradations which meet state highway specifications and exhibit satisfactory records of previous installations.

B. Asphalt Cement: Comply with AASHTO M-226/ASTM D 3381; Table 2 AC-10, AC-20, or AC-30, viscosity grade, depending on local mean annual air temperature. (See chart below):

Temperature Condition	Asphalt Grades
Cold, mean annual air temperature at 7 degrees C (45 degrees F) or lower	AC-10 85/100 pen.
Warm, mean annual air temperature between 7 degrees C (45 degrees F) and 24 degrees C (75 degrees F)	AC-20 60/70 pen.
Hot, mean annual air temperature at 24 degrees C (75 degrees F) or higher	AC-30

C. Prime Coat: A medium curing cut-back asphalt or an asphalt penetrating prime coat consisting of either MC- 30 or SS-1h.

D. Tack Coat: Emulsified asphalt; AASHTO M-140/ASTM D 997 or AASHTO M 208/ASTM D 2397, SS-1h, CSS-1, or CSS-1h, diluted with one part water to one part emulsified asphalt.

E. Mineral Filler: Rock or slag dust, hydraulic cement, or other inert material complying with AASHTO M-17/ASTM D 242, if recommended by applicable state highway standards.

F. Asphalt-Aggregate Mixture: Unless otherwise noted on the Drawings, the Design Mix shall have a minimum stability based on 50-blow Marshall complying with ASTM D 1559 of 1000 lb with a flow

between 8 and 16. The Design Mix shall be within sieve analysis and bitumen ranges below:

SIEVE ANALYSIS OF MIX

Square Sieve	Total Percent Passing	Percent Tolerance
¾"	100	7%
1/2"	80 – 100%	5%
3/8 "	65 - 93%	4%
#8	40 - 55%	4%
#50	12 - 27%	2%
#200	0 - 10%	0%

Percent bitumen by weight of total mix: 5.0 - 8.5.
Air voids: 3-6%

Percent aggregate voids filled with asphalt cement: 70 – 82%.
Allowable variance of percent bitumen by weight of total mix = 0.4

2.02 EQUIPMENT

Maintain equipment in satisfactory operating condition and correct breakdowns in a manner that will not delay or be detrimental to progress of paving operations.

PART 3 EXECUTION

3.01 PREPARATION

A. Remove loose material from compacted base material surface immediately before applying prime coat.

B. Proof roll prepared base material surface to check for areas requiring additional compaction and areas requiring removal and recompaction.

C. Do not begin paving work until deficient base material areas have been corrected and are ready to receive paving.

3.02 APPLICATIONS

A. Prime Coat:

1. Apply bituminous prime coat to all base material surfaces where asphaltic concrete paving will be constructed.

2. Apply bituminous prime coat in accordance with APWA Section 2204 and applicable state highway specifications.

3. Apply at minimum rate of 0.25 gallon per square yard over compacted base material. Apply to penetrate and seal, but not flood surface.

4. Make necessary precautions to protect adjacent areas from overspray.

5. Cure and dry as long as necessary to attain penetration of compacted base and evaporation of volatile substances.

B. Tack Coat:

1. Apply to contact surfaces of previously constructed asphaltic concrete base courses or portland cement concrete and surfaces abutting or projecting into asphaltic concrete or into asphaltic concrete pavement.

2. Apply tack coat to asphaltic concrete base course or sand asphalt base course. Apply emulsified asphalt tack coat between each lift or layer of full depth asphaltic concrete and sand asphalt bases and on surface of all such bases where asphaltic concrete paving will be constructed.

3. Apply emulsified asphalt tack coat in accordance with APWA Section 2204 and applicable state highway specifications.

4. Apply at minimum rate of 0.05 gallon per square yard of surface.

5. Allow to dry until at proper condition to receive paving.

3.03 ASPHALTIC CONCRETE PLACEMENT

A. Place asphaltic concrete mixture on completed compacted subgrade surface, spread, and strike off. Spread mixture at following minimum temperatures:

1. When ambient temperature is between 40 °F and 50 °F, mixture temp. = 285 °F

2. When ambient temperature is between 50 °F and 60° F, mixture temp. = 280° F

3. When ambient temperature is higher than 60° F, mixture temp. = 275° F

B. Whenever possible, all pavement shall be spread by a finishing machine; however, inaccessible or irregular areas may be placed by hand methods. The hot mixture shall be spread uniformly to the required depth with hot shovels and rakes. After spreading, the hot mixture shall be carefully smoothed to remove all segregated course aggregate and rake marks. Rakes and lutes used for hand spreading shall be of the type designed for use on asphalt mixtures. Loads shall not be dumped faster that they can be properly spread. Workers shall-not stand on the loose mixture while spreading.

C. Paving Machine Placement: Apply successive lifts of asphaltic concrete in transverse directions with the surface course placed in the direction of surface-water flow. Place in typical strips not less than 10'-0" wide.

D. Joints: Make joints between old and new pavements, or between successive days and work in a manner that will provide a continuous bond between adjoining work. Construction joints shall have same texture, density, and smoothness as other sections of asphaltic concrete course. Clean contact surfaces of all joints and apply tack coat.

3.04 ROLLING AND COMPACTION

A. The mixture, after being spread, shall be thoroughly compacted by rolling as soon as it will bear the weight of the rollers without undue displacement. The number, weight, and types of rollers and sequences of rolling operations shall be such that the required density and surface are consistently attained while the mixture is in a workable condition.

B. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.

C. Breakdown Rolling: Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling, and repair displaced areas by loosening and filling with hot material.

D. Second Rolling: Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been thoroughly compacted.

E. Finish Rolling: Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained maximum density.

F. Patching: Remove and replace paving areas mixed with foreign materials and defective areas. Cut out such areas and fill with fresh, hot asphaltic concrete. Compact by rolling to maximum surface density and smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.05 FIELD QUALITY CONTROL

A. Independent Testing Laboratory, selected and paid by Owner, shall be retained to perform construction testing of in-place asphaltic concrete courses for compliance with requirements for thickness, compaction and surface smoothness. Asphaltic surface and base courses shall be randomly cored at a minimum rate of one core for every 20,000 square feet of paving. However, no less than three cores in light duty areas and three cores in heavy duty areas shall be obtained. Coring holes shall be immediately filled with full-depth asphalt or with concrete. Asphaltic Concrete pavement samples shall be tested for conformance with the mix design.

B. Grade Control: Establish and maintain required lines and elevations.

C. Thickness: In-place compacted thickness shall not be less than thickness specified on the drawings. Areas of deficient paving thickness shall receive a tack coat and a minimum 1" overlay; or shall be removed and replaced to the proper thickness, at the discretion of the Owner; until specified thickness of the course is met or exceeded at <u>no</u> additional expense to the Owner.

D. Surface Smoothness: Testing shall be performed on the finished surface of each asphalt concrete course for smoothness, using 10'-0" straightedge applied parallel with, and at right angles to centerline of paved area. The results of these tests shall be made available to the owner upon request. Surfaces will not be acceptable if the following 10' straightedge tolerances for smoothness are exceeded.

Base Course Surface:	1/4"
Wearing Course Surface:	3/16"

E. Check surface areas at intervals necessary to eliminate ponding areas. Remove and replace unacceptable paving as directed by Owner.

F. Compaction: Field density test for in place materials shall be performed by examination of field cores in accordance with one of the following standards:

1. Bulk specific gravity of paraffin-coated specimens: ASTM D-1188.

2. Bulk specific gravity using saturated surface-dry specimens: ASTM D-2726.

Rate of testing shall be one core per 20,000 square feet of pavement, with a minimum of 3 cores from heavy-duty areas and 3 cores from standard-duty areas. Cores shall be cut from areas representative of the project.

Areas of insufficient compaction shall be delineated, removed, and replaced in compliance with the specifications at no expense to the Owner.

END OF SECTION 02511

SECTION 02520

PORTLAND CEMENT CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete, integral curbs, median barriers, parking areas and roads.

1.02 RELATED SECTIONS

A. Section 02100 - Site Preparation.

B. Section 02227 - Aggregate Material.

C. Section 02505 - Paving Base Course.

D. Section 02525 - Curbs and Sidewalk.

E. Section 02584 - Parking Lot and Roadway Marking.

F. Section 03300 - Cast-in-place concrete (See Architectural/Building Specifications).

G. State Highway Department Standard Specifications.

H. Construction Drawings.

1.03 REFERENCES

A. ACI 301 - Specifications for Structural Concrete for Buildings.

B. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.

C. ANSI/ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.

D. ANSI/ASTM A497 - Welded Deformed Steel Wire Fabric for Concrete Reinforcement.

E. ANSI/ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural construction.

F. ANSI/ASTM D1752 - Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

G. ASTM A615 - Deformed and Plain Billet-Steel for Concrete Reinforcement.

H. ASTM C33 - Concrete Aggregates.

I. ASTM C94 - Ready Mix Concrete.

J. ASTM C150 - Portland Cement

K. ASTM C260 - Air-Entraining Admixtures for Concrete.

L. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.

M. ASTM C494 - Chemical Admixtures for Concrete.

N. FS TT-C-800 - Curing Compound, Concrete, for New and Existing Surfaces.

1.05 PERFORMANCE REQUIREMENTS

A. Contractor shall maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize temporary striping, flagmen, barricades, warning signs, and warning lights as required.

PART 2 PRODUCTS

2.01 MATERIALS

A. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects. Use flexible spring steel forms or laminated boards to form radius bends as required. Coat forms with non-staining type coating that will not discolor or deface surface of concrete.

B. Welded Wire Mesh: Welded plain cold-drawn steel wire fabric, ASTM A 185. Furnish in flat sheets, not rolls, unless otherwise acceptable to Owner.

C. Reinforcing Bars: Deformed steel bars, ASTM A 615, Grade 40.

D. Concrete Materials: Comply with requirements of applicable Section 03300 for concrete materials, admixtures, bonding materials, curing materials, and others as required.

E. Joint Fillers: Resilient premolded bituminous impregnated fiberboard units complying with ASTM D 1751 FS HH-F-341, Type II, Class A; or AASHTO M 153, Type I.

F. Joint Sealants: Non-priming, pourable, self -leveling polyurethane. Acceptable sealants are Sonneborn "Sonolastic Paving Joint Sealant, Sonneborn "Sonomeric CT 1 Sealant", Sonneborn "Sonomeric CT 2 Sealant", Mameco "Vulken 4511, or Woodmont Products "Chem-Caulk".

2.02 MIX DESIGN AND TESTING

A. Concrete mix design and testing shall comply with requirements of applicable Section 03300.

B. Design mix to produce normal weight concrete consisting of Portland cement, aggregate, water-reducing admixture, air-entraining admixture, and water to produce the following properties:

1. Compressive Strength: 3,500 psi, minimum at 28 days, unless otherwise indicated on the Drawings.

2. Slump Range: 3"-5" at time of placement

3. Air Entrainmnent: 5% to 8%

PART 3 EXECUTION

3.01 PREPARATION

A. Proof-roll prepared base material surface to check for unstable areas. The paving work shall begin after the unsuitable areas have been corrected and are ready to receive paving. Compaction testing for the base material shall be completed prior to the placement of the paving.

B. Surface Preparation: Remove loose material from compacted base material surface to produce a firm, smooth surface immediately before placing concrete.

3.02 INSTALLATION

A. Form Construction

1. Set forms to required grades and lines, rigidly braced and secured.

2. Install sufficient quantity of forms to allow continuance of work and so that forms remain in place a minimum of 24 hours after concrete placement.

3. Check completed formwork for grade and alignment to following tolerances:

   Top of forms not more than 1/8" in 10'-0".
   Vertical face on longitudinal axis, not more than ¼" in 10'-0".

4. Clean forms after each use, and coat with form release agent as often as required to ensure separation from concrete without damage.

B. Reinforcement: Locate, place and support reinforcement per applicable Section 03300.

C. Concrete Placement

1. Comply with applicable requirements of Section 03300.

2. Do not place concrete until base material and forms have been checked for line and grade. Moisten base material if required to provide uniform dampened condition at time concrete is placed. Concrete shall not be placed around manholes or other structures until they are at the required finish elevation and alignment.

3. Place concrete using methods which prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices.

4. Deposit and spread concrete in continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2 hour, place construction joint.

D. Joint Construction: Construct expansion, weakened-plane Control (contraction), and construction joints straight with face perpendicular to concrete surface. Construct transverse joints perpendicular to centerline, unless otherwise detailed.

1. Weakened-Plane Control (Contraction) Joints: Provide joints at a spacing of 15'-0" o.c. maximum each way. Construct control joints for depth equal to at least 1/4 concrete thickness, as follows:

a. Form tooled joints in fresh concrete by grooving top portion with recommended tool and finishing edges with jointer.

b. Form sawed joints using powered saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut joints into hardened concrete as soon as surface will not be torn, abraded, or otherwise damaged by cutting action.

2. Construction Joints: Place concrete joints at end of placements and at locations where placement operations are stopped for period of more than 1/2 hour, except where such placements terminate at expansion joints. Construct joints using standard metal keyway-section forms.

3. Expansion Joints: Locate expansion joints at 180'-0" o.c. maximum each way. Provide premolded joint filler for expansion joints abutting concrete curbs, catch basins, manholes, inlets, structures, walks, and other fixed objects.

E. Joint Fillers: Extend joint fillers full-width and depth of joint, and not less than 1/2" or more than ill below finished surface where joint sealer is indicated. Furnish joint fillers in one-piece lengths for full width being placed, wherever possible. Where more than one length is required, lace or clip joint filler sections together.

F. Joint Sealants: All joints shall be sealed with approved exterior pavement joint sealants and shall be installed per manufacturer's recommendations.

3.03 CONCRETE FINISHING

A. After striking off and consolidating concrete, smooth surface by screeding and floating. Adjust floating to compact surface and produce uniform texture. After floating, test surface for trueness with 10'-Oll straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide continuous smooth finish.

B. Work edges of slabs, gutters, back top edge of integral curb, and formed joints with an edging tool, and round to ½" radius. Eliminate tool marks on concrete surface. After completion of floating and troweling when excess moisture or surface sheen has disappeared, complete surface finishing, as follows:

1. Inclined Slab Surfaces: Provide coarse, nonslip finish by scoring surface with stiff-bristled broom perpendicular to line of traffic.

2. Paving: Provide coarse, nonslip finish by scoring surface with stiff-bristled broom perpendicular to line of traffic.

C. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point up any minor honeycombed areas. Remove and replace areas or sections with major defects, as directed.

D. Protect and cure finished concrete paving using acceptable moist-curing methods, more particularly described in the "water-curing" section of ACI 308-81.

3.04 CLEANING AND ADJUSTING

A. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just prior to final inspection.

B. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials.

3.05 FIELD QUALITY CONTROL

An independent testing laboratory shall randomly core the pavement at a minimum rate of one core per 20,000 square feet of pavement, with a minimum of 3 cores from heavy-duty areas and 3 cores from standard duty areas. Core shall be tested for thickness and quality of aggregate distribution. Core holes shall be patched immediately with portland cement concrete conforming to section 2.02 and shall be finished to provide a level surface conforming to section 3.03 A & 3.03 B.

END OF SECTION 02520

SECTION 02525

CURB AND SIDEWALKS

PART I GENERAL

1.01 SECTION INCLUDES

A. Combination concrete curb and gutter

B. Concrete Curb

C. Concrete Flume

D. Concrete Sidewalk

1.02 RELATED SECTIONS

A. Section 02100 - Site Preparation.

B. Section 02227 - Aggregate Material.

C. Section 02505 - Paving Base Course.

D. Section 02584 - Parking Lot and Roadway Marking.

E. Section 03300 - Cast-in-place Concrete (See Architectural/Building Specifications).

F. State Highway Department Standard Specifications.

G. Construction Drawings.

1.03 REFERENCES

A. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.

B. ANSI/ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural construction.

C. ANSI/ASTM D1752 - Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

D. ASTM C33 - Concrete Aggregates.

E. ASTM C94 - Ready Mix Concrete.

F. ASTM C150 - Portland Cement

G. ASTM C260 - Air-Entraining Admixtures for Concrete.

H. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.

I. ASTM C494 - Chemical Admixtures for Concrete.

J. FS TT-C-800 - Curing Compound, Concrete, for New and Existing Surfaces.

1.05 PERFORMANCE REQUIREMENTS

A. Contractor shall maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize temporary striping, flagmen, barricades, warning signs, and warning lights as required.

PART 2 PRODUCTS

2.01 MATERIALS

A. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects. Use flexible spring steel forms or laminated boards to form radius bends as required. The forms shall be of a depth equal to the depth of curbing or sidewalk, and so designed as to permit secure fastening together at the tops. Coat forms with non-staining type coating that will not discolor or deface surface of concrete.

B. Concrete Materials: Comply with requirements of applicable Section 03300 for concrete materials, admixtures, bonding materials, curing materials, and others as required.

C. Joint Fillers: Resilient premolded bituminous impregnated fiberboard units complying with ASTM D 1751 FS HH-F-341, Type II, Class A; or AASHTO M 153, Type I.

D. Joint Sealers: Non-priming, pourable, self -leveling polyurethane. Acceptable sealants are Sonneborn "Sonolastic Paving Joint Sealant" Sonneborn "Sonomeric CT 1 Sealant", Sonneborn "Sonomeric CT 2 Sealant", Mameco "Vulken 45", or Woodmont Products "Chem-Caulk".

2.02 MIX DESIGN AND TESTING

A. Concrete mix design and testing shall comply with requirements of applicable Section 03300.

B. Design mix to produce normal weight concrete consisting of Portland cement, aggregate, water-reducing admixture, air-entraining admixture, and water to produce the following properties:

1. Compressive Strength: 3,500 psi, minimum at 28 days, unless otherwise indicated on the Drawings.

2. Slump Range: 2"-5" at time of placement.

3. Air Entrainment: 5% to 8%.

PART 3 EXECUTION

3.01 PREPARATION

A. Proof-roll prepared base material surface to check for unstable areas. The paving work shall begin after any unsuitable areas have been corrected and are ready to receive paving. Compaction testing for the base material shall be completed prior to the placement of the paving.

B. Surface Preparation: Remove loose material from compacted base material surface to produce a firm, smooth surface immediately before placing concrete.

3.02 INSTALLATION

A. Form Construction

1. Set forms to required grades and lines, rigidly braced and secured.

2. Install sufficient quantity of forms to allow continuance of work and so that forms remain in place a minimum of 24 hours after concrete placement.

3. Check completed formwork for grade and alignment to following tolerances:

Top of forms not more than 1/8" in 10'-0".
Vertical face on longitudinal axis, not more than ¼" in 10' -0".

4. Clean forms after each use, and coat with form release agent as often as required to ensure separation from concrete without damage.

B. Concrete Placement

1. Comply with applicable requirements of Section 03300.

2. Do not place concrete until base material and forms have been checked for line and grade. Moisten base material if required to provide uniform dampened condition at time concrete is placed. Concrete shall not be placed around manholes or other structures until they are at the required finish elevation and alignment.

3. Place concrete using methods which prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Consolidate with care to prevent dislocation of dowels, and joint devices.

4. Deposit and spread concrete in continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2 hours, place construction joint. Automatic machine may be used for curb and gutter placement at Contractor's option. machine placement must produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete as specified.

C. Joint Construction

1. Contraction Joints: Concrete curb, concrete gutter or concrete curb and gutter, where specified on the plans, shall be constructed in uniform sections of the length specified on the plans. The joints between sections shall be formed either by steel templates 1/8 inch in thickness, of a length equal to the width of the gutter and/or curb, and with a depth which will penetrate at least 2 inches below the

surface of the curb and/or gutter; or with 3/4-inch thick preformed expansion joint filler cut to the exact cross section of the curb and/or gutter; or by sawing to a depth of at least 2 inches while the concrete is between 4 to 24 hours old. If steel templates are used, they shall be left in place until the concrete has set sufficiently to hold its shape, but shall be removed while the forms are still in place.

2. Longitudinal Construction Joints: Concrete curb, concrete gutter or combination concrete curb and gutter, where specified on the plans, shall be tied to concrete pavement with 1/2 inch round deformed reinforcement bars of the length and spacing shown on the plans.

3. Transverse Expansion Joints: Transverse expansion joint in curb, curb and gutter, gutter or sidewalk shall have the filler cut to the exact cross section of the curb, curb and gutter, gutter or sidewalk. The joints shall be similar to the type of expansion joint used in the adjacent pavement.

D. Joint Fillers: Extend joint fillers full-width and depth of joint, and not less than ½" or more than 1" below finished surface where joint sealer is indicated. Furnish joint fillers in one-piece lengths for full width being placed, wherever possible. Where more than one length is required, lace or clip joint filler sections together.

E. Joint Sealants: All joints shall be sealed with approved exterior pavement joint sealants and shall be installed per manufacturer's recommendations.

3.03 CONCRETE FINISHING

A. After striking off and consolidating concrete, smooth surface by screeding and floating. Adjust floating to compact surface and produce uniform texture. After floating, test surface for trueness with 10'-0" straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide continuous smooth finish.

B. Work edges of sidewalks, gutters, back top edge of integral curb, and formed joints with an edging tool, and round to ½" radius. Eliminate tool marks on concrete surface. After completion of floating and troweling when excess moisture or surface sheen has disappeared, complete surface finishing, as follows:

1. Inclined Slab Surfaces: Provide coarse, nonslip finish by scoring surface with stiff-bristled broom perpendicular to line of traffic.

2. Curbs, gutters, and walks: Broom finish by drawing fine-hair broom across surface perpendicular to line of traffic. Repeat operation as necessary to produce a fine line texture.

C. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point up any minor honeycombed areas. Remove and replace areas or sections with major defects, as directed.

D. Protect and cure finished concrete paving using acceptable moist-curing methods, more particularly described in the "water-curing" section of ACI 308-81.

3.04 BACKFILL

After the concrete has set sufficiently, the spaces in front and back of the curb and gutter or sidewalk shall be refilled to the required elevation with suitable material which shall be compacted until firm and solid and neatly graded.

3.05 CLEANING AND ADJUSTING

A. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just prior to final inspection.

B. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials.

END OF SECTION 02525

SECTION 02584

PAVEMENT MARKINGS

PART 1 GENER.AL

1.01 SECTION INCLUDES

A. Painted pavement marking.

B. Painted curbs, guard posts and light pole bases.

1.02 RELATED SECTIONS

A. Section 02200 - Earthwork

B. Section 02505 - Paving Base Course

C. Section 02511 - Asphaltic Concrete Paving

D. Section 02520 - Portland Cement Concrete Paving

E. Construction Drawings

1.03 PROJECT CONDITIONS

A. Maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize flagmen, barricades, warning signs and warning lights as required.

PART 2 PRODUCTS

2.01 MATERIALS

A. The paint shall be a non-bleeding, quick-drying, alkyd petroleum base paint suitable for traffic-bearing surface and shall meet FS 7TP-85E and mixed in accordance with manufacture's instructions before application.

PART 3 EXECUTION

3.01 PREPARATION

A. Sweep and clean surface to eliminate loose material and dust.

B. Where existing pavement markings are indicated on the drawings to be removed or would interfere with the adhesion of new paint, a motorized abrasive device shall be used to remove the markings. The equipment employed shall not damage the existing paving or create a surface hazardous to vehicle or pedestrian traffic. In all areas within public rights-of-way, the method of marking removal shall be approved by governing authority.

3.02 APPLICATION

A. Apply two (2) coats of paint at manufacturer recommended rate without the addition of thinner, with a maximum of 100 square feet per gallon. Apply with mechanical equipment to produce uniform straight edges. At sidewalk curbs and crosswalks, use a straightedge to ensure a uniform, clean, and straight stripe.

B. The following items shall be painted with the colors noted below:

1. Pedestrian Crosswalks: Yellow
2. Exterior Sidewalk Curbs, Light Pole Bases and Guardposts: Yellow
3. Fire Lanes: Red or per local code
4. Lane Striping where separating traffic in opposite directions: Yellow
5. Lane Striping where separating traffic in the same direction: White
6. Handicap Symbols: per local code
7. Parking Stall Striping: plans Yellow, unless otherwise noted

END OF SECTION 02584

SECTION 02605

SEWER STRUCTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Monolithic concrete manhole barrel with the option of monolithic concrete or masonry transition to lid frame, covers, anchorage and accessories.

B. Modular precast concrete manhole barrel with tongue-and-groove joints and with the option of precast concrete or masonry transition to lid frame, covers, anchorage and accessories.

C. Masonry manhole barrel with masonry transition to lid frame, covers, anchorage and accessories.

D. Precast Polyethylene manhole assemblies.

1.02 RELATED SECTIONS

A. Section 02222 - Excavation, Backfill, and Compacting for Utilities

B. Section 02720 - Storm Sewer Systems

C. Section 02730 - Sanitary Sewer Systems

D. Section 03300 - Cast-In-Place Concrete (See Architectural/Building Specifications)

E. Construction Drawings

1.03 REFERENCES

A. ANSI/ASTM C55 - Concrete Building Brick.

B. ASTM A48 - Gray Iron Castings.

C. ASTM C478 - Precast Reinforced Concrete Manhole Sections.

D. ASTM C923 - Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes.

E. AS7M D1248 - Precast Polyethylene Manholes.

F. International Masonry Industry All-Weather Council (IMIAC): Recommended Practices and Guide Specification for Cold Weather Masonry Construction.

1.04 SUBMITTALS

A. Shop Drawings: Indicate reference to drawings of manhole locations, elevations, piping with sizes, locations and elevations of penetrations.

B. Product Data: Provide data for manhole covers, manhole steps, component construction, features, configuration, and dimensions.

PART 2 PRODUCTS

2.01 MATERIALS

A. Manhole Barrel: Reinforced precast concrete, in accordance with ASTM C478 with gaskets in accordance with ASTM C923.

1. Construct manholes of precast concrete sections as required by Drawings to size, shape, and depth indicated, but never less than 4'-0" inside diameter.

B. Manhole Barrel: Non-reinforced cast-in-place concrete as specified in Section 03300.

1. Cast-in place Manholes shall be constructed of 3500 psi concrete.

2. Forms shall be made of steel sheets accurately shaped and fabricated of sufficient strength to form dense watertight walls to true dimensions.

3. Concrete shall be deposited in evenly distributed layers of about 18 inches, with each layer vibrated to bond it to the preceding layer.

C. Manhole Barrel: Precast Polyethylene in accordance with ASTM D 1248. Manholes shall be manufactured with factory-molded steps. The nominal cylinder internal diameter shall be 48" and shall be designed to accept concrete filled polyethylene manhole lids and standard cast iron frames with lid or grate. Manholes shall have compressive strength which meets ASTM D 2412 standards. Acceptable Manufacturers: Advanced Drainage Systems (ADS) or Owner-Approved equivalent manufacturer.

D. Concrete Brick Units: ANSI/ASTM C55, Grade N Type I- Moisture Controlled, normal weight, of same Grade, Type and weight as block units, nominal modular size of 3 5/8 x 7 5/8 x 2 1/4 inches.

E. Mortar and Grout: Mortar for finishing and sealing shall be Class "C". Honeycombing less than two (2) inches deep shall be repaired using Class "D" mortar.

F. Brick Transition Reinforcement: Formed steel 8 gage wire with galvanized finish.

2.02 COMPONENTS

A. Lid and Frame: ASTM A48, Class 30B Heavy Duty Cast iron construction, machined flat bearing surface, removable lid, closed or open as specified on plans; sealing gasket; manufactured by Neenah Foundry Company or approved equal.

B. Manhole Steps: Neenah Foundry Company catalog No. R- 1982-F for precast or catalog No. R-1980-0 for brick/cast-in-place manholes or M.A. Industries PS-1 or approved equal.

C. Base Pad: Cast-in-place concrete as specified in Section 03300.

2.03 CONFIGURATION

A. Barrel Construction: Concentric with eccentric cone top section.

B. Shape: Cylindrical.

C. Clear Inside Dimensions: 48 inch diameter or as indicated on plans.

D. Design Depth: As indicated on plans.

E. Clear Lid Opening: 22 inches minimum.

F. Pipe Entry: Provide openings as indicated on plans.

G. Main and Lateral Pipes: Neatly cut off main and lateral pipes flush with inside of manhole or inlet where they enter structure walls, and point up irregularities and rough edges with non-shrinking grout.

H. Inverts: Shape inverts for smooth flow across structure floor as shown on Drawings. Use concrete and mortar to obtain proper grade and contour and finish surface with fine textured wood float.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify items provided by other sections of Work are properly sized and located.

B. Verify that built-in items are in proper location, and ready for roughing into work.

C. Verify excavation for manholes is correct.

3.02 PREPARATION

Coordinate placement of inlet and outlet pipe or duct sleeves as indicated on plans.

3.03 PLACING PRE-CAST MANHOLE BARREL SECTIONS

A. Place base pad to proper elevation and location and trowel top surface level for placement of manhole barrel.

B. Place manhole barrel plumb and level to correct elevations and anchor to base pad.

1. After completion of slab foundation the first joint of manhole barrel shall be lowered into position, grooved end first, and set level and plumb on concrete base. Align and adjust to proper grade prior to placing and forming invert which shall be poured immediately after setting of first section of manhole barrel.

2. Prior to setting subsequent manhole barrel sections, apply primer to tongue and groove ends and allow to set in accordance with manufacturer recommendations. Place "Ram-nek", or equivalent, plastic rope on tongue end. Lower next section into position, and remove excess material from interior of structure. Add additional material on exterior of joint, if necessary, for completely watertight joint.

3.04 MASONRY MANHOLE BARREL CONSTRUCTION

A. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

B. Lay masonry units in running bond. Course 3 brick units and 3 mortar joints to equal 8 inches.

C. Form flush mortar joints.

D. Lay masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

E. Install joint reinforcement 16 inches o.c.

F. Place joint reinforcement in first and second horizontal joints above base pad and below lid frame opening.

G. As work progresses, build-in fabricated metal items.

H. Cut and fit masonry for pipes in accordance with 2.03-6 of this Section.

I. Set cover frames and covers level without tipping, to correct elevations.

END OF SECTION 02605

SECTION 02660

WATER DISTRIBUTION SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

Providing labor, materials, services, equipment, and other necessary items required for the construction of water systems. This shall include, but not be limited to the following: pipe and fittings for site water line including domestic water line and fire sprinkler system water line, valves and fire hydrants, setting line locations, elevations, and grades for water distribution systems work and control system for duration of work including careful maintenance of benchmarks, property corners, monuments, or other reference points.

1.02 RELATED SECTIONS

A. Section 02222 - Excavating, Backfill and Compacting for Utilities.

B. Section 02227 - Aggregate Materials.

C. Section 02605 - Sewer Structures.

D. Section 15300 - Fire Protection. (See Architectural/Building Specifications)

E. Local Governing Authority and Code Requirements.

F. All Necessary Construction Permits.

G. Construction Drawings

1.03 REFERENCES

A. AASHTO T180 - Moisture-Density Relations of Soils Using a 10-lb (4.54 kg) Rammer and an 18-in. (457 mm) Drop.

B. ANSI/ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.

C. ANSI/ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

D. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb (4.54 Kg) Rammer and 18 inch (457 mm) Drop.

E. ANSI/ASTM D2466 - Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40.

F. ANSI/AWS A5.8 - Brazing Filler Metal.

G. ANSI/AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.

H. ANSI/AWWA C105 - Polyethylene Encasement for Ductile Iron Piping for Water and other liquids.

I. ANSI/AWWA C111 - Rubber-Gasket Joints for Ductile Iron and Grey-Iron Pressure Pipe and Fittings.

J. ANSI/AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.

K. ANSI/AWWA C500 - Gate Valves, 3 inch through 48 inch NPS, for Water and Sewage Systems.

L. ANSI/AWWA C502 - Dry Barrel Fire Hydrants.

M. ANSI/AWWA C504 - Rubber Seated Butterfly Valves.

N. ANSI/AWWA C508 - Swing-Check Valves for Waterworks Service, 2 inch through 24 inch NPS.

O. ANSI/AWWA C509 - Resilient Seated Gate Valves 3 inch through 12 inch NPS, for Water and Sewage Systems.

P. ANSI/AWWA C600 - Installation of Ductile-Iron Water Mains and Appurtenances.

Q. ANSI/AWWA C606 - Grooved and Shouldered Type Joints.

R. ANSI/AWWA C651 - Disinfecting Water Mains

S. ANSI/AWWA C900 - Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 inch through 12 inch, for Water.

T. ASTM B88 - Seamless Copper water Tube.

U. ASTM D1785 - Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120.

V. ASTM D2241 - Polyvinyl Chloride (PVC) Plastic Pipe (SDR-PR).

W. ASTM D2855 - Making Solvent-Cemented Joints with Polyvinyl Chloride (PVC) Pipe and Fittings.

X. ASTM D2922 - Test Methods for Density of Soil and Soil- Aggregate in Place by Nuclear Methods (Shallow Depth).

Y. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

Z. ASTM D3139 - Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals.

AA. ASTM D3035 - Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter.

BB. AWWA C901 - Polyethylene (PE) Pressure Pipe, Tubing, and Fittings, 1/2 inch through 3 inch, for water.

CC. AWWA C600-82 - Hydrostatic Testing

DD. UL 246 - Hydrants for Fire Protection Service.

1.04 SUBMITTALS

A. Product Data: Provide Engineer with data on pipe materials, pipe fittings, hydrants, valves and accessories.

B. Manufacturer's Certificate: Certify that products meet or exceed state or local requirements.

1.05 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of piping mains, valves, connections, and top of pipe elevations.

B. Identify and describe unexpected variations to subsoil conditions and location of uncharted utilities.

1.06 QUALITY ASSURANCE

A. Perform work in accordance with utility company and/or municipality requirements.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

PART 2 PRODUCTS

2.01 PIPE

A. Pipe sizes less than 3 inch that are installed below grade and outside building shall comply with one or combination of the following:

1. Seamless Copper Tubing: Type "K" soft copper to comply with ASTM B 88-62 and installed with wrought copper (95-5 Tin Antimony solder joint) fittings in accordance with ASTM B16.22.

2. Polyvinyl Chloride (PVC) Water Pipe: Pipe shall conform to ASTM D-2241 with an SDR 21 rating and shall be continually marked with manufacturer's name, pipe size, cell classification, SDR rating, and ASTM D 1784 classification. Pipe joints shall be integrally molded bell ends in accordance with ASTM D 3139 with factory supplied elastomeric gaskets and lubricant.

B. Pipe sizes 3 inch and larger that are installed below grade and outside building shall comply with one of the following:

1. Gray Cast Iron Water Pipe: In accordance with ANSI A21.6, thickness class 22, and pressure class 150. Fittings shall be either mechanical joint or push-on joint and shall comply with ANSI A21.10 or ANSI A21.11.

2. Ductile Iron Water Pipe: In accordance with ANSI A21.51, Fittings shall be either mechanical joint or push-on joint complying with ANSI A21.10 or ANSI 21.11 (AWWA C-151) (CLASS 50).

3. Polyvinyl Chloride (PVC) Water Pipe: Pipe shall meet the requirements of AWWA C-900 and comply with ASTM D 2241, rated SDR 21 (Class 150). Pipe shall be continually marked as for smaller pipes. Pipe joints shall be integrally molded bell ends in accordance with ASTM D 3034, Table 2, with factory supplied elastomeric gaskets and lubricant.

2.04 GATE VALVES - 2 Inches and Larger

A. Manufacturers:
Mueller Resilient Seat Gate Valves or approved equal.

B. ANSI/AWWA C509, Iron body, bronze mounted double disc, parallel seat type, non-rising stem with square nut, single wedge, resilient seat, flanged or mechanical joint ends, control rod, post indicator where indicated on plans, extension box and valve key.

2.05 BALL VALVES - 2 Inches and Smaller

A. Manufacturers:
Mueller Oriseal or approved equal.

B. Brass body, teflon coated brass ball, rubber seats and stem seals, Tee stem pre-drilled for control rod, AWWA compression inlet end, compression outlet with electrical ground connector, with control rod, extension box and valve key.

2.06 BUTTERFLY VALVES - From 2 inches to 24 inches

ANSI/AWWA C504, iron body, bronze disc, resilient replaceable seat, water or lug ends, infinite position lever handle.

2.07 Check valves, post indicator valves and backflow preventors - Refer to Section 15300 (Fire Protection) in the Architectural/Building Specifications.

2.08 HYDRANT

A. Hydrant: Type as required by utility company and as shown on plans.

B. Hydrant Extensions: Fabricate in multiples of 6 inches with rod and coupling to increase barrel length.

C. Hose and Steamer Connection: Match sizes with utility company, two hose nozzles, one pumper nozzle.

D. Finish: Primer and two coats of enamel or special coating to color as required by utility company.

2.09 ACCESSORIES

A. Concrete for Thrust Blocks: Place thrust blocking consisting of 2,500 psi concrete to provide sufficient bearing area to transmit unbalanced thrust from bends, tees, caps, or plugs to undisturbed soil without loading undisturbed soil in excess of 2,500 lbs/sq ft when water main pressure is 100 psi.

MINIMUM THRUST BLOCKING BEARING AREAS

Pipe Diameter	Tees Sq. Ft.	900 Bend Sq. Ft.	45° Bend Sq. Ft.	22 1/2° Bend Sq. Ft.	11 1/4° Bend Sq. Ft.
3"	1.0	1.0	1.0	1.0	1.0
4"	1.0	1.0	1.0	1.0	1.0
6"	1.5	2.0	1.0	1.0	1.0
8"	2.5	3.5	1.8	1.0	1.0
10"	4.0	5.5	2.8	1.5	1.0
12"	6.0	8.0	4.0	2.0	1.5
14"	8.0	11.0	5.5	3.0	2.0
16"	10.0	14.2	7.0	4.0	3.0
18"	21.0	21.0	12.0	6.0	4.0

B. Locked Mechanical Joint fittings shall be installed where vertical changes in direction are required and, if approved by the Owner and governing authority, can be installed in lieu of the above thrust blocking requirements.

PART 3 EXECVTION

3.01 EXAMINATION

A. Verify existing conditions.

B. Verify that building service connection and municipal utility water main size, location and depth are as indicated.

3.02 PREPARATION

A. Ream pipe and tube ends and remove burro.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare pipe for connections to equipment with flanges or unions.

3.03 BEDDING

A. Excavate pipe trench and place bedding material in accordance with Section 02222 for work of this Section.

3.04 INSTALLATION - PIPE AND FITTINGS

A. Maintain separation of water main from sanitary and storm sewer piping in accordance with state or local code.

B. Install pipe and fittings in accordance with ANSI/AWWA C600.

C. Install pipe to allow for expansion and contraction without stressing pipe or joints or as specified by pipe manufacturer.

D. Install access fittings in accordance with local codes to permit disinfection of water system performed under this Section.

E. Connections with Existing Pipelines: Where connections are made between new work and existing piping, make connection using suitable fittings for conditions encountered. Make each connection with existing pipe at time and under conditions which least interfere with operation of existing pipeline and in compliance with the local utility company.

F. Form and place concrete for thrust blocks or other specified methods of retainage at each change of direction or end of pipe main.

G. Establish elevations of buried piping in accordance with Section 02222 for work in this Section.

H. Backfill trench in accordance with Section 02222.

3.05 INSTALLATION - VALVES AND HYDRANTS

A. Install gate valves as indicated on Drawings and supported on concrete pads with valve stem vertical and plumb. Install valve boxes in a manner that will not transmit loads, stress, or shock to valve body. Center valve box over operating nut of valve vertical and plumb. Securely fit valve box together leaving cover flush with finished surface.

B. Install fire hydrant assemblies as indicated on Drawings in vertical and plum position with steaLmer/pumper nozzle pointed perpendicular to traffic where hydrant is adjacent to a street, roadway or parking lot drive or toward the protected building unless otherwise directed by local authorities. Support hydrant assembly on concrete pad and firmly braced on side opposite inlet pipe against undisturbed soil and concrete blocking.

Place minimum of 6 cu. ft. of crushed stone or gravel around hydrant base and barrel after thrust blocking has cured at least 24 hours. Exercise care when backfilling and compacting so proper vertical position will not be altered.

3.06 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

Disinfect distribution system with chlorine before acceptance for domestic operation. Amount of chlorine shall be such as to provide dosage of not less than 50 parts/million. Thoroughly flush lines before introduction of chlorinating materials and after contact period of not less than 24 hours, system shall be flushed with clean water until residual chlorine content is not greater than 1.0 part/million. Open and close valves in lines being disinfected several times during contact period. After disinfection, take water sample and bacteriologically test in accordance with AWWA specifications. Do not place distribution system in service until approval is obtained from applicable governing authorities.

3.07 SERVICE CONNECTIONS

Provide water service connection in compliance with utility company requirements including reduced pressure backflow preventer if required and water meter with by-pass valves and sand strainer.

3.08 FIELD QUALITY CONTROL

A. Compaction testing of trench backfill shall be performed in accordance with Section 02222.

B. Water distribution system pipe installed below grade and outside building shall be tested in accordance with following procedures:

1. The Contractor shall perform the testing of pipe materials, joints, and/or other materials incorporated into the construction of water mains and force mains to determine leakage and watertightness. All pressure pipeline shall be tested in accordance with Section 4 of AWWA C600-82. In the event any state or local code requires a more stringent test, the more stringent shall apply.

2. Pressure Test:

   After the pipe has been laid, all newly laid pipe or any valved section thereof shall be subjected to a hydrostatic pressure of at least 1.5 times the working pressure at the point of testing and not less than 1.25 times the working pressure at the highest point along the test section.

3. Leakage Test:

   The leakage test shall be conducted concurrently with the pressure test. Leakage is defined as the quantity of water that must be supplied into the newly laid pipeline, or any valved section thereof, to maintain pressure within 5 psi of the specified test pressure after the air in the pipeline has been expelled and the pipeline has been filled with water. Leakage shall not be measured by a drop in pressure in a test section over a period of time.

No pipeline installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{SD\,P}{133200}$$

L = allowable leakage, (gallons per hour)

S = length of pipe tested, (feet)

D = nominal diameter of pipe, (inches)

P = average test pressure during test, (psig)

4. Visible Leakage:

   All visible leaks shall be repaired regardless of the amount of leakage.

5. Acceptance of Installation:

   If any test of pipe laid in place discloses leakage greater than that specified, the Contractor shall, at his own expense, locate the leak and make repairs as necessary until the leakage is within the specified allowance.

   Contractor shall supply all water for testing at no expense to the Owner.

6. Contractor shall furnish one copy of results of meter test and hydrostatic pressure test to the Owner and utility company upon completion of water distribution backfilling operations.

END SECTION 02660

SECTION 02687

SITE GAS LINES

PART I GENERAL

1.01 SECTION INCLUDES

A. Pipe and fittings for site utility natural or propane gas distribution.

B. Propane storage tanks.

1.02 RELATED SECTIONS

A. Section 02200 - Earthwork

B. Section 02222 - Excavating, Backfill, and Compacting for Utilities

C. Construction Drawings

1.03 REFERENCES

A. AASHTO T180 - Moisture-Density Relations of Soils Using a 10-lb (4.54 kg) Rammer and an 18 in. (457 mm) Drop.

B. ANSI/ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.

C. ANSI/ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

D. ANSI/ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes.

E. ANSI/ASME Sec. 8D - Pressure Vessels.

F. ANSI/ASME Sec. 9 - Welding and Brazing Qualifications.

G. ANSI/ASTM B32 - Solder Metal

H. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb (4.54 Kg) Rammer and 18 inch (457 mm) Drop.

I. ANSI/AWS A5.8 - Brazing Filler Metal.

J. ANSI/AWWA C105 - Polyethylene Encasement for Ductile Iron Piping for Water and Other liquids.

K. ANSI B16.3 - Malleable Iron Threaded Fittings.

L. ANSI B16.11 - Forged Steel Fittings, Socket Welding and Threaded.

M. ANSI B31.2 - Fuel Gas Piping.

N. ANSI B31.8 - Gas Transmission and Distribution Piping Systems.

O. ANSI Z223.1 (NFPA 54) - National Fuel Gas Code.

P. ASME Boiler and Pressure Code.

Q. ASTM A120 - Pipe, Steel, Black and Hot-Dipped, Zinc Coated (Galvanized) Welded and Seamless, for Ordinary Uses.

R. ASTM A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.

S. ASTM B75 - Seamless Copper Tube.

T. ASTM B88 - Seamless Copper Water Tube.

U. ASTM D2513 - Thermoplastic Gas Pressure Pipe, Tubing and Fittings.

V. ASTM D2517 - Reinforced Epoxy Resin Gas Pressure Pipe and Fittings.

W. ASTM D2683 - Socket Type Polyethylene Fittings For Outside Diameter Controlled Polyethylene Pipe and Tubing.

X. ASTM D2922 - Test Methods for Density of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth).

Y. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

Z. ASTM F678 - Polyethylene Gas Pressure Pipe, Tubing and Fittings.

1.04 SUBMITTALS

A. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories.

B. Manufacturer's Certificate: Certify that products meet or exceed specified local requirements.

1.05 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of pipe mains, valves, connections, and top of pipe elevations.

B. Identify and describe unexpected variations to subsoil conditions and location of uncharted utilities.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with utility company and/or municipality.

B. Gas Cock: Manufacturer's name and pressure rating marked on valve body.

C. Welding Materials and Procedures: Conform to ASME Boiler and Pressure Vessel Code and applicable state regulations.

D. Welders Certification: In accordance with ANSI/ASME Sec 9.

E. Conform to ANSI Z223.1 (NFPA 54) ANSI B31.2 and/or ANSI B31-8.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle all products to be included in the work.

B. Deliver and store valves in shipping containers with labeling in place.

PART 2 PRODUCTS

2.01 PIPE

A. Steel Pipe Below Ground: ASTM A120, Schedule 40 black:

1. Fittings: ANSI B16.11, forged steel, or ASTM A234 forged steel welding type.

2. Joints: Welded and seamless.

3. Jackets: ANSI/AWWA C105 polyethylene jacket, Double layer, half lapped, 10 mil polyethylene tape.

B. Steel Pipe Above Ground: ASTM A120 Schedule 40 black:

1. Fittings: ANSI B16.3, malleable iron, ANSI B16.11, forged steel, or ASTM A234, forged steel welding type.

2. Joints: Threaded.

C. For Propane Systems: Copper tubing below ground: ASTM B88, Type K, internally tinned:

1. Fittings: ANSI/AWWA B16.18, cast copper, or ANSI/ASME B16.22, wrought copper; internally tinned.

2. Joint: ANSI/AWS A5.8 BCUP silver brazed.

D. For Propane Systems: Copper tubing above ground: ASTM B88, Type K, L or ASTM B75, Type GP; internally tinned:

1. Fittings: ANSI/ASME B6.18 cast copper, ANSI/ASME B16.22, wrought copper, or ANSI/ASME B16.26, cast copper, internally tinned.

2. Joint: ANSI/ASTM B32, Solder, Grade 95TA or AMSI/AWS A5.8, BCUP silver brazed.

E. Polyethylene Pipe: ASTM D2513, SDR 11.5 or ASTM F678 Series 125:

1. Fittings: ASTM D2513.

2. Joints: Mechanical or Compression fit.

3. Trace Wire: Magnetic detectable conductor, brightly colored plastic covering, imprinted with "Natural Gas Service" in large letters.

F. Reinforced Epoxy Resin Piping: ASTM D2517:

1. Fittings: ASTM D2517.

2. Joints: Bell and spigot with epoxy resin.

3. Trace Wire: Magnetic detectable conductor, brightly colored plastic covering, imprinted with "Natural Gas Service" in large letters.

2.02 GAS COCKS

A. 2 Inches and Smaller: 150 psig (1 040 kPa) WOG, bronze body, bronze tapered plug, non-lubricated, Teflon packing, threaded ends with cast iron curb box, cover, and key.

B. 2 Inches and Larger: 125 psig (860 kPa) WOG, Steel or Cast iron body and tapered plug, non-lubricated, Teflon packing, threaded ends, with cast iron curb box, cover, and key.

C. For Applications With Line Pressure Greater Than 60 psig (415 KPA) : Over 2 Inches (50 mm) : Cast iron body and plug, pressure lubricated, Teflon packing, flanged ends, with cast iron curb box, cover, and key.

2.03 PRESSURE REGULATING VALVES

A. Valves: Single stage, malleable iron body, corrosion- resistant, pressure regulator with atmospheric vent, elevation compensator; with threaded ends for 2 inch and smaller, flanged ends larger than 2 inch.

B. Capacity: For inlet and outlet gas pressures, specific gravity, and flow rate indicated.

2.05 PROPANE STORAGE TANKS

A. Construction: Closed, welded steel, tested and stamped in accordance with ANSI/ASME Section 8D; minimum 250 psig (1 700 kPa) rating; cleaned, prime coated and painted with two coats of silver anti-rust paint, and supplied with steel support saddles, pressure gage; tapping for installation of piping and accessories.

B. Vaporizer: 1,000 watts, heating cable bedded in 1 inch of glass fiber insulation and covered by flexible stainless steel plate, with thermostat in weatherproof box set to turn on at -13 degrees F with manual off -on switch.

C. Size:

1. Capacity: Diameter and length as shown on plans.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions.

B. Verify that building service connection and utility gas main size, location and depth are as indicated.

3.02 PREPARATION

A. Ream pipe ends and remove burrs. Bevel plain end ferrous pipe over 2 inches diameter. Thread ferrous pipe 2 inches diameter and under.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections with flanges or threading and unions.

3.03 BEDDING

A. Excavate pipe trench and place bedding material in accordance with Section 02222 for work of this Section.

3.04 INSTALLATION - PIPING

A. Maintain separation of gas line from sewer, water or storm water piping in accordance with state or local code.

B. Install piping to conserve space and not interfere with use of site space.

C. Install piping to allow for expansion and contraction without stressing pipe or joints.

D. Install cocks and other fittings as required.

E. Establish elevations of buried piping in accordance with Section 02222 for work in this Section.

F. Wrap couplings and fittings of steel pipe with polyethylene tape and heat shrink over pipe.

G. For nonmetallic Pipe: Install trace wire continuous over top of pipe.

H. Backfill trench in accordance with Section 02222.

I. Center and plumb valve box over valve. Set box cover flush with finished ground surface. Prevent shock or stress from being transmitted through valve box to valve.

J. Wrap valve and valve box with polyethylene tape and heat shrink or paint valves and valve boxes with red anti-rust primer and one coat of epoxy paint.

3.05 SERVICE CONNECTIONS

A. Provide sleeve in foundation wall for gas service main. Caulk enlarged sleeve watertight.

B. Anchor service main to interior surface of foundation wall.

C. Install service regulator adjacent to building wall in specified location.

D. Install service regulator and riser pipe to prevent undue stress upon service pipe. For plastic service pipe, use steel pipe riser from below ground to regulator.

E. Provide regulator vent with rain and insect proof opening, terminating not less than five feet away from building openings.

3.06 PROPANE TANK INSTALLATION

A. Place tank legs on concrete footings, level within tolerance of 2 inches. Provide footings in accordance with Section 03300.

B. Prepare and grade an area outside tank perimeter, for a distance of 6 feet. Grade, place and compact gravel fill to a compacted depth of 3 inches. Compact to 95 percent.

C. Provide tank with relief valve, shutoff valve, pressure regulator, pressure gage and removable protection cover. Install piping, shutoff valve and pressure gage to underground piping.

D. Set tank regulator to outlet pressure as indicated on plans.

E. Install vaporizer to under side of tank and secure to tank with aluminum tray and two stainless steel straps.

F. Install weatherproof control box for vaporizer 40 inches above ground surface. Install to 4 x 4 inch cedar post, driven into ground 40 inches.

G. Install wiring. Install control wire from vaporizer to control box 20 inches below ground surface. Install service wiring 24 inches below ground from control box to building.

END OF SECTION 02687

SECTION 02720

STORM SEWER SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Site storm sewerage drainage piping, fittings and accessories, and bedding.

B. Connection of building storm water drainage system to municipal sewers.

C. Catch basins, paved area drainage, site surface drainage, and stormwater detention facilities.

1.02 RELATED REQUIREMENTS

A. Section 02222 - Excavation, Backfill, and Compacting for Utilities

B. Section 02270 - Slope Protection and Erosion Control

C. Section 02605 - Sewer Structures

D. Section 02730 - Sanitary Sewerage System

E. Section 03300 - Cast-in-Place Concrete: (See Architectural /Building Specifications)

F. Local governing authority and code requirements.

G. All necessary construction permits.

H. Construction Drawings

1.03 REFERENCES

A. AASTHO M294 and M252 - Corrugated Polyethylene pipe smooth interior.

B. AASHTO M36 - Metallic (Zinc or Aluminum) Coated Corrugated Steel Culverts and Underdrains.

C. AASHTO T180 - Moisture-Density Relations of Soils Using a 10-lb (4.54 kg) Rammer and an 18-in. (457 mm) Drop.

D. ANSI/ASTM A74 - Cast Iron Soil Pipe and Fittings.

E. ANSI/ASTM C12 - Practice for Installing Vitrified Clay Pipe Lines.

F. ANSI/ASTM C14 - Concrete Sewer, Storm Drain, and Culvert Pipe.

G. ANSI/AS7M C76 - Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.

H. ANSI/ASTM C425 - Compression Joints for Vitrified Clay Pipe and Fittings.

I. ANSI/ASTM C443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.

J. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

K. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb (4.54 Kg) Rammer and 18 inch (457 mm) Drop.

L. ANSI/ASTM D3034 - Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings.

M. ASTM C700 - Vitrified Clay Pipe, Extra Strength, Standard Strength and Perforated.

N. ASTM D2922 - Test Methods for Density of Soil and Soil- Aggregate in Place by Nuclear Methods (Shallow Depth).

O. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

1.04 DEFINITIONS

Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.05 PROJECT RECORD DOCUMIENTS

A. Accurately record actual locations of pipe runs, connections, catch basins, cleanouts, and invert elevations.

B. Identify and describe unexpected variations to subsoil conditions and location of uncharted utilities.

1.06 COORDINATION

Coordinate the Work with termination of storm sewer connection outside building including connection to municipal storm sewer system.

PART 2 PRODUCTS

2.01 SEWER PIPE MATERIALS AND ACCESSORIES

A. Reinforced Concrete Pipe: Comply with requirements of ASTM C 76, Class III unless another class type is indicated on Drawings, installed with flexible plastic (Bitumen) gaskets at all joints. Gaskets shall comply with AASHTO M-198 75I, Type B, and shall be installed in strict accordance with pipe manufacturer's recommendations.

B Corrugated Steel Pipe: Galvanized, aluminized or bituminous coated as specified on the drawings. Only permitted when specifically indicated on Drawings and shall comply with requirements of ASTM A 760; 16 gage unless another gage is indicated on Drawings. Install with matching band connectors. Install sleeve gaskets in accordance with pipe manufacturer's recommendations. Corrugated steel pipe may be round pipe, arch pipe, or slotted drain pipe as indicated on Drawings. Slotted drain pipe shall have 1.75" wide drain guide waterway openings and 6" minimum height drain guide.

C. Spiral Rib Metal Pipe Type 1R: Galvanized, aluminized or bituminous coated as specified on Drawings. Only permitted when specifically indicated on Drawings. Pipe ends shall be recorrugated and installed with semi-corrugated Hugger-type bands and "O" ring gaskets in accordance with pipe

manufacturers installation requirements. Spiral Rib metal pipe must comply with ASTM A 760 Type 1R. Acceptable manufacturer: CONTECH, INC. "ULTRA FLO or ULTRA FLO II" and Caldwell Culvert Co. "Smooth Cor" or approved equal.

D. Polyvinyl Chloride (PVC) Pipe: Only permitted when specifically indicated on Drawings. Pipe and fittings shall comply with ASTM D 3034, rated SDR 35. Pipe shall be continually marked with manufacturer's name, pipe size, cell classification, SDR rating, and ASTM D 3034 classification. Pipe joints shall be integrally molded bell ends in accordance with ASTM D 3034, Table 2, with factory supplied elastomeric gaskets and lubricant.

E. Corrugated Polyethylene Pipe (CPP) Smooth Interior: Only permitted when specifically indicated on Drawings and shall conform with AASHTO Designation M294 and M252. Pipe must be installed in accordance with pipe manufacturers installation Guidelines for Culvert Storm Drainage Applications. Acceptable manufacturers: Advanced Drainage Systems, Inc. "ADS N-1211 & HANCOR, INC. "Hi-Q" or approved equal.

F. Polyvinyl Chloride (PVC) large diameter closed profile gravity sewer pipe, UNL-B-9: Only permitted when specifically indicated on drawings. Pipe and fittings shall comply with ASTM F-794. Pipe must be installed in accordance with pipe manufacturers installation guidelines. Acceptable manufacturer: Carlon "Vylon H.C." or approved equal.

G. Polyvinyl Chloride (PVC) 8" through 30" diameter, smooth interior, open profile gravity sewer pipe. Only permitted when specifically indicated on drawings. Pipe and fittings shall comply with ASTM F-794 and Uni-Bell Uni-B-9. Pipe must be installed in accordance with pipe manufacturers installation guidelines. Acceptable manufacturer: Extrusion Technologies, Inc. "Ultra-Rib" or approved equal.

2.02 INLETS, CATCH BASINS AND JUNCTION BOXES

A. Lid and frame per details shown on plans.

B. Structure construction in accordance with details shown on plans.

PART 3 EXECUTION

3.01 EXAMINATION

Verify that trench cut and excavation is ready to receive work and excavations, dimensions, and elevations are as indicated on civil engineering drawings.

3.02 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with fine aggregate.

B. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.

3.03 BEDDING

A. Excavate pipe trench and place bedding material in accordance with Section 02222 for work of this Section.

3.04 INSTALLATION - PIPE

A. Install pipe, fittings, and accessories in accordance with ASTM C12, ASTM D2321 or manufacturer's instructions and state or local requirements.

B. Install pipe on bedding in accordance with Section 02222 for work in this Section.

C. Lay pipe to slope gradients noted on construction drawings.

D. Refer to Section 02222 for trenching requirements. Do not displace or damage pipe when compacting.

E. Refer to Section 02605 for manhole requirements.

3.05 INSTALLATION - CATCH BASINS, INLETS AND JUNCTION BOXES

A. Form bottom of excavation clean and smooth to correct elevation.

B. Form and place cast-in-place concrete base pad, with provision for storm sewer pipe to be placed at proper elevation.

C. Form and place cast-in-place concrete walls, sleeved at proper elevation to receive storm sewer pipe in accordance with details shown on the plans.

D. Form and place cast-in-place top of structure in accordance with details shown on the plans.

END OF SECTION 02720

SECTION 02730

SANITARY SEWER SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

Furnish labor, materials, services, equipment, and other necessary items required for accompanying the construction of the sanitary sewer systems. This shall include, but not be limited to, the following:

Sanitary sewer drainage piping, Fittings and Accessories, Cleanouts, and Bedding.

Set lines, elevations, and grades for sanitary sewer system work and control system for duration of work, including careful maintenance of benchmarks, property corners, monuments, or other reference points.

1.02 RELATED REQUIRENENTS

A. Construction Drawings

B. Specifications Section 02222 Excavation, Backfilling, and Compacting for Utilities

C. Specifications Section 02605 Sewer Structures

D. Local governing authority and code requirements

E. All necessary construction permits

1.03 REFERENCES

A. ANSI/ASTM A74 - Cast Iron Soil Pipe and Fittings.

B. ANSI/ASTM C12 - Practice for Installing Vitrified Clay Pipe Lines.

C. ANSI/ASTM C14 - Concrete Sewer, Storm Drain, and Culvert Pipe.

D. ANSI/ASTM C76 - Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.

E. ANSI/ASTM C425 - Compression Joints for Vitrified Clay Pipe and Fittings.

F. ANSI/ASTM C443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.

G. ANSI/AS7M D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49 Kg) Rammer and 12 inch (304.8 mm) Drop.

H. ANSI/ASTM D3034 - Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings.

I. ASTM A746 - Ductile Iron Gravity Sewer Pipe.

J. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings,

K. ASTM C700 - Vitrified Clay Pipe, Extra Strength, Standard Strength and perforated.

L. ASTM D1785 - Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80 and 120.

M. ASTM D2922 - Test Methods for Density of Soil and Soil- Aggregate in Place by Nuclear Methods (Shallow Depth).

N. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

1.04 DEFINITIONS

A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.05 SUBMITTALS

A. Product Data: Provide catalog materials indicating pipe, pipe accessories, and fittings.

B. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.

C. Manufacturer's Certificate: Certify that products meet or exceed ASTM designations.

1.06 COORDINATION

A. Coordinate the Work with termination of sanitary sewer connection outside building, connection to municipal sewer utility service, and trenching.

PART 2 PRODUCTS

2.01 SEWER PIPE MATERIALS

A. Polyvinyl Chloride Sanitary Sewer

1. Pipe and fittings shall comply with ASTM D 3034, rated SDR 35 unless otherwise specified by the local utility. Pipe shall be continually marked with manufacturer's name, pipe size, cell classification, SDR rating, and ASTM D 3034 classification.

2. Pipe joints shall be integrally molded bell ends per ASTM D 3034, Table 2, with factory supplied elastomeric gaskets and lubricant.

3. Corrugated Polyvinyl Chloride sewer pipe and fittings shall comply with ASTM F 949. Pipe must be marked with manufacturers name, pipe size, cell classification and ASTM F 949 Classification. Pipe must be installed per the manufacturers installation requirements. Acceptable manufacturer: CON'RECH, INC. "A-2000" PVC sewer pipe or Owner-approved equivalent.

B. Corrugated Polyethylene (CPP) Sanitary Sewer

1. Pipe shall be smooth interior, available in sizes 4" thru 18" and shall comply with AASHTO designation #M294 and/or #M252.

2. Pipe fittings shall be thermo-molded PVC conforming to ASTM D 3034, rated SDR 35.

3. Gasket material used with the thermo-molded PVC fittings and the CPP pipe joint assembly shall conform to ASTM F-477.

C. Vitrified Clay Sanitary Sewer

1. Sanitary Sewer Pipe and Fittings: Vitrified clay pipe meeting or exceeding requirements of ASTM C 700.

2. Joints: ASTM C 425 specifications for "Compression Joints for Vitrified Clay Pipe and Fittings.

3. Gaskets: ASTM C 425 specification for "Compression Joints for Vitrified Clay Pipe and Fittings". Gaskets shall be manufactured from high grade, properly vulcanized elastomeric compound consisting of either basic natural or synthetic rubber. Gasket manufacturing tolerances shall comply with Rubber Manufacturer's Association tolerances for gaskets.

4. Lubricant: Suitable for lubricating joint components; no deteriorating effects on gasket or pipe material, will not support growth of fungi or bacteria, and shall be of type reconunended by gasket manufacturer.

D. Ductile Iron Sanitary Sewer

1. Ductile Iron Pipe: ASTM A746, Extra Heavy type, inside nominal diameter as specified on plans, bell and spigot end.

2. Ductile Iron Pipe Joint Device: ANSI A21.11, rubber gasket joint devices.

E. Cast Iron Sanitary Sewer

1. Cast Iron Soil Pipe: ANSI/AS7M A74, Extra Heavy type, inside nominal diameter of as specified on plans, bell and spigot end.

2. Cast Iron Pipe Joint Device: ASTM C564, rubber gasket joint devices.

F. Concrete Sanitary Sewer

1. Concrete Pipe: ANSI/ASTM C14, Class 1, 2, or 3 bell and spigot pipe with inside nominal diameter as specified on plans.

2. Concrete Pipe Joint Devices: ANSI/ASTM C443, rubber compression gasket joint devices.

G. Reinforced Concrete Sanitary Sewer

1. Reinforced Concrete Pipe: ANSI/ASTM C76, Class I, II, III, IV, or V as specified on plans, with Wall type A, B, or C; mesh reinforcement; inside nominal diameter as specified, bell and spigot end.

2. Reinforced Concrete Pipe Joint Device: ANSI/ASTM C443, rubber compression gasket joint devices.

2.02 PIPE ACCESSORIES

A. Pipe Joints: Mechanical clamp ring type, stainless steel expanding and contracting sleeve, neoprene ribbed gasket for positive seal.

B. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

2.03 CLEANOUTS

A. Lid and Frame: Heavy Duty cast iron construction, manufactured by Mueller:Lid Design: Closed Lid.

B. Shaft Construction: Cast Iron shaft of internal diameter as specified on plans with 2500 psi concrete collar for cleanouts.

PART 3 EXECUTION

3.01 EXAMINATION

Verify that trench cut and excavation is ready to receive work and excavations, dimensions, and elevations are as indicated on civil engineering drawings.

3.02 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with fine aggregate.

B. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling or compaction.

3.03 BEDDING

A. Excavate pipe trench and place bedding material in accordance with Section 02222 for work of this Section.

3.04 INSTALLATION - PIPE

A. Install pipe, fittings, and accessories in accordance with ASTM C12, ASTM C14 and/or manufacturer's instructions and state or local requirements.

B. Lay pipe to slope gradients noted on civil engineering drawings.

C. Install pipe on bedding in accordance with Section 02222 for work in this Section.

D. Refer to Section 02222 for trenching requirements. Do not displace or damage pipe when compacting.

E. Refer to Section 02605 for manhole requirements.

F. Connect to building sanitary sewer outlet and municipal sewer system as indicated on the drawings.

3.05 INSTALLATION - CLEANOUTS

A. Form bottom of excavation clean and smooth to correct elevation.

B. Form and place cast-in-place concrete base pad, with provision for sanitary sewer pipe to be installed to proper elevations.

3.06 FIELD QUALITY CONTROL

A. Compaction testing will be performed in accordance with ANSI/ASTM D698, ASTM D2922 or ASTM D3017.

B. Test sanitary sewer pipe system installed below grade and outside building in accordance with the following procedures:

1. The Contractor shall perform the testing of manhole construction, pipe materials, joints and/or other materials incorporated into the construction of the sanitary sewer system to determine leakage and watertightness. In the event any state or local code requires a more stringent test, the more stringent shall apply.

2. Manhole Testing:

The Owner and/or Governing Agency shall determine the method of manhole testing set forth below. The test method selected will be determined by the depth of each manhole, groundwater level, concrete honeycombing, or other conditions which make the selected test suitable for determining the physical condition and watertightness of the manhole.

2.1 Manhole Exfiltration Testing:

All incoming and outgoing sewer lines shall be plugged the manhole filled with water up to the top of the poured concrete or above the highest precast barrel joint. If the water loss exceeds the maximum allowable as shown below; the manhole shall have failed the test.

Depth of Manhole	Maximum Allowable Water Loss
0-8 feet	1 inch over 5 minutes
greater than 8 feet	1/8 gallon per vertical foot over 5 minutes

2.2 Manhole Vacuum Testing:

The manhole vacuum test shall be performed with suitable apparatus made for such purpose and shall draw a vacuum of 10 inches of Mercury (Hg). The test shall pass if the vacuum remains at 10" of Mercury (Hg) or drops to not less than 9" of Mercury (Hg) in one minute.

3. Flexible Pipe Deflection Testing:

3.1 Allowable Deflection:

The maximum allowable pipe deflection shall not exceed (5) five percent of the nominal inside diameter.

3.2 Mandrel:

The mandrel (go/no-go) device shall be cylindrical in shape and constructed with either 9 or 16 evenly spaced arms or prongs. Mandrels with less arms will be rejected as not sufficiently accurate. The contact length of the mandrel's arms shall equal or exceed the nominal inside diameter of the sewer to be inspected. Critical mandrel dimensions shall carry a tolerance of plus or minus 0.01 inch. The mandrell and all necessary equipment for the mandrell test shall be provided by the Contractor.

3.3 Procedure:

The mandrel shall be hand-pulled by the contractor through all flexible pipe sewer lines no earlier than 30 days after the trench has been completely backfilled. Any sections of the sewer not passing the mandrel shall be uncovered and the Contractor shall rebed, reround, or replace the sewer to the satisfaction of the Owner and/or Governing Agency. Any repaired section shall be retested.

3.4 Mandrell O.D. (outside diameter):

The outside diameter of the mandrell shall be set according to the following table:

NOMINAL DIAMETER (IN.)	MANDRELL O.D. (IN.)
6"	5.40
8"	7.12
10"	8.87
12"	10.55
15"	12.89
18"	15.30

3.5 Contractor's Warranty:

The Owner and/or Governing Agency reserves the right to mandrell test any flexible pipe sewer line before acceptance, and also prior to expiration of the first year of operation. If a previously accepted line fails a mandrell test performed during the first year of operation, the defects must be corrected at the Contractor's expense.

4. Air Testing of Gravity Sewers:

4.1 Procedure:

4.1.1 Plug all pipe outlets with suitable test plugs. Brace each plug securely.

4.1.2 Pipe air supply to the pipeline to be tested in such a manner that the air supply may be shut off, pressure observed, and air pressure released from the pipe without workmen entering the manhole.

4.1.3 Add air slowly to the portion of pipe under test until the internal pressure of the line is raised to approximately 4 psig, but less than 5 psig.

4.1.4 Shut the air supply off and allow at lease two minutes for the air pressure to stabilize

4.1.5 When the pressure has stabilized and is at or above the starting test pressure of 3.5 psi, start the test.

4.1.6 Determine the time in seconds with a stopwatch for the pressure to fall 0.5 psig so that the pressure at the end of the time is at or above 3.0 psig.

4.1.7 Compare the observed time with the minimum allowable times in the chart below for pass/fail determination.

1 Pipe Diameter 450 ft (in.)	2 Minimum Time (min: sec.)	3 Length for Minimum Time (ft.)	4 Time for Longer Length (sec.)	SPECIFICATION TIME FOR LENGTH (L) SHOWN (MIN:SEC)							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400	fi
4	1:53	597	.190L	1:53	1:53	1:53	1:53	1:53	1:53	1:53	
1:53											
6	2:50	398	.427L	2:50	2:50	2:50	2:50	2:50	2:50	2:51	
3:12											
8	3:47	298	.760L	3:47	3:47	3:47	3:47	3:48	4:26	5:04	
5:42											
10	4:43	239	1.187L	4:43	4:43	4:43	4:57	5:56	6:55	7:54	
8:54											
12	5:40	199	1.709L	5:40	5:40	5:42	7:08	8:33	9:58	11:24	
12:50											
15	7:05	159	2.671L	7:05	7:05	8:54	11:08	13:21	15:35	17:48	
20:02											
18	8:30	133	3.846L	8:30	9:37	12:49	16:01	19:14	22:26	25:38	
28:51											
21	9:55	114	5.235L	9:55	13:05	17:27	21:49	26:11	30:3234:54	39:16	
24	11:20	99	6.837L	11:24	17:57	22:48	28:30	34:11	39:5345:35	51:17	
27	12:45	88	8.653L	14:25	21:38	28:51	36:04	43:16	50:3057:42	46:54	
30	14:10	50	10.683L	17:48	26:43	35:37	44:31	53:25	62:1971:13	80:07	
33	15:35	72	12.926L	21:33	32:19	43:56	53:52	64:38	75:2486:10	96:57	
36	17:00	66	15.384L	25:39	38:28	51:17	64:06	76:55	89:44	102:34	
115:23											

4.2 Safety Precautions:

The low pressure air test may be dangerous to personnel if, through lack of understanding or carelessness, a line is over pressurized or plugs are installed improperly. It is extremely important that the various plugs be installed so as to

prevent the sudden expulsion of a poorly inflated plug. As an example of the hazard, a force of 250 pounds; exerted on an 8 inch plug by an internal pressure of 5 psi. Observe the following safety precautions:

4.2.1 No person shall be allowed in the manholes during the test or when a plugged pipe is under pressure.

4.2.2 Gauges, air piping manifolds, and valves, shall be located at the top of the ground.

4.2.3 Install and brace all plugs securely.

4.2.4 Do not over pressurize the lines.

4.3 Ground Water Elevation:

If the pipeline to be tested is below the ground water level, the starting test pressure shall be increased by 0.433 psi for each foot the groundwater level is above the invert of the sewer pipe. In no case shall the starting test pressure exceed 9.0 psig.

4.4 Acceptance of Installation:

No gravity sewer or manhole will be accepted that does not comply with the minimum requirements of tests described in this specification.

4.5 Test Equipment:

All necessary equipment to perform the air test in accordance with this specification shall be provided by the contractor. The test gauge shall preferably have incremental division of 0.10 psi and have an accuracy of at least plus or minus 0.04 psi. In no case shall a test gauge be used which has incremental divisions of greater than 0.25 psi. The gauge shall be of sufficient size in order to determine this accuracy.

4.6 Contractor shall furnish one copy of gravity sewer and manhole test results to the Owner and Governing Agency upon completion of gravity sewer system backfilling operations.

END OF SECTION 02730

SECTION 02810

LANDSCAPE IRRIGATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. When indicated on the Drawings, provide an underground, automatically controlled lawn and shrub bed irrigation system, complete, including electrical connections, connections to water mains, and necessary accessories, constructed to the grades and conforming to the areas and locations as shown on the drawings and as described herein.

B. Provide an Extended Maintenance Agreement as described in paragraph 3.15. Contractors shall be required to provide the Agreement required in order to be considered for providing and constructing the Irrigation System.

1.02 RELATED SECTIONS

A. Section 02222 - Excavation, Backfill, and Compacting for Utilities

B. Section 02660 - Water Distribution Systems

C. Section 02900 - Landscaping, Seeding, and Sodding

D. Refer to local governing authority and code requirements regarding the connection of this system to a potable water system, and required backflow prevention.

1.03 QUALITY ASSURANCE

A. Refer to paragraph 1.03 References, of Section 02660 - Water Distribution Systems for acceptable standards of items described herein.

1.04 IRRIGATION OPERATIONS

A. Performed by a firm having:

1. A minimum of two consecutive years experience in this area of work and having installed other jobs of similar size and scope.

2. Contractor to provide a minimum of three (3) references and a list of similar projects with the owners names, addresses, and telephone numbers, when requested by the Owner's Representative.

1.05 FIELD INVESTIGATIONS

A. Contractor to visit the job site and familiarize himself with the nature and location of the work, existing conditions and conditions that will exist under which he will be obligated to operate in the performance of the work.

1.06 SUBSTITUTIONS AND SUBMITTALS

A. Substitutions shall be made only with the written approval of the Owner' s Representative. Substitutions will not be considered prior to opening of bids.

1. Substitution of a specified irrigation head after the bid (and subsequent award) shall require a piping diagram noting revised pipe sizes, pressure loss calculations, and head locations necessary to achieve the desired watering provided by the system as designed.

2. Provide 5 copies each of product data for requested substitutions to the Owner's Representative for review.

B. Submittals:

1. Required for items specified herein. Provide 5 copies of each to the Owner's Representative for review.

2. Do not proceed with purchase or installation of materials prior to receipt of approved submittals from the Owner's Representative.

1.07 OWNER'S INSTRUCTION AND MAINTENANCE DATA

A. General: Furnish the following instructions and maintenance data as required herein. Final Acceptance will not be made until items have been reviewed and approved by the Owner's Representative.

B. As-built drawings: 2 sets, noting exact locations of elements and changes to the drawings in red.

C. Operation Manual: 2 copies, bound in 1 inch diameter three ring binders, indexed and tabbed for easy reference, and labeled on spine and cover. Manual to include:

1. Approved submittals (refer to paragraph 1.05 above)

2. Installation instructions, including mounting details for control valves.

3. Operating Instructions, including:

a. Winterization procedures.

b. Recommended operation sequence, frequency, and length of operation cycle, as per relationship to estimated absorption rate, evaporation rate and anticipated GPM.

4. Maintenance Instructions:

a. Items requiring manufacturer's product data, installation, and maintenance instructions.

b. Complete warranty information, mail to manufacturer, and provide copies to the Owner.

D. Controller Chart: Prepare a color coded chart, reduced in size, containing the same plan information as the As-Built drawings, and laminated in plastic (both sides), with the following specific information:

1. Note routing of control wires,

2. Identify valves as to size, station number (on controller), and type of irrigation head on each valve.

3. Delineate each station's limits of coverage by color coding, with each station having a different color noting it's areas of coverage.

1.08 WORK BY OTHERS

A. If irrigation work is part of General Construction Contract, the meter shall be provided by the Plumbing Subcontractor in accordance with Section 02660.

B. If a Plumbing Subcontractor is not part of the contract containing irrigation work, the General Contractor shall contract with and pay the local utility company, including meter deposit, to tap the main and install the meter(s) required for this project.

PART 2 PRODUCTS

2.01 GENERAL

A. Materials shall be new and without flaws or defects, and of quality and performance as specified. Overages at completion are property of the Contractor, to be removed from the site.

B. Materials and equipment specified by "Proprietary Specification" as manufactured by a particular company, etc., shall be for the express purpose of establishing minimum acceptable performance requirements. Acceptable manufacturers shall include:

1. Rain Bird Sales, Inc. - Turf Division

2. The Toro Company - Irrigation Division

C. The provision of providing other acceptable manufacturer's as potential substitutions to that required on the drawings shall not disregard the requirements of paragraph 1.06.

2.02 DELIVERY AND STORAGE

A. Damaged materials will not be accepted.

B. Deliver packaged materials to the site in the original, unopened containers.

C. Store materials delivered to site prior to actual usage in a place not to interfere with other trades or construction operations and protect from damage by weather or other elements as needed.

2.03 PIPE AND PIPE FITTINGS

A. Piping:

1. Main line to be schedule 40 ASTM-D-2241 polyvinyl chloride pipe. Lateral line to be Class 200 ASTM-D-2241 polyvinyl chloride pipe.

a. Pipe up to and including 2-1/2 inches in diameter shall have bell and socket joints.

b. Pipe greater that 2-1/2 inches in diameter shall have snap connections with rubber gasket joints.

aa. Thrust blocks as described in Section 02660 shall be required in conjunction with rubber gasket joint pipe.

2. Utilized for laterals in areas where the ground is subject to freezing for extended periods of time each year, subject to approval of the Owner's Representative: Flexible polyethylene (PE) pipe SDR-11.5, PE23, rated at 100 PSI, National Sanitation Foundation (NSF) approved, conforming to ASTM D 2239.

B. Sleeves: Minimum diameter of 2 times larger than the pipe or pipe (s) scheduled to pass through them. Sleeves shall be a minimum of 2 inch diameter and shall be Schedule 40 PVC pipe.

C. Plastic Fittings (and Risers where required):

1. Utilized throughout the system (mains and laterals) in warm climates and main lines in colder climates: Schedule 40 or Schedule 80 PVC.

2. Utilized for laterals of flexible polyethylene (PE) pipe, Type 1 PVC insert fittings designed for used with this type of pipe conforming to ASTM D 2609.

a. Pipe and fittings shall be joined with stainless steel pinch clamps or wormgear clamps (including stainless steel screw).

3. Risers above finished grade shall receive two (2) coats of black exterior semi-gloss enamel paint.

D. PVC Solvent Cement: As per ASTM specification D 2564-67

E. Swing Joint connections between heads and laterals:

1. Thick wall, flexible, polyethylene pipe, with fittings that have male barbs on one end and either male or female screw ends opposite (glue fittings and female barb adapters not allowed). Pipe and fittings shall be either:

a . Rain Bird SP swing pipe with SB spiral barb fittings, or

b. Toro Funny Pipe and Fittings.

2.04 VALVES

A. Manual valves:

1. Globe Valve for use as cut off or isolation valve on lines up to 3 inches in diameter shall be as manufactured by Red-White Valve Corporation, Carson, CA., or approved equal.

2. Mechanical Joint valve for use as cut off or isolation valve on lines greater than 3 inches shall be of cast iron and bronze construction and have a fusion bonded epoxy coated (exterior and interior) finish as the Resilient Wedge Valve, manufactured by the Clow Valve Co., Oskaloosa, Iowa, or approved equal.

a. Provide with each valve a valve key, and cast iron cylindrical valve box with top.

3. Quick Coupler Valves, each with Key having 3/4 inch male top pipe threads for hose connection, shall be either:

a. Rain Bird model 3RC Valve with model 33K Key, or

b. Toro 470 Series Valve and Coupler Key.

B. Electric Control Valves shall be either:

1. Rain Bird PEB Series electric remote control valves, or

2. Toro 252 Series plastic valves.

C. Master Valve:

1. Shall be an electric control valve as noted above.

2. Size of valve shall be the same as the diameter of the main line pipe as noted on the drawings.

D. Provide water-tight connectors as Scotch Lock or Rain Bird Snap Tight connectors with sealant for wiring connections at electric valves.

2.05 SPRINKLER HEADS

A. Full or part Circle Pop-Up Fixed Spray Sprinkler:

1. Pop - up heights:

a. Turf - 4 inches

b. Shrub and Groundcover Beds - 12 inches

2. Acceptable Products shall include:

a. Rain Bird 1800 Series nozzles with 1800 Series sprinklers having Pressure Regulating (PRS) and Seal-A-Matic (SAM) features.

b. Toro 570 Series plastic nozzles with 570C Series sprinklers having Pressure Compensating Devices (PCD) and optional check valve unit.

c. Rain Bird SAM features and Toro optional check valve units shall not be provided on systems using PE pipe for laterals or when heads are to be raised above grade having part of the sprinkler body exposed.

B. Full or Part Circle Pop-up Gear Driven Rotor Sprinkler shall be either:

1. Rain Bird Turf Bird Rotor Pop-up Sprinkler Series R-50C Commercial, with Seal-A-Matic (SAM) check valve, or as otherwise indicated on the irrigation plans.

2. Toro Super 700 Sprinklers Series S700C Commercial, with check valve or as otherwise indicated on the irrigation plans.

2.06 VALVE BOX

A. For electric control valves, manual valves, and quick coupler valves, shall be as manufactured by Ametek, Plymouth Products Division, Sheboygan WI., or an approved equal.

1. When used with a single valve, provide the Economy Turf Box with black colored snap fit cover labelled "Valve Box",

2. When used with up to 2 valves, provide the Jumbo Box with 20 inch by 14 cover opening with cover labelled "Control Valve".

2.07 LOW POINT DRAINS

A. Required on all zones. Automatic drain valves shall be Rain Bird Model Number 16A, FDV, or approved equal.

B. Provide two (2) at lowest points of each zone, with each atop a 1 cubic foot (12 inches) area of coarse gravel.

2.08 AUTOMATIC CONTROLLER

A. For systems with 1 to 12 zones, controller shall have a wall mount weatherproof lockable cabinet with internal transformer and shall be either:

1. Rain Bird HP Series Controller.

2. Toro Vision II Series Controller, or approved equal.

B. For systems greater than 12 zones, controller shall have a wall mount weatherproof lockable cabinet with internal transformer as the Rain Bird RC Series Controller, or approved equal.

2.09 CONTROL WIRE

A. Number 14 size (minimum) copper wire, U. L. approved for underground direct burial.

1. Colored wire shall have color coding as shown on the controller.

2. Provide a single wire from the controller to each valve.

3. Provide a common neutral from the controller to each valve.

2.10 BACKFLOW PREVENTER

A. General: Contractor shall comply with the requirements and codes of the local governing authority regarding backflow prevention. In addition, the Contractor shall provide the necessary materials, insulation/draining capabilities, and acceptable concealment to satisfy the requirements and codes of the local authority and aesthetic needs of the Owner's Representative.

1. Concealment techniques may range from painting of exposed piping to providing a plant material screen, or providing a painted metal enclosure around the unit.

2. In the absence of local codes or requirements, a double check assembly backflow prevented installed in strict accordance with the manufacturer's written instructions shall be considered as a minimum requirement.

B. Backflow Preventers shall be a type suitable for use in a high hazard cross connection to a potable water system as manufactured by Watts Regulator Company, Lawrence, Ma., or approved equal:

1. If reduced pressure backflow preventers are required - No. 909 series Reduced Pressure Principle Backflow Preventer, or approved equal.

2. If reduced pressure backflow preventers are not required - No. 709 series Double Check Valve Assembly, or approved equal.

2.11 RAINFALL SENSOR

A. Provide a rainfall sensor to cancel the operation of the controller during substantial rainfall. Sensor shall be by the same manufacturer as the controller provided and shall be either:

1. Rain Bird Rain Check Automatic Rain Shutoff, or

2. Toro Rainswitch model 850-74.

2.12 METER

A. With meter box, shall meet or exceed the requirements set forth by the local Water Department/Water Utility.

PART 3 EXECUTION

3.01 GENERAL

A. Pressure/Flow Test: Immediately after Contract award, conduct tests at the beginning tap or meter and note as such on the written results provided to the Owner's Representative of the following:

1. Static Pressure

2. Dynamic Pressure

3. Gallons per minute

B. Layout of sprinkler heads: Stake locations of each sprinkler in accordance with the drawings.

1. If discrepancies in drawings become apparent, notify Owner's Representative of discrepancies.

C. Receive approval from the Owner's Representative to proceed with construction along with proposed revisions, if required due to test results or discrepancies with the drawings, prior to installation.

3.02 EXECUTION AND TRENCHING

A. Excavate trench to pipe grade depth.

B. Make width of trench at least 3 1/2 in.

C. Backfill and hand tamp over-excavation prior to installing piping.

D. Excavate trenches deeper than required in soils containing rock or other hard material that might damage pipe. Backfill to pipe grade with selected fine earth or sand.

E. Keep trenches free of obstructions and debris that would damage pipe.

F. Avoid heating trenches, electric ducts, storm and sanitary sewer lines, water and gas mains, each of which have right-of-way.

G. Do not cut walks, drives, or curbing when trenching for piping.

1. Provide sleeves under paving prior to installation of paving.

2. Under existing paving, auger bore or tunnel.

3.03 PIPING SYSTEM

A. General:

1. Do not lay pipe on unstable material or blocking, or when in the opinion of the Owner's Representative, conditions are unsuitable.

2. Rest full length of pipe section on bed of trench, excavating recesses to accommodate joints.

B. Cover:

1. Lawn and planting areas:

a. Mains and Control Valves - minimum 18 inches below finish grade.

b. Laterals - minimum 12 inches below finish grade.

2. Roadways or parking areas: minimum 24 inches below finish grade.

C. Clearances: Minimum of 3 inches between parallel lines in the same trench or vertical clearance between lines crossing at angles.

D. Special Requirements - PVC and PE pipe:

1. Snake in trench at least 1 foot per 100 feet of pipe to allow for thermal expansion.

2. Pipe laterals to drain to low point drains located at the lowest elevations of each zone.

3.04 SLEEVING

A. Provide sleeves for both piping and control wiring where each passes under paved surfaces:

1. Depths of sleeves shall be the same as that required for piping per location/ condition.

2. Extend sleeves 12 inches beyond paving at each end.

3. Install permanent benchmark at top of curbs for reference to sleeve locations.

3.05 PIPING ERECTIONS

A. Hold pipe securely while joints are being made.

B. Threaded Plastic Pipe:

1. Do not use solvent cement on threaded joints.

2. Wrap joints with teflon tape or utilize virgin teflon lubricant.

3. When threaded pipe is used, material shall be Schedule 80 PVC.

C. Cemented joints for PVC bell end pipe and PVC pipe with socket fittings: ASTM D 2855-70.

3.06 VALVES

A. Do not locate beneath paved surfaces.

B. Install plumb to within 1/16 inch.

C. Locate within a valve box with a 6 inch (deep) layer of washed gravel below the bottom of the valve.

1. Top of quick coupler valves shall be as close to the top of the valve box as possible. Top of gravel layer shall be 3 inches below top of valve.

D. Master Valve:

1. Locate immediately behind backflow prevented

2. Valve shall be energized by the master valve circuit on the automatic controller.

3.07 SPRINKLERS

A. Sprinklers: Install plumb to within 1/16 inch, with top collar (not nozzle) flush with finish grade.

B. Provide swing joint with each sprinkler.

1. Swing joint not required where entire head is raised above grade and/ or where rigid riser piping is required.

C. Heads adjacent to paving and curbs: Locate between 1 inch and 4 inches from edge of paving or back of curb.

3.08 ELECTRICAL CONNECTIONS/CONTROL WIRE

A. Shall be in strict accordance with the latest edition of National Electrical Code and local electrical codes.

B. Provide the electrical connection to the system as designated on the drawings and as specified herein.

C. General:

1. Do not run control wiring and power supply wiring in the same conduit.

2. Provide continuous runs of wire between the controller and valves. Should splices be necessitated, they shall be either:

a. made within water tight below ground electrical junction boxes, or

b. with water-tight connectors (as utilized for valves) and located within a valve box for ease of locating.

3. Bury control wire beside pipe in same trench and bundle and tape together at not more than 10 foot intervals.

D. Expansion Loops: Constructed by wrapping wire around a 1/2 inch diameter pipe to create a coil. A 3 foot section of wire shall be used to create a 12 inch coil, and a 6 foot section is required to create a 24 inch coil.

1. Provide 12 inch expansion loops at each wire splice (not including valves) and at each change of wire direction.

2. Provide 24 inch expansion loops at each control valve and where each valve enters the conduit for the automatic controller.

3.09 BACKFILL

A. Sand or fine grained soils should be used for cover to a sufficient depth to prevent damage to the pipe from rocks or other debris in backfill during the compacting operation.

B. Fill trench to within 3 in. of top with excavated soil and compact.

C. Fill top 3 in. with existing topsoil in planting or turf areas and wheel roll until compaction of backfill is same as surrounding soil.

D. Grade backfilled trench uniform with surrounding grades.

3.10 BACKFLOW PREWNTER

A. Comply with local codes for the installation of the backflow preventer. In the absence of local codes, minimum requirements shall be to set in accordance with the manufacturer's written instructions.

B. Provide a combination of drains and quick coupler valves to accommodate winterization of the entire system by forced air.

1. Contractor shall submit materials/methods to the Owner's representative for consideration and receive approval prior to installation of work.

3.11 AUTOMATIC CONTROLLER

A. Location and installation shall be as per drawings, and approved by Owner's Representative PRIOR to installation.

B. Provide separate, rigid conduits for both power supply and control wiring.

1. Control wire conduit shall extend to 18 inches below grade.

2. Secure conduit to wall in a manner acceptable to Owner's Representative.

C. Provide electrical grounding for the controller in accordance with the manufacturer's written instructions.

3.12 TEST AND FLUSHING

A. Following installation, make final adjustments of lawn irrigation system prior to Owner's Representative's final inspection.

1. Flush system completely to remove debris, with nozzles removed.

2. Verify sprinkler operation and alignment for direction of throw.

3. Check pop-up spray nozzling for proper arc of spray.

4. Determine whether uniform distribution exists over all areas.

B. Following final adjustment, operate the entire installation to demonstrate the complete and successful operation of equipment.

3.13 GUARANTEE

A. Guarantee Work for one year from date of final acceptance:

1. Against defects in material, equipment and workmanship.

2. Repair of damage to the premises resulting from leaks or other defects in material, equipment and workmanship to the satisfaction of the Owner.

B. Repairs, if required, shall be done promptly at no cost to the Owner.

3.14 FINAL ACCEPTANCE

A. Contractor shall provide an on-site walk through of the system and fully describe its operation with the Owner's Representative for a period of not less than 1 hour.

B. Contractor shall achieve final acceptance when:

1. Systems are fully operational, and

2. Approved by both the Owner's Representative and Owner, and

3. As-built drawings and project manuals have been accepted and approved.

3.15 EXTENDED MAINTENANCE

A. Within the requirements of THIS CONSTRUCTION CONTRACT:

1. Once a month for the first 6 months of operation following Final Acceptance, provide on-site consultation with the Owner's operating personnel.

2. This shall include up to 4 hours time per month.

B. Additional work beyond THIS CONSTRUCTION CONTRACT:

1. Prior to beginning the work, the Contractor shall execute a bonded, written agreement with the Owner for a period of 2 years from the date of Final Acceptance for the following:

   a. Spring start-up of the system as soon as weather permits making the system fully operational including opening of valves, setting controller operation, and checking the operation of the complete system.

   b. Monthly checks of the system during the operation season.

   c. Winterization of the system during the fall or when the season demands, including draining of the system, clearing piping (including supply line to backflow preventer) with forced air, and the shut down of the automatic controller. Winterization shall also include items not listed herein, however, are usually included in winterization programs in the local area.

C. Costs for additional work required for repair of items not covered by warranty (ie: damage by others), shall be negotiated between the Owner and Contractor prior to initiation of repairs.

D. Costs for the Extended 2-Year Maintenance Agreement are over and above the Contract Sum, and shall not be included in the construction price. Payment for extended maintenance by the Owner shall occur upon completion of the scheduled service (and additional work, if any) as it occurs on a monthly basis throughout the duration of the Extended Maintenance Agreement.

END OF SECTION 02810

SECTION 02831

CHAIN LINK FENCES AND GATES

PART I GENERAL

1.01 SECTION INCLUDES

Provide chain link fences and gates units controlled by single source including erection accessories, fittings, and fastenings as indicated on Drawings. Refer to architectural building plans for fencing attached to building.

1.02 RELATED SECTIONS

A. Construction Drawings

B. Manufacturer's technical data and installation requirements

1.03 REFERENCES

A. ANSI/ASTM A123 - Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.

B. ANSI/ASTM F567 - Installation of Chain-Link Fence.

C. ASTM A116 - Zinc-Coated (Galvanized) Steel Woven Wire Fence Fabric.

D. ASTM A120 - Pipe, Steel, Black and Hot-Dipped zinc Coated (Galvanized) welded and seamless, for Ordinary Uses.

E. ASTM A121 - Zinc-Coated (Galvanized) Steel Barbed Wire.

F. ASTM A153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

G. ASTM A392 - Zinc-Coated Steel Chain-Link Fence Fabric.

H. ASTM A428 - Weight of Coating on Aluminum-Coated Iron or Steel Articles.

I. ASTM A491 - Aluminum-Coated Steel Chain Link Fence Fabric.

J. ASTM A569 - Steel, Carbon (0.15 Maximum Percent), Hot- Rolled Sheet and Strip Commercial Quality.

K. ASTM A585 - Aluminum Coated Steel Barbed Wire.

L. ASTM C94 - Ready-mixed Concrete.

M. ASTM F573 - Residential Zinc-Coated Steel Chain Link Fence Fabric.

N. ASTM F668 - Polyvinyl Chloride (PVC) Coated Steel Chain Link Fence Fabric.

O. Chain Link Pence Manufacturers Institute (CLFMI) - Product Manual.

P. FS RR-F-191 - Fencing, Wire and Post Metal (and Gates, Chain Link Fence Fabric, and Accessories).

1.04 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of property perimeter posts relative to property lines and easements.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, provide products of one of the following:

1. Allied Tube and Conduit Corp.

2. Anchor Fence, Inc.

3. United States Steel

2.02 MATERIALS

A. Fabric:

1. No. 9 ga. (0.148" ± 0.005") finished size galvanized steel wires, 2" mesh, with both top and bottom selvages twisted and barbed.

2. Furnish one-piece fabric widths for fencing.

B. End, Corner, and Pull Posts: Galvanized steel, minimum sizes and weights as follows:

1. 4.85 lbs./lin. ft.

2. Over 6'-0" Fabric Height: 2.875" OD pipe, 5.79 lbs./lin. ft., or 3.5"x3.5" roll-formed sections, 4.85 lbs./lin. ft.

C. Line Posts: Galvanized steel, minimum sizes and weights as f ollows:

1. Up to 6'-0" Fabric Height: 1.90" OD steel pipe, 2.70 lbs./lin. ft. or 1.875'x 1.625" C-sections, 2.28 lbs./lin. ft.

2. 6'-0" to 8'-0" Fabric Height: 2.375" OD steel pipe, 3.65 lbs./lin. ft. or 2.25"x 1.875" H-sections, 2.64 lbs./lin. ft.

3. Over 8'-0" Fabric Height: 2.875" OD steel pipe, 5.79 lbs./lin. ft. or 2.25"x 1.875", H-sections, 3.26 lbs./lin. ft.

D. Gate Posts: Galvanized steel, posts for supporting single gate leaf, or one leaf of double gate installation, for nominal gate widths as follows:

1. Up to 6' -0": 3.5" x 3.5" roll-formed section, 4.85 lbs./lin. ft., or 2.875 OD pipe, 5.79 lbs./lin. ft.

2. Over 6' –0" to 13' –0": 4.000", OD pipe, 9.11 lbs./lin. ft.

E. Top Rail: Rails: 1.66", OD pipe, 2.27 lbs./ft. or 1.625"x 1.25", roll-formed sections, 1.35 lbs./ft.; galvanized steel, manufacturer's longest lengths.

F. Couplings: Expansion type, approximately 6" long, for each joint.

G. Attaching Devices: Provide means for attaching top rail securely to each gate corner, pull and end post.

H. Sleeves: Galvanized steel pipe not less then 6" long and with inside diameter not less than ½" greater than outside diameter of pipe. Provide steel plate closure welded to bottom of sleeve of width and length not less than 1" greater than outside diameter of sleeve.

I. Tension Wire: 7 gage galvanized steel, coated coil spring wire, located at bottom of fabric.

J. Wire Ties: 11 ga. galvanized steel

K. Post Brace Assembly: Manufacturer's standard adjustable brace at end of gate posts and at both sides of corner and pull posts, with horizontal brace located at mid-height of fabric. Use same material as top rail for brace, and truss to line posts with 0.375" diameter rod and adjustable tightener.

L. Post Tops: Galvanized steel, weathertight closure cap for each tubular post. Furnish caps with openings to permit passage of top rail.

M. Stretcher Bars: Galvanized steel, one piece lengths equal to full height of fabric, with minimum cross-section of 3/16" x ¾". Provide one stretch bar for each gate and end post, and two for each corner and pull post.

N. Stretch Bar Bands: Manufacturer's standard.

O. Gate Cross-bracing: 3/80 diameter galvanized steel adjustable length truss rods.

P. Portland Cement: ASTM C 150.

Q. Aggregates: ASTM C 33.

R. Water: Clean.

S. Non-shrink, non-Metallic Grout: Premixed, factory- packaged, noncorrosive nonstaining, nongaseous, exterior grout complying with CE CRD-C621.

T. Swinging Gate Hardware:

1. Hinges: Size and material to suit gate size, non- lift-off type, offset to permit 180 degree gate opening. Provide 1-1/2" pair of hinges for each leaf over 6"-0" nominal height.

2. Latch: Forked type or plunger-bar type to permit operation from either side of gate, with padlock eye as integral part of latch.

U. Double Gates Hardware: Provide gate stops for double gates, consisting of mushroom type of flush plate with anchors set in concrete, to engage center drop rod or plunger bar. Include locking device and padlock eye as integral part of latch, using one padlock for locking both gate leaves.

V. Sliding Gate Hardware: Provide manufacturer's standard heavy-duty track, ball-bearing hanger sheaves, overhead framing and supports, guides, stays, bracing, and accessories as required.

PART 3 EXECUTION

3.01 GATE FABRICATION

A. Fabricate swing gate perimeter frames of 1.90" OD pipe, galvanized steel. Provide horizontal and vertical members to ensure proper gate operation and for attachment of fabric, hardware, and accessories. Space frame members maximum of 8'-0", apart.

B. Assemble gate frames by welding or special fittings and rivets, for rigid connections. Install same fabric as for fence with stretcher bars at vertical edges. Install diagonal cross-bracing on gates as required to ensure rigid frame without sag or twist. Bars may be used at top and bottom edges. Attach stretchers to gate frame at 15" o.c. maximum.

C. Attach hardware to provide security against removal or breakage.

3.02 FINISH

A. Fabric Finish: Galvanized, ASTM A 392, Class I, with not less than 1.2 oz. zinc/sq. ft. of surface.

B. Framing: Galvanized steel, AS7M A 120 or A 123, with not less than 1.8 oz. zinc/sq. ft. of surface.

C. Hardware and Accessories: Galvanized, ASTM A 153 with zinc weights in accordance with Table I.

3.03 CONCRETE MIXING

Mix materials to obtain concrete with minimum 28-day compressive strength of 2,500 psi; in maximum size aggregate, maximum 3" slump, and 2-4% entrained air.

3.04 INSTALLATION

A. Comply with recommended procedures and instructions of fencing manufacturer. Provide secure, aligned installation with line posts spaced at 10'-0" o.c. maximum.

B. Grade Set Posts: Drill or hand excavate using post hole digger in firm undisturbed or compacted soil.

C. Excavate hole for each post to minimum diameter recommended by fence manufacturer but not less than four times the largest cross-section of post. Excavate hole depths not less than 36" below finish grade surface.

D. Center and align posts in holes with bottom of posts 3" above bottom of excavation.

E. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations. Extend concrete footing 2" above grade and trowel to crown to shed water.

F. Sleeve Set Posts: Anchor posts by means of pipe sleeves preset and anchored into concrete. After posts have been inserted into sleeves, fill annular space between post and sleeve solid with nonshrink, non-metallic grout, mixed and placed to comply with grout manufacturer's directions.

G. Top Rails: Run rail continuously, bending to form radius for curved runs. Provide expansion couplings as recommended by manufacturer.

H. Center Rails: Provide center rails where indicated. Install in one piece between posts and flush with post on fabric side, using special offset fittings where necessary.

I. Brace Assemblies: Install braces so posts are plumb when diagonal rod is under proper tension.

J. Tension wire: Install tension wires through post cap loops before stretching fabric and tie to each post cap with not less than 6 ga. galvanized wire. Fasten fabric to tension wire using 11 ga. galvanized steel hog rings spaced 24" o.c.

K. Fabric: Leave approximately 2" between finish grade and bottom selvage. Pull fabric taut and tie to posts, rails, and tension wires. Install fabric on security side of fence, and anchor to framework so that fabric remains in tension after pulling force is released.

L. Stretcher Bars: Secure at end, corner, pull, and gate posts by threading through or clamping to fabric at 4" o.c., and secure to posts with metal bands spaced at 15" o.c.

M. Tie Wires:

1. Use U-shaped wire, conforming with diameter of pipe to which attached, clasping pipe and fabric firmly when ends twisted at least two full turns. Bend ends of wire to minimize hazard to persons or clothing.

2. Tie fabric to line posts with wire ties spaced 12" o.c. Tie fabric to rails and braces with wire ties spaced 24" o.c. Tie fabric to tension wires with hog rings spaced 24" o.c.

3. Manufacturer's standard procedure will be accepted if of equal strength and durability.

N. Fasteners: Install nuts for tension bands and hardware bolts on side of fence opposite fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

P. Gates: Install gates plumb, level, and secure for full opening without interference. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubrication.

END OF SECTION 02831

SECTION 02846

SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

Traffic control signs complying with U.S. Department of Transportation, Federal Highway Administration's Manual "Uniform Traffic Control Devices" and as specified. See Construction Drawings for type, location, and quantity of signs required.

1.02 RELATED REQUIREMENTS:

A. Construction Drawings

B. Manufacturer's mounting instructions.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

Signs to be equivalent to those manufactured by SA-SO, Inc., Grand Prairie, TX.

2.02 SIGNS

A. "STOP" Signs: 24" x 24", Octagon, reflectorized copy and border.

B. "SPEED LIMIT 1511 Signs: 1811 x 24", black legend on white reflective baked enamel background.

c . "HANDICAPPED SYMBOL- Signs: 12" x 18,, white legend on blue reflective baked enamel background.

D . "NO PAP-KING, FIRE LANE" Signs: 12" x 18", red letters on white reflective or baked enamel background. (R7 - 8)

E . **"KEEP** RIGHT" Signs: **18" x 24",** black **letters** and symbol on white reflective or baked enamel background. **(R7-1)**

F. "DO NOT ENTER" Signs: Highway Dept. standard red and white sign except 2411 x 2411 size with reflective baked enamel finish.

2.03 POSTS

Round galvanized posts with galvanized sign-mounting hardware for each sign.

PART 3 EXECUTION

Install posts in 18" round x 241 deep concrete foundations. Set posts vertical and plumb with bottom of sign at 61-5" above finish grade. Mount signs in accordance with manufacturer's instructions.

ZND OF SZCTION 02846

Revised 7-9-93

SECTION 02900

LANDSCAPING

PART 1 GENERAL

1.01 QUALITY OF WORK AND MATERIALS

The Contractor shall furnish all materials and perform all work in accordance with these specifications, drawings, and instructions provided by the Landscape Architect or Owner's representative hereafter also referred to as Landscape Architect. The work shall include everything shown on the drawings and required by the specifications and everything to which in the judgment of the Landscape Architect is incidental to what is shown on the drawings or required by the specifications. All work completed and materials furnished and installed shall be of the best quality and shall be in strict accordance with the intention of the drawings, specifications and samples. The Contractor shall cooperate with the Landscape Architect so that no error or discrepancy in the drawings or specifications shall cause defective or inappropriate materials to be used or poor workmanship to be allowed and so that the work may proceed in the most efficient and effective manner.

1.02 WEATHER CONDITIONS

Work must be carried out only during weather conditions favorable to landscape construction and to the health and welfare of plants. The suitability of such weather conditions shall be determined by the Landscape Architect.

1.03 PROTECTION

A. Before commencing work, all trees and shrubs which are to be saved must be protected from damage by the placement of fencing flagged for visibility or some other suitable protective procedure approved by the Owner's Construction Manager. No work may begin until this requirement is fulfilled.

B. In order to avoid damage to roots, bark or lower branches, no truck or other equipment shall be driven or parked within the drip line of any tree, unless the tree overspreads a paved way.

C. The contractor shall use any and all precautionary measures when performing work around trees, walks, pavements, utilities, and any other features either existing or previously installed under this Contract.

D. The Contractor shall adjust depth of earthwork and loaming when working immediately adjacent to any of the aforementioned features in order to prevent disturbing tree roots, undermining walks and pavements, and damage in general to any existing or newly incorporated item.

E. Plants transported to the project in open vehicles shall be covered with tarpaulins or other suitable covers securely fastened to the body of the vehicle to prevent injury to the plants. Closed vehicles shall be adequately ventilated to prevent overheating of the plants. Evidence of inadequate protection following digging, carelessness while in transit, or improper handling or storage shall be cause for rejection. All plants shall be kept moist,

fresh, and protected. Such protection shall encompass the entire period during which the plants are in transit, being handled, or are in temporary storage.

F. Where excavating, fill, or grading is required within the branch spread of trees that are to remain, the work shall be performed as follows:

1. TRENCHING: When trenching occurs around trees to remain, the tree roots shall not be cut but the trench shall be tunneled under or around the roots by careful hand digging and without injury to the roots.

2. RAISING GRADES: When the existing grade at tree is below the new finished grade, and fill not exceeding 16 inches (16") is required, clean, washed gravel graded from one to two inches (1" - 2") in size shall be placed directly around the tree trunk. The gravel shall extend out from trunk on all sides a minimum of 18 inches (18") and finish approximately two inches (2") above the finished grade at tree. Install gravel before any earth fill is placed. New earth fill shall not be left in contact with the trunks of any trees requiring fill. Where fill exceeding 16 inches (16") is required, a dry laid tree well shall be constructed around the trunk of the tree. The tree. The tree well shall extend out from the trunk on all sides a minimum of three feet (3') and to three inches (3") above finish grade. Coarse grade rock shall be placed directly around the tree well extending out to the drip line of the tree. Clean, washed graved graded from one to two inches (1" - 2") in size shall be placed directly over the coarse rock to a depth of three inches (3"). Approved backfill material shall be placed directly over the washed gravel to desired finished grade.

3. LOWERING GRADES: Existing trees in areas where the new finished grade is to be lowered shall have regrading work done by hand to elevation as indicated. Roots as required shall be cut cleanly three inches (3") below finished grade and scars covered with tree paint.

4. Trees marked for preservation that are located more than six inches (6") above proposed grades shall stand on broad rounded mounds and be graded smoothly into the lower level. Trees located more than 16 inches (16") above proposed grades shall have a dry laid stone wall, or other retaining structure as detailed on the plans, constructed a minimum of five feet (5') from the trunk. Exposed or broken roots shall be cut clean and covered with topsoil.

1.04 SAMPLES

A. It is the responsibility of the Contractor, before ordering or purchasing materials, to provide samples of those materials to the Landscape Architect for approval, if so requested.

B. The Contractor is to submit certification tags from trees, shrubs and seed verifying type and purity.

1.05 QUALITY OF PLANTS

A. Plant shall in all cases conform with requirements of the American Standard for Nursery Stock latest versions of rules and grading adopted by the American Association of Nurserymen, Inc., but upgraded to meet the following additional requirements.

B. Unless specifically noted otherwise, all plants shall be of selected specimen quality, exceptionally heavy, symmetrical, tightly knit, so trained or favored in their development and appearance as to be superior in form, number of branches, compactness and symmetry. All plants shall have a normal habit or sound, healthy, vigorous plants with well developed root system.

C. Plants shall be free of disease, insect pests, eggs or larvae.

D. Plants shall not be pruned before delivery.

E. Trees with abrasion of the bark, sunscalds, disfiguring knots or fresh cuts of limbs over one and one-fourth inches (1-1/4") which have not completely calloused shall be rejected.

F. All plants shall be typical of their species or variety and shall have a normal habit of growth and be legibly tagged with the proper name. All plants shall have been grown under climatic conditions similar to those in the locality of the site of the project under construction or have been acclimated to such condition for at least two (2) years.

G. The root system of each shall be well provided with fibrous roots. All parts shall be sound, healthy, vigorous, well-branched and densely foliated when in leaf.

H. All plants designated ball and burlap (B&B) must be moved with the root systems as solid units with balls of earth firmly wrapped with burlap. The diameter and depth of the balls of earth must be sufficient to encompass the fibrous root feeding systems necessary for the healthy development of the plant. No plant shall be accepted when the ball of earth surrounding its roots has been badly cracked or broken preparatory to or during the process of planting. The balls shall remain intact during all operations. All plants that cannot be planted at once must be heeled-in by setting in the ground and covering the balls with soil or mulch and then watering. Hemp burlap and twine is preferable to treated. If treated burlap is used, all twine is to be cut from around trunk and all burlap is to be removed.

I. The trunk of each tree shall be a single trunk growing from a single unmutilated crown of roots. No part of the trunk shall be conspicuously crooked as compared with normal trees of the same variety.

J. The thickness of each shrub shall correspond to the trade classification "No.1". Single stemmed of thin plants shall not be accepted. The side branches must be generous, well-twigged, and the plant as a whole well-branched to the ground. The plants must be in moist condition, free from dead wood, bruises or other root or branch injuries.

1.06 MIX DESIGN AND TESTING

A. Plants shall be measured when branches are in their normal position.

B. Shrubs shall meet the requirements for spread, height or container size stated in the Plant List. The measurements are to be taken from the ground level to the average height of the shrub and not to the longest branch. Height and spread dimensions specified refer to the main body of the trees (measured from the crown of the roots to the tip of the top branch) shall be not less than the minimum size designated.

C. Caliper measurements shall be taken at a point on the trunk six inches (6") above natural ground line for trees up to four inches (4") in caliper, and at a point 12 inches (12") above the natural ground line for trees exceeding four inches (4") in caliper.

D. If a range of size is given, no plant shall be less than the minimum size, and not less than 50% of the plants shall be as large as the upper half of the range specified.

E. The measurements specified are the minimum size acceptable and, where pruning is required, are the measurements after pruning.

1.07 NOTIFICATION OF DELIVERY

Unless otherwise authorized by the Landscape Architect, the Contractor shall notify the Landscape Architect at least 48 hours in advance of the anticipated delivery date of any plant materials. A legible copy of the invoice, showing kinds and sizes of materials included for each shipment shall be furnished to the Landscape Architect.

1.08 GUARANTEE

A. The condition of all new plant materials is the responsibility of the Contractor and shall be approved by the Landscape Architect.

B. Until final approval, any replacement of plant materials that may be necessary shall be at the expense of the Contractor.

C. In addition to other standard provisions, the Contractor's bid amount shall also provide for the following:

1. Maintenance necessary during Establishment Period.

2. Replacement in kind, or with a substitute acceptable to the Landscape Architect, of all plant materials not in a healthy growing condition or that has died back to the crown or beyond normal pruning limits.

3. The Contractor shall also be responsible for any damage caused by his operations and shall dispose of all rubbish and excess soil as directed.

1.09 RIGHT OF REJECTION

The Landscape Architect reserves the right to inspect and reject plants at any time and at any place.

1.10 MAINTENANCE OPERATIONS BEFORE APPROVAL

A. Plant care shall begin immediately after each plant is satisfactorily installed and shall continue throughout the life of the contract until final acceptance of the project.

B. Care shall include, but not be limited to, replacing mulch that has been displaced by erosion or other means, repairing and reshaping water rings or saucers, maintaining stakes and guys as originally installed, watering when needed or directed, and performing any other work required to keep the plants in a healthy condition.

C. Contractor shall remove and replace all dead, defective and/or rejected plants as required before final acceptance.

D. Grassed areas damaged during the process of the work shall be the responsibility of the Contractor, who shall restore the disturbed areas to a condition satisfactory to the Landscape Architect. This may include filling to grade, fertilizing, seeding and mulching.

1.11 FINAL APPROVAL

The Landscape Architect shall have the final approval for acceptance of the landscaping.

1.12 RELATED REQUIREMENTS

Construction Drawings
Specs. Section 02222 Excavating, Backfilling, and Compacting for Utilities
Specs. Section 02660 Water and Sewer Systems
Specs. Section 02810 Irrigation System

PART 2 PLANTING MATERIALS:

2.01 LOAM OR TOPSOIL

A. Work Included - Place topsoil in areas designated on the drawings or as specified herein.

B. Area - All exterior ground within the limit of contract, except surfaces occupied by buildings and structures, paving, and except areas indicated to be undisturbed, shall be topsoiled.

C. Placement of Topsoil - Place no topsoil until subgrade has been approved. Before placing topsoil, rake subsoil surface clear of stones, debris, and roots. Compact topsoil to form a layer with minimum depth of 4 inches (4") in lawn areas and twelve inches (12") in shrub beds. Topsoil shall be placed so that after final settlement there will be good drainage (and conforming to elevations shown on drawings). Contractor is to maintain surfaces and place any additional topsoil necessary to replace that eroded before acceptance.

D. Preparation - Disk, drag, harrow or hand rake subgrade to a depth of three inches (3") to provide bond for topsoil. Topsoil which must be transported across finished walks shall be delivered in such a manner that no damage will be done to the walks. The Contractor shall be responsible for the repair of such damage.

E. Topsoil: Natural, friable, fertile, fine loamy soil possessing the characteristics of representative topsoils in the vicinity which produces a heavy growth; free from subsoil, objectionable weeds, litter, sods, stiff clay, stones larger than 1 inch (1") in diameter, stumps, roots, trash, toxic substances, or any other material which may be harmful to plant growth or hinder planting operations. Contractor is to verify amount stockpiled and supply any additional as needed.

2.02 FERTILIZER

A. Fertilizer shall be delivered to the site, mixed as specified, in the original unopened standard size bags showing weight, analysis and name of manufacturer. Containers shall bear the manufacturer's guaranteed statement of analysis or a manufacturer's certificate of compliance covering analysis shall be furnished to the Landscape Architect. Store fertilizer in a weatherproof place and in such a manner that it shall be kept dry and its effectiveness shall not be impaired.

B. Percentages of nitrogen, phosphorus and potash shall be based on laboratory test recommendations as approved by the Landscape Architect. For the purpose of bidding, assume 10% nitrogen, 6% phosphorus and 4% potash by weight. At least 50% of the total nitrogen shall contain no less than 3% water-insoluble nitrogen. At least 60% of the nitrogen content shall be derived from super-phosphate containing not less than 18% phosphoric acid or bone meal containing 25% - 30% phosphoric acid and 2% - 3% nitrogen. Potash shall be derived from muriate of potash containing 55% - 60% potash.

C. Grass or sodded areas shall have fertilizer applied in two (2) applications with a thorough watering immediately following application. The first application shall be one (1) week before the seeding at the rate of 35 pounds per 1,000 square feet harrowed into the top two inches (2") of seed bed. The second application shall be done at the rate of 25 pounds per 1,000 square feet, immediately following the second mowing.

2.03 PEAT MOSS

A. Peat moss shall be Michigan peat moss or approved equal in color and consistency, to be used for planting soil mixture only.

B. Peat moss shall be a moss peat, finely shredded to pass a one-half inch (1/2") mesh and shall be no less than 90% organic material by weight, with an ash content by ignition of no more than 10%.

C. Material shall contain no less than 35% and no more than 66% moisture by weight, but shall have a water-holding capacity of 150% - 200%.

D. Material shall have a pH value between 4 and 5.

E. Material may be imported (supplied in bales) or domestic (furnished in bulk). If furnished in bulk, the material and its source must be acceptable to the Landscape Architect.

F. Peat moss shall <u>not</u> be used as mulch, except on ground cover.

2.04 SHREDDED HARDWOOD BARK MULCH

Shredded hardwood bark mulch or approved equal shall be used as a four inch (4") top dressing in all plant beds and around all trees planted by landscape contractor. Single trees or shrubs shall be mulched to the outside edge of the saucer. Mulch shall be of sufficient character as not to be easily displaced by wind or water runoff.

2.05 STAKING MATERIAL

A. Stakes shall be 2" x 3" x 8' pressure treated wood. Three (3) staked per tree.

B. Wire tree staking shall be pliable No. 12 galvanized soft steel wire.

C. Hose shall be two-ply fibre-bearing rubber garden hose, not less than one-half inch (1/2") inside diameter, black or green, and of suitable length.

2.06 WATER

On-site water shall be furnished by the Owner. Hose and other watering equipment shall be furnished by the Contractor.

2.07 LAWN SEED

Lawn seed mixture shall be fresh, clean new crop seed. The Contractor shall furnish to the Landscape Architect the dealer's guaranteed statement of the composition of the mixture and the percentage of purity and germination of each variety.

2.08 WEED MAT

Weed mat shall be "Dewitt Weed Barrier" or approved equal. The weed mat shall be placed under all planting areas not to be seeded, or as directed on drawings. The mat shall be covered with mulch and secured in place by a soil anchor.

2.09 STEEL EDGE

Steel edge shall be 1/8" x 4" interlocking steel edge, staked with metal stakes sufficiently to hold in place. See plans for locations.

2.10 STONE MULCH

A. Install stone mulch as per plans, details and specifications.

B. The size and color of the stone mulch should be as per the plans placed to a depth of four inches (4").

C. Adjust grades allowing for thickness of mulch by cutting or filling. Assure slight pitch away from building. Rake surface smooth and even and roll or tamp so that subgrade is uniformly firm.

D. Lay 3 mil sheets of "Visqueen" type polyethylene, on the compacted subgrade before placing stone, minimum overlap shall be six inches (6"). Perforate sheeting in plant beds before placing stone.

2.11 SOD

A. Sod shall be a species recommended by an experienced local A.N.A.-certified nursery. Sod to be strongly rooted, weed-disease and pest free and uniform in thickness.

B. All slopes greater than 3:1 shall be pegged to hold sod in place.

2.12 EROSION CONTROL BLANKET/FABRIC NETTING

A. Contractor shall provide and install where indicated on civil drawings "Curlex" blankets: by American Excelsior Company; "Polyjute" Style 465 GT: by Synthetic Industries or approved equal.

B. The area to be covered shall be properly prepared, fertilized, and seeded before blanket is applied. When blanket is unrolled, the netting shall be on top and the fibers in contact with the soil over the entire area. In ditches the blanket shall be applied in the direction of the flow of water, butted snugly at ends and side and stapled. On slopes, the blankets shall be applied either horizontally or vertically to the slope. Ends and sides shall be butted snugly and stapled. Staple to manufacturer's recommendations.

PART 3 PLANTING PROCEDURES

3.01 PLANTING COORDINATION

A. The Contractor shall inform the Landscape Architect of the date when the planting shall commence and of the anticipated delivery date of the material.

B. Failure to notify the Landscape Architect in advance of order to arrange proper scheduling may result in loss of time or rejection of a plant or plants not installed as specified or directed.

3.02 DIGGING AND HANDLING

A. Bare rooted shrubs shall be dug with adequate fibrous roots. Roots of these plants shall be covered with a uniformly thick coating of mud by being puddled immediately after they are dug, or packed in moist straw, or moss.

B. Balled and burlapped plants shall be dug with firm natural balls of earth of sufficient diameter and depth to include most of the fibrous roots.

C. Roots or balls of all plants shall be adequately protected at all times from the sun and from drying winds.

D. All balled and burlapped plants which cannot be planted immediately upon delivery shall be set on the ground and shall be well protected with soil, wet moss or other acceptable material. Bare rooted plants which cannot be planted immediately shall be heeled-in upon delivery. All shall be kept moist.

E. Bundles of plants shall be opened and the plants separated before the roots are covered. Care shall be taken to prevent air pockets among the roots. During planting operations, bare roots shall be covered with canvas, hay or other suitable material. No plant shall be bound with wire or rope at any time so as to damage the bark or break the branches.

3.03 TREES AND SHRUB PLANTING OPERATIONS

A. Planting operations shall be performed at a steady rate of work unless weather conditions make it impossible to work. No plant material shall be planted in frozen ground.

B. The Contractor shall provide sufficient tools and equipment required to carry out the planting operation.

C. All plants too large for two men to lift in and out of holes shall be placed with a sling. Do not rock trees in holes to raise.

D. For soil mix for plant holes, see Materials - 2.01 Loam or Topsoil.

E. If rock or other underground obstruction is encountered, the Landscape Architect may require plant pits to be relocated, the pits enlarged or the plants deleted from the contract.

F. Locations containing unsuitable subsoil shall be treated in one of the following manners:

1. Where unsuitability within the construction site is deemed by the Landscape Architect to be due to excessive compaction caused by heavy equipment or by the presence of boards, mortar, concrete or other construction materials in sub-grade, and where the natural subsoil is other than A.A.S.H.O. classification of A6 or 7, the Contractor shall loosen such areas with spikes, discing, or other means to loosen the soil to a condition acceptable by the Landscape Architect. The Contractor shall also remove all debris and objectional material. Soil should be loosened to a minimal depth of 12 inches (12") with additional loosening as required to obtain adequate drainage. Contractor may introduce peat moss, sand, or organic matter into the subsoil to obtain adequate drainage should he so desire. All such remedial measures shall be considered as incidental to the work and no extra payment shall be made for this part of the work.

2. Where sub-grade is deemed by the Landscape Architect to be unsuitable because the natural subsoil falls into an A.A.S.H.O. classification of A6 or 7 and contains moisture in excess of 30%, then such a condition shall be rendered suitable by installation of a sub-drainage system or by other means described elsewhere in these specifications. Where such conditions have not been known or revealed prior to planting time and where they have not been recognized in the preparation of plans and specifications, then the Landscape Architect shall issue a change order to install the proper remedial measures, all of which shall be in addition to the contract sum.

G. Adjustments in locations and outlines shall be made as directed. In the event that pits or areas for planting are prepared and backfilled with topsoil to grade prior to commencement of lawn operations, they shall be so marked that when the work of planting proceeds, they can be readily located. In case underground obstructions such as ledges or utilities are encountered, location shall be changed under the direction of the Landscape Architect without charge.

H. Holes for trees shall be at least two feet (2') greater in diameter than the spread of the root system and at least six inches (6") deeper than the root ball. Holes for shrubs and vines shall be at least 12 inches (12") greater in diameter than the spread of the root system and at least two feet (2') deep.

I. To the topsoil in the backfilling of tree holes and shrub beds, there shall be added as the progress of the work permits, manure as herein specified, ground limestone if soil tests indicate it is needed, and commercial fertilizer at the rate of three (3) pounds for tree up to three inches (3") in caliper, one (1) pound per one inch (1") in caliper for larger trees, six (6) ounces for small shrubs and eight (8) ounces for each shrub four feet (4') or over. Ground limestone and manure shall be omitted in the case of acid soil plants. The manure, limestone and fertilizer shall be thoroughly mixed with the topsoil in the planting operation, care being taken that the manure does not come in immediate contact with the roots.

J. The plants shall be planted in the center of the holes and at the same depth as they previously grew. Loam shall be backfilled in layers of not more than eight inches (8") and each layer watered sufficiently to settle before the next layer is put in place. Loam shall be tamped under edges of balled plants . Enough topsoil shall be used to bring the surfaces to finish grade when settled.

1. A saucer shall be provided around each plant as shown on the drawings.

2. Plants shall be soaked with water twice within the first twenty-four (24) hours of time of planting. Water shall be applied with low pressure so as to soak in thoroughly without dislodging the topsoil.

3. Approved weed mat shall be placed under all areas to be covered with mulch. Secure weed mat in place with a soil anchor, then cover with mulch as directed.

4. A three inch (3") layer (after settlement) of mulch or approved equal shall be applied directly on top of weed mate to the entire area of each saucer or planting bed.

3.04 PLANT BED EXCAVATIONS

Excavate tree pits and plant beds to the depth indicated on the detail sheet.

3.05 MAINTENANCE DURING CONSTRUCTION

A. Maintenance shall begin immediately after planting. Plants shall be watered, mulched, weeded, pruned, sprayed, fertilized, cultivated, and otherwise maintained and protected until provisional acceptance. Settled plants shall be reset to proper grade and position, planting saucer restored and dead material removed. Stakes and wires shall be tightened and repaired. Defective work shall be corrected as soon as possible after it becomes apparent and weather and season permit.

B. If a substantial number of plants are sickly or dead at the time of inspection, acceptance shall not be granted and the Contractor's responsibility for maintenance of all plants shall be extended until replacements are made.

C. All replacements shall be plants of the same kind and size specified on the Plant List. They shall be furnished and planted as specified above. The cost shall be borne by the Contractor. Replacements resulting from removal, loss, or damage due to occupancy of the project in any part, vandalism, physical damage by animals, vehicles, etc., and losses due to curtailment of water by local authorities shall be approved and paid for by the Owner.

D. Plants shall be guaranteed for a period of one (1) year after inspection and provisional acceptance.

E. At the end of the Establishment Period, inspection shall be made again. Any plant required under this contract that is dead or unsatisfactory to the Owner shall be removed from the site. These shall be replaced during the normal planting season.

3.06 SEEDING

A. Area - All exterior ground within the limit of contract, except surfaces occupied by buildings and structures and paving, except areas indicated to be undisturbed, shall be seeded or planted as shown on drawings.

Furnish topsoil, finish grading, prepare see bed, seed and maintain areas as indicated on the drawings.

B. Seed Bed Preparation - Grade areas to finish grades, filling as needed or removing surplus dirt and floating areas to a smooth, uniform grade as indicated on grading plans. All lawn areas shall slope to drain. Where no grades are shown, areas shall have a smooth and continual grade between existing or fixed controls (such as walks, curbs, catch basin, elevational steps or building) and elevations shown on plans. Roll, scarify, rake and level as necessary to obtain true, even lawn surfaces. All finish grades shall meet approval of the Landscape Architect, before grass seed is sown. Loosen soil to a depth of six inches (6") in lawn areas by approved method of scarification and grade to remove ridges and depressions. Remove stones or foreign matter over two inches (2") in diameter from the top two inches (2") of soil. Float lawn areas to approximately finish grades.

C. Seed beds should be permitted to settle or should be firmed by rolling before seedings are made.

D. Seeding shall not performed in windy weather.

E. Seeding shall be done in two (2) directions at right angles to each other.

F. Lawn areas shall be seeded by sowing evenly with an approved mechanical seeder at the rate of a minimum of three (3) pounds per 1,000 square feet. Culti-packer or approved similar equipment may be used to cover the seed and to form the seed bed in one operation. In areas inaccessible to culti-packer, the seeded ground shall be lightly raked with flexible rakes and rolled with a water ballast roller. After rolling, seeded areas are to be lightly mulched with wheat straw.

G. If the project completion date prohibits in-season planting, the Contractor shall prepare himself for out-of- season seeding or sodding so that all lawns shall be completed and ready for acceptance at time of project completion, without additional cost to the Owner. Lawn maintenance shall be the same as for other planting.

H. Lawns shall be maintained by the Contractor for at least 30 days after sodding and 60 days after seeding, or as long as is necessary to establish a uniform stand of the specified grasses, or until substantial completion of the project or until acceptance of lawns, whichever is later.

I. In the event that lawn operations are completed too late in the Fall for adequate germination and/or growth, maintenance shall continue into the following growing season or until a uniform stand of the specified grasses has been established.

J. Water seeded areas twice the first week to a minimum depth of six inches (6") with a fine spray and once per week thereafter as necessary to supplement natural rain to the equivalent of one inch (1") or to a six inch (6") depth.

K. The surface layer of soil for seeded areas must be kept moist during the germination period. After first cutting, water as specified above.

L. Make weekly inspections to determine the moisture content of the soil and adjust the watering schedule established by the irrigation system installer to fit conditions.

M. After grass growth has started, all areas or parts of areas which fail to show a uniform stand of grass for any reason whatsoever shall be reseeded in accordance with the plans and as specified herein. Such areas and parts of areas shall be reseeded repeatedly until all areas are covered with a satisfactory growth of grass at no additional cost to the Owner.

N. Watering shall be done in such a manner and as frequently as is deemed necessary by the Landscape Architect to assure continued growth of healthy grass. All areas of the site shall be watered in such a way as to prevent erosion due to excessive quantities applied over small areas and to avoid damage to the finished surface due to the watering equipment.

O. Water for the execution and maintenance of this work shall be provided by the Owner at no expense to the Contractor. The Contractor shall, however, furnish his own portable tanks, pumps, hose, pipe, connections, nozzles, and any other equipment required to transport the water from the available outlets and apply it to the seeded areas in an approved manner.

P. Mowing of the seeded areas shall be initiated when the grass has attained a height of one and one-half to two inches (1-1/2" to 2"). Grass height shall be maintained between one and one and one-half inches (1" to 1-1/2") at subsequent cuttings depending on the time of year. Not more than one third (1/3) of the grass leaf shall be removed at any cutting and cutting shall not occur closer than ten (10) days apart.

Q. When the amount of grass is heavy, it shall be removed to prevent destruction of the underlying turf. If weeds or other undesirable vegetation threaten to smother the planted species, such vegetation shall be mowed or, in the case of rank growths, shall be uprooted, raked and removed from the area by methods approved by the Landscape Architect.

R. Protect seeded area against trespassing while the grass is germinating. Furnish and install fences, signs, barriers or any other necessary temporary protective devices. Damage resulting from trespass, erosion, washout, settlement or other causes shall be repaired by the Contractor at his expense.

S. Remove all fences, signs, barriers or other temporary protective devices after final acceptance.

3.07 SOD

A. Area - As noted on plan, a 3-foot wide strip shall be sodded along walks, roadways, and parking areas to prevent washing and erosion.

B. Sod Bed Preparation - Grade areas to finish grade, filling as needed or removing surplus dirt, stones, debris, etc. and floating areas to a smooth, uniform grade as indicated on grading plans. All lawn areas are to slope to drain.

C. Sod shall be cut and laid on site the same day. Only healthy vigorous growing sod is to be laid.

D. Always lay sod across slope and tightly together so as to make a solid area.

E. Roll or firmly but lightly tamp with suitable wooden or metal tamper all new sod sufficiently to set or press sod into underlaying soil.

F. After sodding has been completed, clean up and thoroughly moisten by sprinkler newly sodded areas.

PART 4 MAINTENANCE CONTRACT

4.01 GENERAL LANDSCAPING

A. Contractor shall provide the Owner with three (3) written proposals due no later that the established possession date for landscape maintenance from experienced local A.N.A. certified nursery businesses capable of performing the work outlined herein. The accepted proposal and maintenance contract will be for a period of 1 year and renewable in one year increments. Maintenance will begin immediately after final approval and acceptance of the landscaping and irrigation by the Owner.

B. Landscape maintenance shall include all necessary watering, cultivation, weeding, pruning, wound dressing, disease and insect pest control, protective spraying, replacement of dead plant material (labor only), straightening plants which lean or sag, adjustments of plants which settle or are planted too low, mowing of turf areas, replacement of mulch that has been displaced by erosion or other means, repairing and reshaping of water rings or saucers, re-placement of mulch that has been displaced by erosion or subsidence, and the reseeding or replanting of those areas affected. Removal of all rubbish, waste, tools, and equipment used in the execution of the contract at the end of each work day, and any other procedure consistent with good horticultural practice necessary to insure normal, vigorous and healthy growth of all plant material are also part of this maintenance contract.

C. During the first year of the maintenance contract, any replacement of plant material shall be the responsibility of the general contractor with exceptions as listed in Section 2900, 3.05, C.

D. Landscape maintenance contractor shall purchase and maintain Contractor's general liability insurance in the amounts of $1,000,000 to protect him from the Contractor's operations under the maintenance contract. Certification of such insurance shall be filed with the Owner prior to the commencement of the work.

4.02 WATERING

A. The irrigation system, if installed on the site, shall be used by the maintenance contractor for the watering program, but any failure of the system does not eliminate the Contractor's responsibility of maintaining the desired level of moisture necessary to maintain vigorous, healthy growth.

B. The quality of water applied at one time shall be sufficient to penetrate the soil to a minimum of eight inches (8") in shrub beds and six inches (6") in turf areas at a rate which will prevent saturation of the soil.

C. On-site water shall be furnished by the Owner. Hose and other watering equipment shall be furnished by the Contractor.

4.03 WEEDING

Maintenance contractor shall keep all planting areas free from weeds and undesirable grasses by a method and by materials approved by the A.N.A.

4.04 DISEASE AND INSECT PEST CONTROL

Inspect all plant material at least once a month to locate any disease or insect pest infestations. Upon the discovery of any disease or insect pest infestation, identify, or have identified, the nature or species of the infestation. A method of control in accordance with common A.N.A. standards shall be immediately implemented.

4.05 FERTILIZING

Maintenance contractor is to fertilize plant material on a regularly scheduled program to fit the requirements of the plant material to maintain vigorous and healthy plant growth.

4.06 PRUNING AND REPAIR

The amount of pruning shall be limited to the minimum necessary to remove dead or injured twigs and branches and to compensate for the loss of roots as a result of transplanting operation and/or to maintain safety in vehicular use areas. Pruning shall be done in such a manner as to not change the natural habit or shape of the plant. All cuts shall be made flush, leaving no stubs.

4.07 MOWING

Mow all grass areas at regular intervals to keep the grass height from exceeding three inches (3"). Mow grass areas in such a manner as to prevent clippings from blowing on paved areas, and sidewalks. Cleanup after mowing shall include sweeping or blowing of paved areas and sidewalks to clear them from mowing debris.

4.08 CLEAN UP

During the course of maintenance planting, excess and waste materials shall be continuously and promptly removed at the end of each work day.

4.09 MAINTENANCE REPORT AND SCHEDULE OF ACTIVITIES

Maintenance contractor shall provide a schedule and report to store management and to the address referenced in Section 2900, 4.01, A. that details his planned maintenance activities including any subcontractors.

4.10 GENERAL IRRIGATION

A. Landscape maintenance contractor shall maintain the irrigation system in good operating condition through periodic monthly inspections of all system components and make repairs as necessary. This includes checking and verifying operation in each zone, the alignment of heads, rain sensors, controller, and check leaks.

B. Landscape maintenance contractor shall make every effort to conserve water by adjusting the programming to allow for weather changes and growth seasons. Irrigation operations should be conducted between 2:00 A.M. and 6:00 A.M. unless other hours are requested by the store management.

4.11 WINTER SHUT DOWN

A. When cold weather approaches and the chance for freezing conditions exist, the system should be drained after each use.

B. Winter shut down procedure as follows:

-Shut water off at main gate valve
-Open all manual drain valves
-Blow out each section twice with compressed air
-Set controller to cycle through each section the minimum time available, once a day through Winter months
-If backflow prevention is installed with unions, remove and store out of the weather.

4.12 SPRING START UP

A. Spring start up procedure as follows:

-Reinstall backflow prevention
-Close all manual drain valves
-Slowly turn water on
-Check for leaks and proper alignment of heads
-Repair and adjust system as required for proper operation

4.13 COMPONENT REPLACEMENT

If replacement of component parts in the irrigation system becomes necessary after normal use, and after the original period of warranty has expired (Section 2810, 3.03), the Owner is responsible for the expense of these replacement components, if there has been no mishandling of these items on the part of the maintenance contractor.

4.14 MAINTENANCE CONTRACT

These terms and conditions herein outlined shall be attached and made a part of a maintenance contract with the Owner.

4.15 TERMINATION OF THE MAINTENANCE CONTRACT

A. If the Owner fails to make payment for a period of ninety (90) days without written clarification, the maintenance contractor may, upon twelve (12) additional days' written notice to the Owner, terminate the contract and recover from the Owner, payment for all work executed and for any proven loss sustained upon any materials, equipment, or tools, including reasonable profit and damages applicable to the maintenance contract.

B. If the maintenance contractor defaults or persistently fails or neglects to carry out the work in accordance with the maintenance contract, the Owner, after twelve (12) days' written notice to the maintenance contractor, and without prejudice to any other remedy they may have, may make good such deficiencies and deduct the cost thereof, including compensation for additional services made necessary thereby, from the payment then or thereafter due the contractor, or at their option, may terminate the contract.

END OF SECTION 02900

SECTION 03100

CONCRETE FORMS AND ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Formwork for cast-in place concrete.
2. Shoring, bracing, and anchorage.
3. Architectural form liners.
4. Form accessories.
5. Form stripping.

B. Related Sections:
1. Section 03200 - Concrete Reinforcement.
2. Section 03300 - Cast-in-Place Concrete.

1.2 REFERENCES

A. American Concrete Institute:
1. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials.
2. ACI 301 - Specifications for Structural Concrete.
3. ACI 318 - Building Code Requirements for Structural Concrete.
4. ACI 347 - Guide to Formwork for Concrete.

B. American Forest and Paper Association:
1. AF&PA - National Design Specifications for Wood Construction.

C. The Engineered Wood Association:
1. APA/EWA PS 1 - Voluntary Product Standard for Construction and Industrial Plywood.

D. ASTM International:
1. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
2. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

E. West Coast Lumber Inspection Bureau:
1. WCLIB - Standard Grading Rules for West Coast Lumber.

1.3 DESIGN REQUIREMENTS

A. Design, engineer and construct formwork, shoring and bracing in accordance with ACI 318 to conform to design and applicable code requirements to achieve concrete shape, line and dimension as indicated on Drawings.

1.4 PERFORMANCE REQUIREMENTS

A. Vapor Retarder Permeance: Maximum 1 perm perms when tested in accordance with ASTM E96, Procedure A.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 347 ACI 301 ACI 318.

B. For wood products furnished for work of this Section, comply with AF&PA.

C. Perform Work in accordance with State Municipality of Highways Public Work's standard.

1.6 COORDINATION

A. Section 01300 - Administrative Requirements: Coordination and project conditions.

B. Coordinate this Section with other sections of work, requiring attachment of components to formwork.

PART 2 PRODUCTS

2.1 WOOD FORM MATERIALS

A. Form Materials: At discretion of Contractor.

2.2 FORMWORK ACCESSORIES

A. Vapor Retarder: Where indicated on Drawings, 10 mil thick polyethylene sheet manufacture by:
1. Stego Wrap Class A: by Stego Industries LLC (887) 464-7834
2. Griffolyn by Reef Industries (800) 231-6074
3. VaporBlock 10 by Raven Industries (800) 635-3456
4. Perminator Vapor – May by W.R. Meadows (800) 342-5976
5. Or Equivalent

B. Bituminous Joint Filler: ASTM D1751.

C. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Size, strength and character to maintain formwork in place while placing concrete.

D. Water Stops: Rubber Polyvinyl chloride, minimum 1,750 psi tensile strength, minimum 50 degrees F to plus 175 degrees F working temperature range, inch wide, maximum possible lengths, ribbed profile, preformed corner sections, heat welded jointing.

****** OR ******

E. Waterstop: Flexible strip of bentonite waterproofing compound in coil form for joints in concrete construction.
1. Colloid Environmental Technologies Company Model.
2. TC MiraDRi Model.
3. Paramount Technical Products Model.
4. Substitutions: Section 01600 - Product Requirements Not Permitted.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01300 - Administrative Requirements: Coordination and project conditions.

B. Verify lines, levels, and centers before proceeding with formwork. Verify dimensions agree with Drawings.

C. When formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement before proceeding, request instructions from Architect/Engineer.

3.2 INSTALLATION

A. Earth Forms:
1. Earth forms are not permitted.

B. Formwork - General:
1. Provide top form for sloped surfaces steeper than 1.5 horizontal to 1 vertical to hold shape of concrete during placement, unless it can be demonstrated that top forms can be omitted.
2. Construct forms to correct shape and dimensions, mortar-tight, braced, and of sufficient strength to maintain shape and position under imposed loads from construction operations.
3. Camber forms where necessary to produce level finished soffits unless otherwise shown on Drawings.
4. Carefully verify horizontal and vertical positions of forms. Correct misaligned or misplaced forms before placing concrete.
5. Complete wedging and bracing before placing concrete.

C. Forms for Smooth Finish Concrete:
   1. Use steel, plywood or lined board forms.
   2. Use clean and smooth plywood and form liners, uniform in size, and free from surface and edge damage capable of affecting resulting concrete finish.
   3. Install form lining with close-fitting square joints between separate sheets without springing into place.
   4. Use full size sheets of form lines and plywood wherever possible.
   5. Tape joints to prevent protrusions in concrete.
   6. Use care in forming and stripping wood forms to protect corners and edges.
   7. Level and continue horizontal joints.
   8. Keep wood forms wet until stripped.

D. Erect formwork, shoring, and bracing to achieve design requirements, in accordance with requirements of ACI 301 ACI 318.

E. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

F. Obtain Architect/Engineer's approval before framing openings in structural members not indicated on Drawings.

G. Install fillet and chamfer strips on external corners of beams joists columns and.

H. Install void forms in accordance with manufacturer's recommendations.
   1. SureVoid Products, Inc., Englewood, CO (800) 458-5444.

I. Do not reuse wood formwork more than times for concrete surfaces to be exposed to view. Do not patch formwork.

3.3 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

C. Do not apply form release agent where concrete surfaces are indicated to receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

D. Reuse and Coating of Forms: Thoroughly clean forms and reapply form coating before each reuse. For exposed work, do not reuse forms with damaged faces or edges. Apply form coating to forms in accordance with manufacturer's specifications. Do not coat forms for concrete indicated to receive "scored finish". Apply form coatings before placing reinforcing steel.

3.4 INSTALLATION - INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Install formed openings for items to be embedded in or passing through concrete work.

B. Locate and set in place items required to be cast directly into concrete.

C. Coordinate with Work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.

D. Install accessories straight, level, and plumb. Ensure items are not disturbed during concrete placement.

E. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.

F. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

G. Form Ties:
1. Use sufficient strength and sufficient quantity to prevent spreading of forms.
2. Place ties at least 1 inch away from finished surface of concrete.
3. Leave inner rods in concrete when forms are stripped.
4. Space form ties equidistant, symmetrical and aligned vertically and horizontally unless otherwise shown on Drawings.

H. Arrangement: Arrange formwork to allow proper erection sequence and to permit form removal without damage to concrete.

I. Construction Joints:
1. Install surfaced pouring strip where construction joints intersect exposed surfaces to provide straight line at joints.
2. Just prior to subsequent concrete placement, remove strip and tighten forms to conceal shrinkage.
3. Show no overlapping of construction joints. Construct joints to present same appearance as butted plywood joints.
4. Arrange joints in continuous line straight, true and sharp.

J. Openings for Items Passing Through Concrete:
1. Frame openings in concrete where indicated on Drawings. Establish exact locations, sizes, and other conditions required for openings and attachment of work specified under other sections.
2. Coordinate work to avoid cutting and patching of concrete after placement.
3. Perform cutting and repairing of concrete required as result of failure to provide required openings.

K. Screeds:

1. Set screeds and establish levels for tops of concrete slabs and levels for finish on slabs.
2. Slope slabs to drain where required or as shown on Drawings.
3. Before depositing concrete, remove debris from space to be occupied by concrete and thoroughly wet forms. Remove freestanding water.

L. Screed Supports:
1. For concrete over waterproof membranes and vapor retarder membranes, use cradle, pad or base type screed supports which will not puncture membrane.
2. Staking through membrane is not be permitted.

M. Cleanouts and Access Panels:
1. Provide removable cleanout sections or access panels at bottoms of forms to permit inspection and effective cleaning of loose dirt, debris and waste material.
2. Clean forms and surfaces against which concrete is to be placed. Remove chips, saw dust and other debris. Thoroughly blow out forms with compressed air just before concrete is placed.

3.5 FORM CLEANING

A. Clean forms as erection proceeds, to remove foreign matter within forms.

B. Clean formed cavities of debris prior to placing concrete.

C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

3.6 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads and removal has been approved by Architect/Engineer.

B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

D. Leave forms in place for minimum number of days as specified in ACI 347.

3.7 ERECTION TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 301 ACI 318.

****** OR ******

B. Camber slabs and beams 1/4 inch per 10 feet in accordance with ACI 301 ACI 318.

3.8 FIELD QUALITY CONTROL

A. Section 01400 - Quality Requirements 01700 - Execution Requirements: Field inspecting, testing, adjusting, and balancing.

B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.

C. Notify Architect/Engineer after placement of reinforcing steel in forms, but prior to placing concrete.

D. Schedule concrete placement to permit formwork inspection before placing concrete.

END OF SECTION

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Reinforcing bars.
2. Welded wire fabric.
3. Reinforcement accessories.

B. Related Sections:
1. Section 03100 - Concrete Forms and Accessories.
2. Section 03300 - Cast-in-Place Concrete.
3. Section 03350 - Concrete Finishing: Reinforcement for concrete floor toppings.

1.2 REFERENCES

A. American Concrete Institute:
1. ACI 301 - Specifications for Structural Concrete.
2. ACI 318 - Building Code Requirements for Structural Concrete.
3. ACI 530.1 - Specifications for Masonry Structures.
4. ACI SP-66 - ACI Detailing Manual.

B. ASTM International:
1. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
2. ASTM A184/A184M - Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
3. ASTM A496 - Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.
4. ASTM A497 - Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
5. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
6. ASTM A704/A704M - Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement.
7. ASTM A706/A706M - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
8. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
9. ASTM A775/A775M - Standard Specification for Epoxy-Coated Reinforcing Steel Bars.

10. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement.
11. ASTM A934/A934M - Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars.
12. ASTM A996/A996M - Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement.
13. ASTM D3963/D3963M - Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Reinforcing Steel Bars.

C. American Welding Society:
1. AWS D1.4 - Structural Welding Code - Reinforcing Steel.

D. Concrete Reinforcing Steel Institute:
1. CRSI - Manual of Standard Practice.
2. CRSI - Placing Reinforcing Bars.

1.3 SUBMITTALS

A. Section 01330 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate bar sizes, spacings, locations, and quantities of reinforcing steel and welded wire fabric, bending and cutting schedules, and supporting and spacing devices and.

C. Certificates: Submit AWS qualification certificate for welders employed on the Work.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.
1. Submit certified copies of mill test report of reinforcement materials analysis.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with CRSI - Manual of Standard Practice ACI 301 ACI 318.

B. Prepare shop drawings in accordance with ACI SP-66.

C. Perform Work in accordance with State Municipality of Highways Public Work's standard.

1.5 QUALIFICATIONS

A. Welders: AWS qualified within previous 12 months.

1.6 COORDINATION

A. Section 01300 - Administrative Requirements: Coordination and project conditions.

B. Coordinate with placement of formwork, formed openings and other Work.

PART 2 PRODUCTS

2.1 REINFORCEMENT

A. Deformed and Plain Reinforcement: ASTM A615/A615M; 60 ksi yield strength, steel bars, unfinished galvanized finish epoxy coated finish.

2.2 ACCESSORY MATERIALS

A. Tie Wire: Minimum 16 gage annealed type, epoxy coated.

B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent vapor retarder puncture.

C. Special Chairs, Bolsters, Bar Supports, Spacers Adjacent to Weather Exposed Concrete Surfaces: Plastic-coated steel Plastic tipped steel Stainless steel type; size and shape to meet Project conditions.

D. Reinforcing Splicing Devices: Exothermic welding type; full tension and compression; sized to fit joined reinforcing.

****** OR ******

E. Reinforcing Splicing Devices: Mechanical set screw swaged threaded type; full tension and compression; sized to fit joined reinforcing.

F. Epoxy Coating Patching Material: Type as recommended by coating manufacturer.

2.3 FABRICATION

A. Fabricate concrete reinforcement in accordance with CRSI Manual of Practice ACI 318 applicable code.

B. Form standard hooks for 180 degree bends, 90 degree bend, stirrup and tie hooks, and seismic hooks as indicated on Drawings.

C. Form reinforcement bends with minimum diameters in accordance with ACI 318 applicable code.

D. Fabricate column reinforcement with offset bends at reinforcement splices.

E. Form spiral column reinforcement from minimum 3/8 inch diameter continuous plain deformed bar or wire.

F. Form ties and stirrups from the following:
   1. For bars No. 10 and Smaller: No. 3 deformed bars deformed wire.
   2. For bars No. 11 and Larger: No. 4 deformed bars deformed wire.

G. Weld reinforcement in accordance with AWS D1.4.

H. Galvanized Epoxy-Coated Reinforcement: Clean surfaces, weld and re-protect welded joint in accordance with CRSI.

I. Locate reinforcement splices not indicated on Drawings, at point of minimum stress. Review location of splices with Architect/Engineer.

2.4 SHOP FINISHING

A. Galvanized Finish for Steel Bars: ASTM A767/A767M, Class I II, hot dip galvanized after fabrication.

B. Epoxy Coated Finish for Steel Bars: ASTM A775/A775M ASTM A934/A934M.

C. Epoxy Coated Finish for Steel Wire: ASTM A884/A884M; Class A using ASTM A775/A775M ASTM A934/A934M.

PART 3 EXECUTION

3.1 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position beyond specified tolerance.
   1. Do not weld crossing reinforcement bars for assembly except as permitted by Architect/Engineer.

B. Do not displace or damage vapor retarder.

C. Accommodate placement of formed openings.

D. Space reinforcement bars with minimum clear spacing in accordance with ACI 318 of one bar diameter, but not less than 1 inch.
   1. Where bars are indicated in multiple layers, place upper bars directly above lower bars.

E. Maintain concrete cover around reinforcement in accordance with ACI 318 applicable code as follows:

Footings and Concrete Formed Against Earth	3 inches

Concrete exposed to earth or weather	No. 6 bars and larger	2 inches
	No. 5 bars and smaller	1-1/2 inches
Supported Slabs, Walls, and Joists	No. 14 bars and larger	1-1/2 inches
	No. 11 bars and smaller	3/4 inches
Beams and Columns		1-1/2 inches
Shell and Folded Plate Members	No. 6 bars and larger	3/4 inches
	No. 5 bars and smaller	1/2 inches

3.2 ERECTION TOLERANCES

A. Section 01400 - Quality Requirements: Tolerances.

B. Install reinforcement within the following tolerances for flexural members, walls, and compression members:

Reinforcement Depth	Depth Tolerance	Concrete Cover Tolerance
Greater than 8 inches	plus or minus 3/8 inch	minus 3/8 inch
Less than 8 inches	plus or minus 1/2 inch	minus 1/2 inch

C. Install reinforcement within the tolerances specified in ACI 530.1 for foundation walls.

3.3 FIELD QUALITY CONTROL

A. Section 01400 - Quality Requirements 01700 - Execution Requirements: Field inspecting, testing, adjusting, and balancing.

B. Field inspection and testing will be performed by Owner's testing laboratory in accordance with ACI 318 applicable code.

C. Perform field inspection and testing in accordance with ACI 318 applicable code.

D. Provide free access to Work and cooperate with appointed firm.

E. Reinforcement Inspection:
1. Placement Acceptance: Specified and ACI 318 material requirements and specified placement tolerances.
2. Welding: Inspect welds in accordance with AWS D1.1.

3. Periodic Placement Inspection: Inspect for correct materials, fabrication, sizes, locations, spacing, concrete cover, and splicing.
4. Weldability Inspection: Inspect for reinforcement weldability when formed from steel other than ASTM A706/A706M.
5. Continuous Weld Inspection: Inspect reinforcement as required by ACI 318 applicable code.
6. Periodic Weld Inspection: Other welded connections.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. Section includes cast-in-place concrete for the following:
1. Building frame members.
2. Shear walls.
3. Foundation walls.
4. Supported slabs.
5. Slabs on grade.
6. Control, expansion and contraction joint devices.

B. Related Sections:
1. Section 03100 - Concrete Forms and Accessories: Formwork and accessories. Placement of joint device joint device anchors in formwork.
2. Section 03200 - Concrete Reinforcement.
3. Section 03350 - Concrete Finishing.
4. Section 03390 - Concrete Curing.

1.2 REFERENCES

A. American Concrete Institute:
1. ACI 301 - Specifications for Structural Concrete.
2. ACI 305 - Hot Weather Concreting.
3. ACI 306.1 - Standard Specification for Cold Weather Concreting.
4. ACI 308.1 - Standard Specification for Curing Concrete.
5. ACI 318 - Building Code Requirements for Structural Concrete.

B. ASTM International:
1. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
2. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
3. ASTM C33 - Standard Specification for Concrete Aggregates.
4. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
5. ASTM C42/C42M - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
6. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.

7. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic Cement Concrete.
8. ASTM C150 - Standard Specification for Portland Cement.
9. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
10. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
11. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
12. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
13. ASTM C330 - Standard Specification for Lightweight Aggregates for Structural Concrete.
14. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
15. ASTM C595 - Standard Specification for Blended Hydraulic Cements.
16. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
17. ASTM C685/C685M - Standard Specification for Concrete Made By Volumetric Batching and Continuous Mixing.
18. ASTM C845 - Standard Specification for Expansive Hydraulic Cement.
19. ASTM C989 - Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
20. ASTM C1017/C1017M - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
21. ASTM C1064/C1064M - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
22. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
23. ASTM C1116 - Standard Specification for Fiber-Reinforced Concrete and Shotcrete.
24. ASTM C1157 - Standard Performance Specification for Hydraulic Cement.
25. ASTM C1218 - Standard Test Method for Water-Soluble Chloride in Mortar and Concrete.
26. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures.
27. ASTM D994 - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
28. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
29. ASTM D1752 - Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
30. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
31. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

32. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
33. ASTM E1643 - Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs.
34. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

1.3 PERFORMANCE REQUIREMENTS

A. Vapor Retarder Permeance: Maximum 1 perm when tested in accordance with ASTM E96, Procedure A.

1.4 SUBMITTALS

A. Section 01330 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data on joint devices, attachment accessories, admixtures.

C. Design Data:
1. Submit concrete mix design for each concrete strength. Submit separate mix designs when admixtures are required for the following:
   a. Hot and cold weather concrete work.
   b. Air entrained concrete work.
2. Identify mix ingredients and proportions, including admixtures.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301 ACI 318.

B. Conform to ACI 305 when concreting during hot weather.

C. Conform to ACI 306.1 when concreting during cold weather.

D. Acquire cement and aggregate from one source for Work.

1.6 COORDINATION

A. Section 01300 - Administrative Requirements: Coordination and project conditions.

B. Coordinate placement of joint devices with erection of concrete formwork and placement of form accessories.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

A. Cement: ASTM C150, Type I - Normal Type IA - Air Entraining Type II - Moderate Type IIA - Air Entraining Type III - High Early Strength Type IIIA - Air Entraining Type IV - Low Heat of Hydration Type V - Sulfate Resistant Portland type; manufactured by; ASTM C595, list appropriate blend and cement type.

B. Normal Weight Aggregates: ASTM C33.
   1. Coarse Aggregate Maximum Size: inches In accordance with ACI 318. Water: ACI 318; potable, without deleterious amounts of chloride ions with maximum percent of water soluble chloride ions by weight of cement.

2.2 ADMIXTURES

A. Furnish materials in accordance with State Municipality of Highways Public Work's standards.

B. Air Entrainment: ASTM C260.

C. Chemical: ASTM C494/C494M Type A - Water Reducing Type B - Retarding Type C - Accelerating Type D - Water Reducing and Retarding Type E - Water Reducing and Accelerating Type F - Water Reducing, High Range Type G - Water Reducing, High Range and Retarding.

D. Fly Ash Calcined Pozzolan: ASTM C618 Class.

E. Silica Fume: ASTM C1240.

F. Slag: ASTM C989; Grade 80 100 120; ground granulated blast furnace slag.

G. Plasticizing: ASTM C1017/C1017M Type I, plasticizing Type II, plasticizing and retarding.

2.3 ACCESSORIES

A. Bonding Agent: Polymer resin emulsion Polyvinyl Acetate Latex emulsion Two component modified epoxy resin Non-solvent two component polysulfide epoxy Mineral filled polysulfide polymer epoxy Mineral filled polysulfide polymer epoxy resin Polyamid cured epoxy.

B. Vapor Retarder: ASTM E1745 Class A B C; 10 mil thick polyethylene film fabric reinforced plastic film; type recommended for below grade application. Furnish joint tape recommended by manufacturer.

C. Non-Shrink Grout: ASTM C1107, Grade A B C; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 psi in 48 hours and 7,000 psi in 28 days.

2.4 JOINT DEVICES AND FILLER MATERIALS

A. Joint Filler Type A: ASTM D1751 ASTM D994; Asphalt impregnated fiberboard or felt, 1/4 inch thick; tongue and groove profile.

****** OR ******

B. Joint Filler Type B: ASTM D1752; Closed cell polyvinyl chloride molded vinyl foam, resiliency recovery of 95 percent if not compressed more than 50 percent of original thickness.

****** OR ******

C. Joint Filler Type C: ASTM D1752; Premolded sponge rubber fully compressible with recovery rate of minimum 95 percent.

D. Construction Joint Devices: Integral galvanized steel extruded plastic; inch thick, formed to tongue and groove profile, with removable top strip exposing sealant trough, knockout holes spaced at 6 inches, ribbed steel spikes with tongue to fit top screed edge; manufactured by.

E. Expansion and Contraction Joint Devices: ASTM B221 alloy, extruded aluminum; resilient elastomeric vinyl neoprene filler strip with Shore A hardness of 35 to permit plus or minus 25 percent joint movement with full recovery; extruded aluminum vinyl cover plate, of longest manufactured length at each location, flush recessed mounted; color as selected; manufactured by.

F. Sealant: ASTM D6690, Type I.

2.5 CONCRETE MIX

A. Select proportions for normal weight concrete in accordance with ACI 301 Method 1

B. Admixtures: Include admixture types and quantities indicated in concrete mix designs only when approved by Architect/Engineer.
   1. Use accelerating admixtures in cold weather. Use of admixtures will not relax cold weather placement requirements.
   2. Do not use calcium chloride nor admixtures containing calcium chloride.
   3. Use set retarding admixtures during hot weather.
   4. Add air entrainment admixture to concrete mix for work exposed to freezing and thawing or deicing chemicals.

5. For concrete exposed to deicing chemicals, limit fly ash, pozzolans, silica fume, and slag content as required by applicable code.

C. Average Compressive Strength Reduction: Not permitted.

D. Ready Mixed Concrete: Mix and deliver concrete in accordance with ASTM C94/C94M ASTM C685/C685M.

E. Site Mixed Concrete: Mix concrete in accordance with ACI 318.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01300 - Administrative Requirements: Coordination and project conditions.

B. Verify requirements for concrete cover over reinforcement.

C. Verify anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with placing concrete.

3.2 PREPARATION

A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent. Remove laitance, coatings, and unsound materials.

B. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

C. Remove debris and ice from formwork, reinforcement, and concrete substrates.

D. Remove water from areas receiving concrete before concrete is placed.

3.3 PLACING CONCRETE

A. Place concrete in accordance with ACI 301 ACI 318.

B. Notify testing laboratory and Architect/Engineer minimum 24 hours prior to commencement of operations.

C. Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints, and are not disturbed during concrete placement.

D. Install vapor retarder under interior slabs on grade in accordance with ASTM E1643. Lap joints minimum 6 inches and seal watertight by adhesive applied between overlapping edges and ends taping edges and ends.

E. Repair vapor retarder damaged during placement of concrete reinforcing. Repair with vapor retarder material; lap over damaged areas minimum 6 inches and seal watertight.

F. Install construction joint devices in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

G. Install joint device anchors. Maintain correct position to allow joint cover to be flush with floor and wall finish.

H. Install joint covers in one piece longest practical length, when adjacent construction activity is complete.

I. Apply sealants in joint devices in accordance with Section 07900.

J. Deposit concrete at final position. Prevent segregation of mix.

K. Place concrete in continuous operation for each panel or section determined by predetermined joints.

L. Consolidate concrete.

M. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

N. Place concrete continuously between predetermined expansion, control, and construction joints.

O. Do not interrupt successive placement; do not permit cold joints to occur.

P. Place floor slabs in checkerboard or saw cut pattern indicated.

Q. Saw cut joints within 12 hours after placing. Use 3/16 inch thick blade, cut into 1/4 depth of slab thickness.

R. Screed floors and slabs on grade level, maintaining surface flatness of F_f of 20 maximum 1/4 inch in 10 ft.

3.4 CONCRETE FINISHING

A. Provide formed concrete surfaces to be left exposed concrete walls columns beams joists with smooth rubbed sand float sack rubbed finish as Scheduled in this section.

B. Finish concrete floor surfaces in accordance with ACI 301 ACI 318.

C. Wood float surfaces receiving quarry tile ceramic tile terrazzo with full bed setting system.

D. Steel trowel surfaces receiving carpeting resilient flooring seamless flooring thin set quarry tile thin set ceramic tile.

E. Steel trowel surfaces which are indicated to be exposed.

F. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1/8 1/4 inch per foot nominal as indicated on drawings.

3.5 CURING AND PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
   1. Protect concrete footings from freezing for minimum 5 days.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

C. Cure concrete in accordance with ACI 308.1

D. Cure floor surfaces in accordance with ACI 301 ACI 318.

E. Ponding: Maintain 100 percent coverage of water over floor slab areas continuously for 7 days.

F. Spraying: Spray water over floor slab areas and maintain wet for 7 days.

3.6 FIELD QUALITY CONTROL

A. Section 01400 - Quality Requirements 01700 - Execution Requirements: Field inspecting, testing, adjusting, and balancing.

B. Perform field inspection and testing in accordance with ACI 318 applicable code.

C. Provide free access to Work and cooperate with appointed firm.

D. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of Work.

E. Concrete Inspections:
   1. Continuous Placement Inspection: Inspect for proper installation procedures.

2. Periodic Curing Inspection: Inspect for specified curing temperature and procedures.

F. Strength Test Samples:
1. Sampling Procedures: ASTM C172.
2. Cylinder Molding and Curing Procedures: ASTM C31/C31M, cylinder specimens, standard cured field cured.
3. Sample concrete and make one set of three cylinders for every 150 cu yds or less of each class of concrete placed each day and for every 5,000 sf of surface area for slabs and walls.
4. When volume of concrete for any class of concrete would provide less than 3 sets of cylinders, take samples from three randomly selected batches, or from every batch when less than 3 batches are used.
5. Make one additional cylinder during cold weather concreting, and field cure.

G. Field Testing:
1. Slump Test Method: ASTM C143/C143M.
2. Air Content Test Method: ASTM C173/C173M ASTM C231.
3. Temperature Test Method: ASTM C1064/C1064M.
4. Measure slump and temperature for each compressive strength concrete sample.
5. Measure air content in air entrained concrete for each compressive strength concrete sample.

H. Cylinder Compressive Strength Testing:
1. Test Method: ASTM C39.
2. Test Acceptance: In accordance with ACI 318 applicable code.
3. Test one cylinder at 7 days.
4. Test two cylinders at 28 days.
5. Dispose remaining cylinders when testing is not required.

I. Core Compressive Strength Testing:
1. Sampling and Testing Procedures: ASTM C42/C42M.
2. Test Acceptance: In accordance with ACI 318 applicable code.
3. Drill three cores for each failed strength test from concrete represented by failed strength test.

J. Water Soluble Chloride Ion Concentration Test Method: ASTM C1218; tested at 28 days.
1. Maximum Concentration: As permitted by applicable code.

K. Maintain records of concrete placement. Record date, location, quantity, air temperature and test samples taken.

3.7 PATCHING

A. Allow Architect/Engineer to inspect concrete surfaces immediately upon removal of forms.

B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Architect/Engineer upon discovery.

C. Patch imperfections as directed by Architect/Engineer in accordance with ACI 301 ACI 318.

3.8 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

B. Repair or replacement of defective concrete will be determined by Architect/Engineer.

C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect/Engineer for each individual area.

END OF SECTION

SECTION 03350

CONCRETE FINISHING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Finishing concrete floors [and floor toppings].
2. Floor surface treatment.

B. Related Sections:
1. Section 03300 - Cast-in-Place Concrete: [Prepared concrete floors ready to receive finish;] [control and formed expansion and contraction joints and joint devices].
2. Section 03360 - Concrete Finishes: Exposed aggregate finish.
3. Section 03390 - Concrete Curing.
4. Section 05810 - Expansion Joint Cover Assemblies.
5. Section 07900 - Joint Sealers.

1.2 REFERENCES

A. American Concrete Institute:
1. ACI 301 - Specifications for Structural Concrete.
2. ACI 302.1 - Guide for Concrete Floor and Slab Construction.

B. ASTM International:
1. ASTM E1155 - Standard Test Method for Determining Floor Flatness and of Levelness Using the F-number System.

1.3 SUBMITTALS

A. Section 01330 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data on concrete hardener, sealer, curing compounds curing papers and slip resistant treatment, compatibilities, and limitations.

1.4 CLOSEOUT SUBMITTALS

A. Section 01700 - Execution Requirements: Closeout procedures.

B. Operation and Maintenance Data: Submit data on maintenance renewal of applied coatings.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301 and ACI 302.1.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01600 - Product Requirements: Product storage and handling requirements.

B. Deliver materials in manufacturer's packaging including application instructions.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01600 - Product Requirements: Environmental conditions affecting products on site.

1.8 COMPOUNDS - HARDENERS AND SEALERS

A. Chemical Hardener: Magnesium fluorosilicate and zinc fluorosilicate blend

PART 2 EXECUTION

2.1 EXAMINATION

A. Section 01300 - Administrative Requirements: Coordination and project conditions.

B. Verify floor surfaces are acceptable to receive the Work of this section.

2.2 FLOOR FINISHING

A. Finish concrete floor surfaces in accordance with ACI 301 and ACI 302.1.

B. Wood float surfaces receiving quarry tile, ceramic tile, and cementitious terrazzo with full bed setting system.

C. Steel trowel surfaces receiving carpeting, resilient flooring, seamless flooring, thin set terrazzo, thin set quarry tile, and thin set ceramic tile.

D. Steel trowel surfaces which are scheduled to be exposed.

2.3 TOLERANCES

A. Section 01400 - Quality Requirements: Tolerances.

B. Measure for F(F) and F(L) tolerances for floors in accordance with ASTM E1155, within 48 hours after slab installation.

C. Finish concrete to achieve the following tolerances:
   1. Under Glazed Tile on Setting Bed: F(F) 35 and F(L) 20.
   2. Under Resilient Finishes: F(F) 75 and F(L) 50.
   3. Exposed to View and Foot Traffic: F(F) 75 and F(L) 40.
   4. Correct slab surface when actual F(F) or F(L) number for floor installation measures less than required.

D. Correct defects in defined traffic floor by grinding or removal and replacement of defective Work. Areas requiring corrective Work will be identified. Re-measure corrected areas by same process.

END OF SECTION

SECTION 03390

CONCRETE CURING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes initial and final curing of horizontal and vertical concrete surfaces.

B. Related Sections:
1. Section 03300 - Cast-In-Place Concrete.
2. Section 03350 - Concrete Finishing.

1.2 REFERENCES

A. American Concrete Institute:
1. ACI 301 - Specifications for Structural Concrete.
2. ACI 302.1 - Guide for Concrete Floor and Slab Construction.
3. ACI 308.1 - Standard Specification for Curing Concrete.
4. ACI 318 - Building Code Requirements for Structural Concrete.

B. ASTM International:
1. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.
2. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
3. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
4. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting.

1.3 SUBMITTALS

A. Section 01330 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data on curing compounds.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301 ACI 302.1 ACI 318.

PART 2 PRODUCTS

2.1 MATERIALS

A. Membrane Curing Compound Type 1

B. Water: Potable, not detrimental to concrete.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01300 - Administrative Requirements: Coordination and project conditions.

B. Verify substrate surfaces are ready to be cured.

3.2 INSTALLATION - HORIZONTAL SURFACES

A. Cure concrete in accordance with ACI 308.1.

B. Ponding: Maintain 100 percent coverage of water over floor slab areas, continuously for 4 days.

****** [OR] ******

C. Spraying: Spray water over floor slab areas and maintain wet for 7 days.

****** [OR] ******

D. Absorptive Mat: Spread cotton fabric over floor slab areas. Spray with water until mats are saturated, and maintain in saturated condition for 7 days.

****** [OR] ******

E. Absorptive Mat: Saturate burlap-polyethylene and place burlap-side down over floor slab areas, lapping ends and sides; maintain in place for 7 days.

END OF SECTION

SECTION 03600

GROUT

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Portland cement grout.
2. Rapid curing epoxy grout.
3. Non-shrink cementitious grout.

B. Related Sections:
1. Section 03300 - Cast-in-Place Concrete.

1.2 REFERENCES

A. American Concrete Institute:
1. ACI 301 - Specifications for Structural Concrete.
2. ACI 318 - Building Code Requirements for Structural Concrete.

B. American Society of Testing and Materials:
1. ASTM C33 - Standard Specification for Concrete Aggregates.
2. ASTM C40 - Test Method for Organic Impurities in Fine Aggregates for Concrete.
3. ASTM C150 - Standard Specification for Portland Cement.
4. ASTM C191 - Test Method for Time of Setting of Hydraulic Cement by Vicat Needle.
5. ASTM C307 - Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacings.
6. ASTM C531 - Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
7. ASTM C579 - Test Method for Compressive Strength of Chemical-Resistant Mortars, Grouts, monolithic Surfacings and Polymer Concretes.
8. ASTM C827 - Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures.

C. U. S. Army Corps of Engineers Concrete Research Division (CRD):
1. CRD C621 - Non-Shrink Grout.

PART 2 PRODUCTS

2.1 PORTLAND CEMENT GROUT MATERIALS

A. Portland Cement: ASTM C150, Type I and II.

B. Water:
1. Potable; containing no impurities, suspended particles, algae or dissolved natural salts in quantities capable of causing:
a. Corrosion of steel.
b. Volume change increasing shrinkage cracking.
c. Efflorescence.
d. Excess air entraining.

C. Fine Aggregate:
1. Washed natural sand.
2. Gradation in accordance with ASTM C33 and represented by smooth granulometric curve within required limits.
3. Free from injurious amounts of organic impurities as determined by ASTM C40.

D. Mix:
1. Portland cement, sand and water. Do not use ferrous aggregate or staining ingredients in grout mixes.

2.2 RAPID CURING EPOXY GROUT

A. Rapid Curing Epoxy Grout: High strength, three component epoxy grout formulated with thermosetting resins and inert fillers. Rapid-curing, high adhesion, and resistant to ordinary chemicals, acids and alkalies.

Compressive Strength	ASTM C579	12,000 psi at 7 days
Tensile Strength	ASTM C307	2,000 psi minimum
Coefficient of Expansion	ASTM C531	30x10-6 in per degree F
Shrinkage	ASTM C827	None

2.3 NON-SHRINK CEMENTITIOUS GROUT

A. Properties: Certified to maintain initial placement volume or expand after set and meet the following minimum properties when tested in accordance with CRD-C621, for Type D non-shrink grout:

Property	Test	Time	Result
Setting Time	ASTM C191	Initial	2 hours (Approx)
		Final	3 hours (Approx)

Expansion			0.10% - 0.4% Maximum
Compressive Strength	CRD-C621	1 day	4,000 psi
		7 days	7,000 psi
		28 days	10,000 psi to 10,800 psi

2.4 FORMWORK

A. Refer to Section 03100 for formwork requirements.

2.5 CURING

A. Prevent rapid loss of water from grout during first 48 hours by use of approved membrane curing compound or with use of wet burlap method.

PART 3 EXECUTION

3.1 PREPARATION

A. Remove defective concrete, laitance, dirt, oil, grease and other foreign material from concrete surfaces by brushing, hammering, chipping or other similar means until sound, clean concrete surface is achieved.

B. Rough concrete lightly, but not enough to interfere with placement of grout.

C. Remove foreign materials from metal surfaces in contact with grout.

D. Align, level and maintain final positioning of components to be grouted.

E. Saturate concrete surfaces with clean water; remove excess water, leave none standing.

3.2 MIXING

A. Portland Cement Grout:
1. Use proportions of 2 parts sand and 1 part cement, measured by volume.
2. Prepare grout with water to obtain consistency to permit placing and packing.
3. Mix water and grout in two steps; pre-mix using approximately 2/3 of water;after partial mixing, add remaining water to bring mix to desired placement consistency and continue mixing 2 to 3 minutes.
4. Mix only quantities of grout capable of being placed within 30 minutes after mixing.
5. Do not add additional water after grout has been mixed.
6. Capable of developing minimum compressive strength of 2400 psi in 48 hours and 7000 psi in 28 days.

****** [OR] ******

3.3 PLACING GROUT

A. Place grout material quickly and continuously.

B. Do not use pneumatic-pressure or dry-packing methods.

C. Apply grout from one side only to avoid entrapping air.

D. Do not vibrate placed grout mixture, or permit placement when area is being vibrated by nearby equipment.

E. Thoroughly compact final installation and eliminate air pockets.

F. Do not remove leveling shims for at least 48 hours after grout has been placed.

3.4 CURING

A. Immediately after placement, protect grout from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. After grout has attained its initial set, keep damp for minimum of 3 days.

3.5 FIELD QUALITY CONTROL

A. Submit proposed mix design of each class of grout to inspection and testing firm for review prior to commencement of Work.

B. Tests of grout components may be performed to ensure conformance with specified requirements.

END OF SECTION

SECTION 05120

STRUCTURAL STEEL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Structural shapes.
2. Channels and angles.
3. Hollow structural sections.
4. Structural pipe.
5. Structural plates and bars.
6. Fasteners, connectors, and anchors.

B. Related Sections:
1. Section 03600 - Grout: Grout for setting base plates.
2. Section 05210 - Steel Joists.
3. Section 05312 - Steel Roof Deck

1.2 REFERENCES

A. American Institute of Steel Construction:
1. AISC Code of Standard Practice for Steel Buildings and Bridges.
2. AISC Load and Resistance Factor Design (LRFD) Specification for Structural Steel Buildings.
3. AISC Load and Resistance Factor Design Specification for Single-Angle Members.
4. AISC Seismic Provisions for Structural Steel Buildings.
5. AISC Specification for Allowable Stress Design of Single-Angle Members.
6. AISC Specification for the Design of Steel Hollow Structural Sections.
7. AISC Specification for Structural Steel Buildings Allowable Stress Design, and Plastic Design.

B. ASTM International:
1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
2. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
3. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
4. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

5. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
6. ASTM A193/A193M - Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.
7. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
8. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
9. ASTM A354 - Standard Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners.
10. ASTM A449 - Standard Specification for Quenched and Tempered Steel Bolts and Studs.
11. ASTM A490 - Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength.
12. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
13. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
14. ASTM A514/A514M - Standard Specification for High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding.
15. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality.
16. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.
17. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
18. ASTM A588/A588M - Standard Specification for High-Strength Low-Alloy Structural Steel with 50 ksi (345 MPa) Minimum Yield Point to 4-in. (100-mm) Thick.
19. ASTM A618 - Standard Specification for Hot-Formed Welded and Seamless High-Strength Low-Alloy Structural Tubing.
20. ASTM A786/A786M - Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates.
21. ASTM A847 - Standard Specification for Cold-Formed Welded and Seamless High Strength, Low Alloy Structural Tubing with Improved Atmospheric Corrosion Resistance.
22. ASTM A852/A852M - Standard Specification for Quenched and Tempered Low-Alloy Structural Steel Plate with 70 ksi (485 MPa) Minimum Yield Strength to 4 in. (100 mm) Thick.
23. ASTM A913/A913M - Standard Specification for High-Strength Low-Alloy Steel Shapes of Structural Quality, Produced by Quenching and Self-Tempering Process (QST).
24. ASTM A992/A992M - Standard Specification for Structural Steel Shapes.
25. ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
26. ASTM E94 - Standard Guide for Radiographic Examination.

27. ASTM E164 - Standard Practice for Ultrasonic Contact Examination of Weldments.
28. ASTM E165 - Standard Test Method for Liquid Penetrant Examination.
29. ASTM E709 - Standard Guide for Magnetic Particle Examination.
30. ASTM F436 - Standard Specification for Hardened Steel Washers.
31. ASTM F959 - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners.
32. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
33. ASTM F1852 - Standard Specification for Twist Off Type Tension Control Structural Bolt/Nut/Washer Assemblies, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

C. American Welding Society:
1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
2. AWS D1.1 - Structural Welding Code - Steel.

D. Research Council on Structural Connections:
1. RCSC - Specification for Structural Joints Using ASTM A325 or A490 Bolts.

E. SSPC: The Society for Protective Coatings:
1. SSPC - Steel Structures Painting Manual.
2. SSPC Paint 15 - Steel Joist Shop Paint.
3. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).
4. SSPC SP 3 - Power Tool Cleaning.
5. SSPC SP 6 - Commercial Blast Cleaning.
6. SSPC SP 10 - Near-White Blast Cleaning.

1.3 SUBMITTALS

A. Section 01330 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings:
1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
2. Connections.
3. Cambers
4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with the following:
1. AISC Code of Standard Practice for Steel Buildings and Bridges.

2. AISC Load and Resistance Factor Design (LRFD) Specification for Structural Steel Buildings.
3. AISC Specification for the Design of Steel Hollow Structural Sections.
4. AISC Load and Resistance Factor Design Specification for Single-Angle Members.
5. RCSC Specification for Structural Joints Using ASTM A 325 or A 490 Bolts.
6. ASCE 19.

PART 2 PRODUCTS

2.1 STRUCTURAL STEEL

A. Structural W-Shapes: ASTM A572/A572M; Grade 50

B. Structural M-Shapes: ASTM A572/A572M; Grade 50

C. Structural T-Shapes: Cut from structural W-shapes.

D. Channels and Angles: ASTM A36/A36M.

E. Round Hollow Structural Sections: ASTM A500, Grade C

F. Square and Rectangular Hollow Structural Sections: ASTM A500, Grade C.

G. Structural Plates and Bars: ASTM A36/A36M.

2.2 FASTENERS, CONNECTORS, AND ANCHORS

A. Bolts: ASTM A307; Grade A or B.

B. High Strength Bolts: ASTM A325; Type 1 or ASTM A490; Type 1.

C. Nuts: ASTM A563 heavy hex type.

D. Washers: ASTM F436; Type 1, circular Furnish clipped washers where space limitations require.

E. Threaded Rods: ASTM A307; Grade A.

F. Forged Structural Steel Hardware:
1. Clevises and Turnbuckles: ASTM A108; Grade 1085.
2. Eye Nuts and Eye Bolts: ASTM A108; Grade 1030.
3. Sleeve Nuts: ASTM A108; Grade 1018.
4. Rod Ends, Yoke Ends and Pins, Cotter Pins, and Coupling Nuts: Carbon steel.

2.3 WELDING MATERIALS

A. Welding Materials: AWS D1.1; type required for materials being welded.

2.4 FABRICATION

A. Fabricate connections for bolt, nut, and washer connectors.

B. Develop required camber for members.

2.5 FINISH

A. Shop prime structural steel members. Do not prime surfaces that will be fireproofed.

2.6 SOURCE QUALITY CONTROL AND TESTS

A. Section 01400 - Quality Requirements: Testing, inspection and analysis requirements.

B. Shop test bolted and welded connections as specified for field quality control tests.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01300 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify bearing surfaces are at correct elevation.

C. Verify anchors rods are set in correct locations and arrangements with correct exposure for steel attachment.

3.2 PREPARATION

A. Furnish templates for installation of anchor rods and embedments in concrete and masonry work.

3.3 ERECTION

A. Allow for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in alignment until completion of erection and installation of permanent bracing.

B. Field weld components and shear connectors indicated on Drawings.

C. Field connect members with threaded fasteners; tighten to snug tight for bearing type connections.

D. Do not field cut or alter structural members without approval of Architect/Engineer.

E. After erection, touch up welds and abrasions to match shop finishes.

3.4 GROUT INSTALLATION

A. Shim bearing plates and equipment supports to proper elevation, snug tighten anchor bolts.

B. Fill void under bearing surface with grout. Install and pack grout to remove air pockets.

C. Moist cure grout.

D. Remove forms after grout is set. Trim grout edges to from smooth surface, splayed 45 degrees.

E. Tighten anchor bolts after grout has cured for a minimum of 3 days.

3.5 ERECTION TOLERANCES

A. Section 01400 - Quality Requirements: Tolerances.

B. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

C. Maximum Offset From Alignment: 1/4 inch.

3.6 FIELD QUALITY CONTROL

A. Bolted Connections: Inspect in accordance with AISC specifications.
   1. Visually inspect all bolted connections.
   2. For Direct Tension Indicators, comply with requirements of ASTM F959. Verify that gaps are less than gaps specified in Table 2.

B. Welding: Inspect welds in accordance with AWS D1.1.
   1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
   2. Visually inspect all welds.
   3. Ultrasonic Inspection: ASTM E164; perform on all full penetration welds.
   4. Liquid Penetrant Inspection: ASTM E165.

C. Correct defective bolted connections and welds.

END OF SECTION

SECTION 05210

STEEL JOISTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Open web steel joists and shear stud connectors, with bridging, attached seats and anchors.

B. Related Sections:
1. Section 05120 - Structural Steel: Superstructure framing.
2. Section 05312 - Steel Roof Deck
3. Section 05500 - Metal Fabrications: Non-framing steel fabrications attached to joists.

1.2 REFERENCES

A. American Institute of Steel Construction:
1. AISC Seismic Provisions for Structural Steel Buildings.

B. ASTM International:
1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
2. ASTM A108 - Standard Specification for Steel Bars, Carbon, Cold Finished, Standard Quality.
3. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
4. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
5. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
6. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.
7. ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
8. ASTM F436 - Standard Specification for Hardened Steel Washers.
9. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

C. American Welding Society:
1. AWS D1.1 - Structural Welding Code - Steel.

D. Steel Joist Institute:
   1. SJI K - Standard Specifications for Open Web Steel Joists, K-series.
   2. SJI LH/DLH - Standard Specifications for Longspan Steel Joists, LH-Series and Deep Longspan Steel Joists, DLH-Series.
   3. SJI JG - Standard Specification for Joist Girders.

E. SSPC: The Society for Protective Coatings:
   1. SSPC - Steel Structures Painting Manual.
   2. SSPC SP 1 - Solvent Cleaning.
   3. SSPC SP 10 - Near-White Blast Cleaning.

1.3 SUBMITTALS

A. Section 01330 - Submittal Procedures: Submittal requirements.

B. Shop Drawings:
   1. Indicate standard designations, configuration, sizes, spacing, locations of joists, joist leg extensions.
   2. Joist coding, bridging, connections, attachments.
   3. Cambers
   4. Connection details.

C. Welders' Certificates: Submit manufacturer's certificates, certifying welders employed on the Work, verifying AWS qualification within previous 12 months.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with the following:
   1. SJI K, SJI LH/DLH, and SJI JG

1.5 DELIVERY, STORAGE, AND HANDLING

A. Section 01600 - Product Requirements: Product storage and handling requirements.

PART 2 PRODUCTS

2.1 MATERIALS

A. Manufacturers:
   1. Vulcraft Steel Joist

B. Open Web Joists Members: SJI Type K. LH Longspan. DLH Deep Longspan. Joist Girders.

C. Nuts: ASTM A563 heavy hex type.

D. Washers: ASTM F436; Type 1

E. Structural Steel For Supplementary Framing and Joist Leg Extensions: ASTM A36/A36M.

F. Welding Materials: AWS D1.1; type required for materials being welded.

G. Shop and Touch-Up Primer: SSPC 15, Type 1, red oxide.

2.2 FABRICATION

A. Furnish bottom and top chord extensions as indicated on drawings.

B. Fabricate to achieve end bearing of:
1. 2-1/2 inches on steel.
2. 4 inches on masonry.

C. Drill holes in chords necessary for attachment of wood nailers.

2.3 FINISH

A. Shop prime joists and supplementary framing members. Do not prime surfaces that will be fireproofed.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01300 - Administrative Requirements: Coordination and project conditions.

3.2 ERECTION

A. Erect and bear joists on supports.

B. Allow for erection loads. Install sufficient temporary bracing to maintain framing safe, plumb, and in alignment.

C. Coordinate placement of anchors in concrete or masonry construction for securing bearing plates and angles.

D. After joist alignment and installation of framing, field weld joist seat to bearing plates or angles.

E. Position and field weld joist chord extensions and wall attachments.

F. Frame openings greater than 18 inches with supplementary framing.

G. Do not permit erection of decking until joists are bridged, and secured or until completion of erection and installation of permanent bridging and bracing.

H. Do not field cut or alter structural members without approval of Architect/Engineer.

I. After erection, prime welds, abrasions, and surfaces not shop primed

3.3 ERECTION TOLERANCES

A. Section 01400 - Quality Requirements: Tolerances.

B. Maximum Variation From Plumb: ¼ inch.

C. Maximum Offset From Alignment:1/4 inch.

3.4 FIELD QUALITY CONTROL

A. Field inspect members, connections, welds, and tightening of high strength bolts in slip-critical connections.

END OF SECTION

SECTION 05311

STEEL FLOOR DECK

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Steel floor deck and accessories.
2. Bearing plates and angles.

B. Related Sections:
1. Section 03200 - Concrete Reinforcement.
2. Section 05120 - Structural Steel: Support framing for deck openings.
3. Section 05210 - Steel Joists: Support framing for deck openings [and shear stud connectors].
4. Section 05312 - Steel Roof Deck.

1.2 REFERENCES

A. American Society of Civil Engineers:
1. ASCE 3 - Standard Practice for the Construction and Inspection of Composite Slabs.

B. ASTM International:
1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
2. ASTM A108 - Standard Specification for Steel Bars, Carbon, Cold Finished, Standard Quality.
3. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
4. ASTM A924/A924M - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
5. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

C. American Welding Society:
1. AWS D1.1 - Structural Welding Code - Steel.

D. Steel Deck Institute:
1. SDI 29 - Design Manual for Composite Decks, Form Decks and Roof Decks.

E. SSPC: The Society for Protective Coatings:
1. SSPC Paint 15 - Steel Joist Shop Paint.

2. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).

F. Underwriters Laboratories Inc.:
1. UL - Fire Resistance Directory.

G. Intertek Testing Services (Warnock Hersey Listed):
1. WH - Certification Listings.

1.3 PERFORMANCE REQUIREMENTS

A. Design metal deck in accordance with SDI 29 Design Manual and ASCE 3.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with ASCE 3 for composite decks.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Section 01600 - Product Requirements: Product storage and handling requirements.

B. Cut plastic wrap to encourage ventilation.

PART 2 PRODUCTS

2.1 FABRICATION

A. Metal Deck: Sheet steel, configured as follows:
1. Span Design: multiple double single.
2. Minimum Metal Thickness Excluding Finish: 28 gage.
3. Nominal Height: 0.6 inch, fluted profile [to SDI 29 [NR] [IR] [WR]].

PART 3 EXECUTION

3.1 INSTALLATION

A. Erect metal deck in accordance with SDI 29 Manual.

3.2 FIELD QUALITY CONTROL

A. Welding: Inspect welds in accordance with AWS D1.1.

END OF SECTION

SECTION 06010

LUMBER

PART 1 - GENERAL:

1.1 DESCRIPTION:

A. WORK INCLUDED: Provide all wood, nails, bolts, screws, framing anchors, and other rough hardware, and all other items needed for rough and finished carpentry in this Work but not specifically described in other Sections of these Specifications.

B. RELATED WORK DESCRIBED ELSEWHERE:

1.	FORM LUMBER:	SECTION 03100
2.	ARCHITECTURAL WOODWORK:	SECTION 06400

1.2 QUALITY ASSURANCE:

A. STANDARDS: Comply with all pertinent codes and regulations, and with the standards listed in this Section as described in Section 01085.

B. CONFLICTING REQUIREMENTS: In the event of conflict between pertinent codes and regulations and the requirements of the referenced standards or these Specifications, the provisions of the more stringent shall govern.

1.3 SUBMITTALS:

A. Make all proposals for substitution in strict accordance with the provisions of Section 01300 of these Specifications.

1.4 PRODUCT HANDLING:

A. PROTECTION:

1. Use all means necessary to protect lumber materials before, during, and after delivery to the job site, and to protect the installed work and materials of all other trades.
2. Deliver the materials to the job site and store, all in a safe area, out of the way of traffic, and shored up off the ground surface.
3. Identify all framing lumber as to grades, and store all grades separately from the other grades.
4. Protect all metal products with adequate waterproof outer wrappings.
5. Use extreme care in the off-loading of lumber to prevent damage, splitting, and breaking of materials.

B. REPLACEMENTS: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2: PRODUCTS

2.1 GRADE STAMPS:

A. FRAMING LUMBER: Identify all framing lumber by the grade stamp of the West Cost Lumber Inspection Bureau.

B. PLYWOOD: Identify all plywood as to species, grade, and glue type by the stamp of the American Plywood Association.

C. OTHER: Identify all other materials of this Section by the appropriate stamp of the agency listed in the reference standards, or by such other means as are approved by the Architect.

2.2 MATERIALS:

A. All materials, unless otherwise specifically approved in advance by the Architect, shall meet or exceed the following:

ITEM:	DESCRIPTION:
STUDS:	Yellow pine fir, stud grade, Douglas Fir- Hemlock, stud grade
POSTS AND BEAMS:	Douglas Fir, Structural Number 1
ALL OTHER HORIZONTAL FRAMING MEMBERS:	Douglas Fir-Hemlock, Construction Grade
ALL OTHER VERTICAL FRAMING MEMBERS:	Douglas Fir-Hemlock, Standard or better grade
PLYWOOD:	
Concealed Sheathing:	Standard interior-grade with exterior glue
EXTERIOR WOOD TRIM:	Redwood or Cedar, Select Heart Grade, Smooth
INTERIOR WOOD TRIM:	
Base:	White Pine, ½" by 1 7/8", reversible, fingerjointed acceptable.
Door & Window Casing:	White Pine, 5/8 by 1 5/8", beveled casing, finger-jointed acceptable.
CLOSET SHELVES:	White Pine, 1"X12", Number 2 or better, on 1"x4" White Pine cleats continuous 3 sides, or as shown on the Drawings in 3/4" plywood.
WOOD PRESERVATIVE:	Ammoniacal copper arsenite, or 5% solution of pentachlorophenol.
STEEL HARDWARE:	ASTM A7 or A36 (use galvanized at exterior locations).
MACHINE BOLTS:	ASTM A307
LAG BOLTS:	FED. SPEC. FF-B-561
NAILS:	Common (except on noted), Fed. Spec. FF-N-1-1 (use galvanized at exterior locations)

2.3 OTHER MATERIALS:

A. All other materials, not specifically described but required for a complete and proper installation as indicated on the Drawings, shall be new, suitable for intended use, and subject to the approval of the Architect.

PART 3: EXECUTION

3.1 DELIVERIES:

A. STOCKPILING: Stockpile all materials sufficiently in advance of need to ensure their availability in a timely manner for this work.

B. DELIVERY SCHEDULE: Make as many trips to the job site as are necessary to deliver all materials of this Section in a timely manner to ensure orderly progress of the total work.

C. COMPLIANCE: Do not permit materials not complying with the provisions of this Section of these Specifications to be brought onto or to be stored at the job site. Immediately remove from the job site all non-complying materials and replace them with materials meeting the requirements of this Section.

END OF SECTION

SECTION 06100

ROUGH CARPENTRY

PART 1 - GENERAL:

1.01 DESCRIPTION:

A. WORK INCLUDED: Provide all wood framing indicated on the Drawings or required for a complete and operable facility.

B. RELATED WORK DESCRIBED ELSEWHERE:

1.	CONCRETE FORMWORK:	SECTION 03100
2.	LUMBER:	SECTION 06010
3.	INSTALLATION OF WOOD DOORS/FRAMES:	SECTION 06200

1.02 QUALITY ASSURANCE:

A. QUALIFICATIONS OF WORKMEN: Provide sufficient workmen and supervisors who shall be present at all times during execution of this portion of the Work, and who shall be thoroughly familiar with the type of construction involved and the materials and techniques specified.

B. REJECTION: In the acceptance or rejection of rough carpentry, the Architect will make no allowance for lack of skill on the part of the workmen.

1.03 PRODUCT HANDLING:

A. PROTECTION:

1. Store all materials in such a manner as to ensure proper ventilation and drainage, and to protect against damage and the weather.
2. Keep all materials clearly identified with all grade marks legible. Keep all damaged material clearly identified as damaged, and store separately to prevent its inadvertent use.
3. Do not allow installation of damaged or otherwise non-complying material.
4. Use all means necessary to protect the installed work and materials of all other trades.

B. REPLACEMENTS: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2: PRODUCTS

2.01 (NO PRODUCTS ARE REQUIRED IN THIS SECTION)

PART 3: EXECUTION

3.01 INSPECTION:

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 WORKMANSHIP:

A. GENERAL: All rough carpentry shall produce joints true, tight, and well nailed, with all members assembled in accordance with the Drawings and with all pertinent codes and regulations.

B. SELECTION OF LUMBER PIECES:
1. Carefully select all members. Select individual pieces so that knots and obvious defects will not interfere with placing bolts or proper nailing or making connections.
2. Cut and discard all defects which will render a piece unable to serve its intended function. Lumber may be rejected by the Architect, whether or not it has been installed, for excessive warp, twist, bow, crook, mildew, fungus, or mold, as well as for improper cutting and fitting.
3. SHIMMING: Do not shim sills, joists, short studs, trimmers, headers, lintels, or other framing components.

3.03 WOOD TREATMENTS:

A. Treat all blocking and framing lumber, and other wood members used in contact with concrete, masonry, plaster, or other damp material, and all exterior members including roof blocking in accordance with AWPA.
1. Reduce moisture content to 19% or less after treatment for members which will painted.
2. Brush coat surfaces that have been cut after treatment.
3. Approved Material: KOPPERS "WOLMANIZED" or OSMOSE "K-33".

B. Treat members indicated as "Fire-Retardant" with Koppers "Non-Com" or Osmose "Flameproof". (All members within the building including framing members above the ceiling).
1. Reduce moisture content to 19% or less after treatment.
2. Each piece shall bear UL label for flame spread of 25 or less.
3. Reduce moisture content to 12% or less after treatment for members which will be painted.

3.04 GENERAL FRAMING:

A. GENERAL:
1. In addition to all framing operations normal to fabrication and erection indicated on the Drawings, install all backing and blocking required for work of other trades.
2. Set all horizontal or sloped members with crown up.
3. Do not notch, bore, or cut members for pipes, ducts, conduits, or other reasons except as shown on the Drawings or as specifically approved in advance by the Architect.

B. BEARINGS:
1. Make all bearings full unless otherwise indicated on the Drawings.
2. Finish all bearing surfaces on which structural members are to rest so as to give sure and even support. Where framing members slope, cut or notch the ends as required to give uniform bearing surface.

3.05 BLOCKING AND BRIDGING:

A. BLOCKING:
1. Install all blocking required to support all items of finish and to cut off all concealed draft openings, both vertical and horizontal, between ceiling and floor areas.

END OF SECTION

SECTION 06200

FINISH CARPENTRY

PART 1 - GENERAL:

1.01 DESCRIPTION:

A. WORK INCLUDED: Provide all finish carpentry needed for a complete and proper installation including, but not necessarily limited to:
   1. Fitting and installing all wood doors.
   2. Installing all finish hardware.

B. RELATED WORK DESCRIBED ELSEWHERE:

1.	Architectural Woodwork:	SECTION 06400
2.	Furnishing Wood Doors:	SECTION 08210
3.	Furnishing Finish Hardware:	SECTION 08710

1.02 QUALITY ASSURANCE:

A. STANDARDS: Comply with standards specified herein as listed in Section 01085.

B. QUALIFICATIONS OF PERSONNEL:
   1. Throughout progress of the work of this Section, provide at least one person who shall be thoroughly familiar with the specified requirements, completely trained and experienced in the necessary skills, and who shall be present at the site and shall direct all work performed under this Section.
   2. In actual installation of the work of this Section, use adequate numbers of skilled workmen to ensure installation in strict accordance with the approved design and the approved recommendations of the materials manufacturers.

C. QUALIFICATIONS OF FINISH HARDWARE ADJUSTER: Provide the services of an AHC member of the Door and Window Institute, or an equally qualified individual approved in advance by the Architect, who shall inspect, adjust, and report to the Architect as described in Part Three of this Section.

1.03 PRODUCT HANDLING:

A. PROTECTION: Use all means necessary to protect the materials of this Section before, during, and after installation, and to protect the work and materials of all other trades.

B. REPLACEMENTS: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2: PRODUCTS

2.01 FASTENERS:

A. Provide fasteners properly selected for the material to be fastened and the substrate to which the material will be fixed, designed to develop proper and adequate strength commensurate with the use.

PART 3: EXECUTION

3.01 INSPECTION:

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to the proper and timely completion of the work. Do not proceed until satisfactory conditions have been corrected.

3.02 INSTALLATION OF WOOD DOORS:

A. Initial Inspection of Doors: Prior to start of installation of each door, carefully inspect the door and verify:
   1. That the door furnished is the proper door for the opening, as described on the Door Schedule in the Drawings.
   2. That the door is in sound condition, unblemished, without warp, twist, bow, or other attributes causing it to be rejected upon installation.

B. HANDLING: Carry wood doors, do not drag them. Use extreme care n handling to prevent damage.

C. FITTING: Trim all wood doors as necessary to provide a uniform clearance of between 3 mm (1/8") and 5 mm (3/16") at jambs and head, and a uniform clearance at the threshold or floor to properly clear the floor covering described on the Finish Schedule in the Drawings.

D. INSTALLING: For each door, verify the hardware type as described on the Door Schedule in the Drawings and verify that hardware actually supplies is the hardware specified. Use only the specified hinges or butts, and the proper equipment for the purpose, install the door into the opening with the following hinge or butt locations throughout the work:

1.	TOP HINGE OR BUTT:	The center of the hinge or butt not more than 28 cm (11") below the top of the door;
2.	BOTTOM HINGE OR BUTT:	The center of the hinge or butt not more than 33 cm (13") above the finish floor;
3.	INTERMEDIATE HINGE, BUTT, OR PIVOT:	Equidistant between the top and bottom hinge, butt, or pivot.

E. FINISHING:
   1. With fine sandpaper, working only in direction of the grain of the wood, remove all rough edges resulting from door trimming and leave the installed door in condition to receive its final finish.
   2. Carefully touch-up all trimmed surfaces, applying a finish equal in all respects to the factory-prefinish specified in Section 08210.

3.03 INSTALLATION OF OTHER FINISH HARDWARE:

A. LOCATIONS: Using only the specified finish hardware, and the proper equipment for the purpose, install all other finish hardware in the following locations throughout the work:

1. ARMOR PLATES:	On the push side of single-acting doors, and on both sides of double-acting doors;
2. COMBINATION PUSH-AND-PULL PLATES:	Centered 102.4 cm (40-5/16") above the finish floor;
3. DOOR PULL ON PLATES:	Centered 102.4 cm (40-5/16") above the finish floor;
4. DOOR PULLS, SECTIONAL:	Centered 102.4 cm (40-5/16") above the finish floor;
5. DOOR-CLOSING DEVICES:	Install and adjust in strict accordance with the templates and printed instructions supplied by the manufacturer of

	the devices. Insofar as practicable, doors opening to or from halls or corridors shall have the closer mounted on the room side of the door.
6. EXTENSION LEVER FLUSH BOLTS:	In the edge of the door. Center to bolt fronts 30 cm (12") from bottom and 30 cm (12") from top edge of the door;
7. FLUSH CUP PULLS:	Centered 102.4 cm (40-5/16") above the finish floor;
8. KEY CABINET:	Install where directed.
9. KICK PLATES:	On single-acting doors; with kick plate on push side. On double-acting doors; with kick plate on both sides.
10. MORTISE DEADLOCK STRIKE:	Center 152.4 cm (60") above the finish floor;
11. KNOB LOCK AND KNOB LATCH STRIKE:	Center 102.4 (40-5/16") above the finish floor;
12. ROLLER LATCH STRIKES:	Center 102.4 cm (40-5/16") above the finish floor;
13. PANIC BOLT CROSS BARS:	Align in horizontal position with top and bottom bolts and rods aligned vertically. Install the centerline of strike 102.4 cm (40-5/16") above the finish floor;
14. PUSH BARS, SINGLE:	Centered 106.7 cm (42") above the finished floor;
15. PUSH BARS, TYPE 476:	Centered 106.7 cm (42") above the finished floor;
16. PUSH PLATES:	Centered 121.9 cm (48") above the finished floor;
17. ROLLER BUMPERS:	Install at the top of the door near the edge of the lock stile.
18. OTHER HARDWARE ITEMS, NOT DESCRIBED ABOVE:	Install as directed.

B. ANCHORING: Anchor all components firmly into position for long life under hard use. Use only the anchoring devices furnished with the hardware item, unless otherwise specifically directed.

3.04 INSPECTION, ADJUSTMENT, AND REPORTING:

A. GENERAL: Using the personnel descried in Paragraph 1.2C of this Section, inspect each of installed finish hardware. Verify that each such item has been installed in strict accordance with the manufacturer's recommendations, is in proper condition, and functions in its intended manner.

B. ADJUSTMENT: On all finish hardware items designed to permit adjustment, submit a written report stating:
1. That all installed finish hardware has been inspected in accordance with this Article;
2. That all installed finish hardware is in accordance with these specifications as to quality, type, appearance, operation, and all other specified attributes;
3. A precise list, by door opening number and hardware item, of all items of finish hardware which do not meet the specified requirements in furnishing, installation, or both.

END OF SECTION

SECTION 06240

LAMINATED PLASTIC

PART 1 - GENERAL:

1.01 DESCRIPTION:

A. WORK INCLUDED: Provide all laminated plastic, complete, in place, as an shown on the Drawings, specified herein, and needed for a complete and proper installation:

B. RELATED WORK DESCRIBED ELSEWHERE:

1. Architectural Woodwork: SECTION 06400

1.02 QUALITY ASSURANCE:

A. STANDARDS: Comply with standards specified herein as listed in Section 01085.

B. QUALIFICATIONS OF MANUFACTURERS: Products used in the work of this Section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Architect.

1.03 SUBMITTALS:

A. PRODUCT DATA:

1. Complete materials list of all items proposed to be furnished and installed under this Section.
2. Manufacturer's specifications and other data required to demonstrate compliance with the specified requirements.
3. Samples of the full range of colors and patterns available in each of the specified grades from the proposed manufacturer.
4. Manufacturer's recommended installation procedures.

The manufacturer's recommended installation procedures, when approved by the Architect, will become the basis for inspection and accepting or rejecting actual installation procedures used on the work.

1.04 PRODUCT HANDLING:

A. PROTECTION: Use all means necessary to protect the materials of this Section before, during, and after installation, and to protect the work and materials of all other trades.

B. REPLACEMENTS: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2: PRODUCTS

A. GENERAL: All plastic laminate shall be general purpose, "post-forming", or "specific purpose" type as recommended by the Contractor and approved by the Architect for use on the various surfaces, and shall be "high wear" type finish in accordance with provisions of NEMA LD3. (WILSONART, or equal).

B. COLORS AND PATTERNS: All colors shall be as selected by the Architect from the standard colors and patterns of the approved manufacturer.

2.01 ADHESIVES:

For installation of plastic laminates, use only "rigid set" (urea-resin) or "semi-rigid set" (PVC acetate) adhesives. Do not use so-called "contact" adhesives.

PART 3: EXECUTION

3.01 INSTALLATION:

Install the approved plastic laminates in strict accordance with the manufacturer's recommendations as approved by the Architect.

END OF SECTION

SECTION 06400

ARCHITECTURAL WOODWORK

PART 1: GENERAL:

1.01 PROJECT DESCRIPTION:

A. Work Included: Provide all architectural woodwork shown on the Drawings, complete in place, as specified herein.

B. Related work described elsewhere:
   1. Laminated Plastic: SECTION 06240

1.02 QUALITY ASSURANCE:

A. Standards: Comply with standards specified herein as listed in Section 01085.

B. Qualifications of Manufacturer: Products used in the work of this Section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Architect.

C. Qualifications of Installers: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods for proper performance of the work of this Section.

D. Certification: In addition to complying with all pertinent codes and regulations, comply with the "Architectural Woodwork Institute", latest edition for the grades specified, and provide certification on shop drawings and on each item of architectural woodwork signifying such compliance.

1.03 SUBMITTALS:

A. General: Comply with all provisions of Section 01300.

B. Product Data:
   1. Complete materials list of all items proposed to be furnished and installed under this Section.
   2. Sufficient other data to demonstrate compliance with the specified requirements.
   3. Shop drawings showing each of the items to be provided under this Section, completely detailing joinery and other construction, including anchorage, and displaying the "Certificate of Compliance" of the Woodwork Institute for the grades specified.
   4. Samples of the proposed woods to be used.
   5. Manufacturer's recommended installation procedure.

   The manufacturer's recommended installation procedures, as approved by the Architect, will become the basis for inspecting and accepting or rejecting actual installation procedures actually used on the work.

1.04 PRODUCT HANDLING:

A. Protection: Use all means necessary to protect materials of this Section before, during, and after installation and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2: PRODUCTS

2.01 CABINETS:

A. General: Fabricate the cabinets and countertops to the dimensions and arrangements shown on the Drawings, and according to the requirements of this Section. Use of particle board is not permitted under any circumstances. Countertop Material: 3/4" exterior grade hardwood faced plywood, all cabinets.

B. Grades:
1. All cabinet material that is to be plastic-clad; 3/4" hardwood-faced plywood.
2. All other cabinet material; "Premium or Select Grade", natural finish, suitable for transparent finish.

C. Species:
1. All cabinet material that is to be plastic-clad: Standard of the mill for the grade specified.
2. All other cabinets: Birch veneered plywood. 1/4" x 3/4", solid birch EB6ES to match birch veneered plywood to take transparent finish to match as close as possible.

D. Countertops:
1. All tops and edges (and back and end splashes where shown) shall be laminated plastic countertops. Comply with provisions of Section 06240, as manufactured by WILSONART Division of Ralph Wilson Plastics, or an equal approved by the Architect.

E. Finish Hardware: Provide and factory install all required finish hardware.

F. Millwork Hardware:
1. EACH DRAWER SHALL HAVE:

HARDWARE ITEMS (unless indicated otherwise in the Drawings0

a.	SHELF STANDARDS:	KNAPE & VOGT. #255 x 646 and 87 x 646
b.	SHELF BRACKETS:	K & V 256 & 646 and 187 x 646 x 14”
c.	EUROPEAN HINGES:	Grass Nexis #3803
d.	CABINET PULLS:	STANLELY #4478 X 628
e.	MAGNETIC CATCHES:	K & V #1300 x 603 STANLEY #46 X 628
f.	DRAWER SLIDES:	K & V #1300 x 603
g.	LOCKS:	NATIONAL LOCK #MZ-3704-831 with sleeve #M5-0405. Provide for doors and drawers. Solid wood stiles at all lock locations.
h.	HANGER RODS:	
	1. TUBING:	K & V #770-5CHR
	2. END FLANGES:	K & V #764-CHR
	3. ADJUSTABLE HANGER:	K & V #1195
i.	SLIDING GLASS DOORS:	K & V #1093 top & Bottom Channels K & V #1085 vinyl guides K & V #963 rachet lock for ¼” glass
j.	SHELVES:	
	1. Width and length of shelves as indicated on drawings.	
	2. Clothes rod:	K & V #1 1/16” diameter 660 stainless steel.
	3. Clothes rod support:	K & V #760 anchrome to be cut as noted on drawings.
	4. Shelf brackets:	K & V #208 series titanium finish size as required.

G. All millwork shall conform to the AMERICAN WOODWORK INSTITUTE.

H. Unless otherwise indicated on Drawings shelves shall be 1” x 8” Birch solid wood finished natural where exposed in a room; or, 1” x 8” Pine painted where located in a closet or storage room.

END OF SECTION

SECTION 07200
BUILDING INSULATION

PART 1: GENERAL:

1.01 PROJECT DESCRIPTION:

A. Work Included: Provide all building insulation required for this work including, but not necessarily limited to:
   1. Sound Walls
   2. Exterior Walls
   3. Ceilings
   4. Metal Roof Insulation

1.02 PRODUCT HANDLING:

A. Protection: Use all means necessary to protect materials of this Section before, during, and after installation and to protect the installed work and materials of all other trades.
B. Delivery and Storage: Deliver materials to the jobsite, and store in a safe dry place with all labels intact and legible at time of installation.
C. Replacement: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2: PRODUCTS

2.01 INSULATION MATERIALS:

A. General: All insulation material shall be the product of Owens/Corning Fiberglass, or an equal approved in advance by the Architect.
B.. SOUND WALLS INSULATION: All metal or wood stud and gypsum board partition walls, such as corridor walls, all walls enclosing toilet rooms, work areas, offices, closets, etc., shall receive R-13 3 1/2" or R-19 6 1/2" thick "Noise Barrier" unfaced batts, 16" in net width x full height of partition.
C. CEILINGS: Where shown on drawings. Provide R-30-12" on attic and R-19-6 1/2" above ceiling on first floor Plastic-wrapped Thermal and Sound Control.
D. FIRE SAFING INSULATION: By IIG Min Wool 1200 safing with FSP one face or equal to be installed at fire rated walls where fire rating runs to the bottom of roof or floor assemblies. Where indicated on drawings.
E. METAL ROOF INSULATION AND INTERIOR FINISH ROOF & WALLS:

   1. The first layer of R-13 (3½") PSF faced fiberglass is to be rolled over the purlins with 1" thermal blocks R-5. The second layer of R-13 (3½") unfaced fiberglass is to be installed over the first layer in between the purlins. The vapor membrane shall be on the first layer placed nearest the interior of the building. All joints shall be lapped, taped, or folded over stapled in accordance with the Building Manufacturers standard. The vapor membrane shall be polypropylene/ scrim/polyester white face to have a perm rating of not more than 0.02. Both layers to provide R-26. At exposed locations shall have a white face.
   2. All exposed roof insulation shall be supported by White plastic mesh.
   3. Roof insulation shall be flexible, non-combustible fiberglass blankets with a vapor resistant membrane. The vapor resistant membrane shall be laminated to the insulation as a composite unit. The insulation and vapor membrane shall carry an Underwriters' Laboratories Inc. (U.L. Label) fire hazard classification indicating a flame spread rating of 25 or less and a smoke developed rating of 450 or less, as a tested assembly.
   4. Exterior wall insulation on the metal building shall be R-19 insulation with white polypropylene/scrim/polyester face supported with white plastic mesh.

2.02 OTHER MATERIALS:

A. All other materials not specifically described but required for a complete and proper installation of the work of this section, shall be as selected by the Contractor subject to the approval of the Architect.

PART 3: EXECUTION

3.01 INSPECTION:

A. Examine the areas and conditions under which work of this section will be installed. Correct conditions detrimental to proper and timely completion of the work. Do not proceed until satisfactory conditions have been corrected.

3.02 INSTALLATION:

A. Except as otherwise specifically directed by the Architect, install all building insulation in accordance with the current edition of "Fiberglass Building Insulation Application Instructions", publication 3-BL-4992 of the Owens/Corning Fiberglas Corporation.

3.03 VERIFICATION:

A. Upon completion of the installation in each area, visually inspect and verify that all insulation is complete and properly installed.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Exposed fastener metal roof panels, with related metal trim and accessories.

1.2 RELATED REQUIREMENTS

A. Division 05 Section "Structural Steel Framing" for structural steel framing supporting metal panels.

B. Division 05 Section "Steel Decking" for continuous metal decking supporting metal panels.

C. Division 05 Section "Cold-Formed Metal Framing" for cold-formed metal framing supporting metal panels.

D. Division 05 Section "Cold-Formed Metal Trusses" for cold-formed metal trusses supporting metal panels.

E. Division 07 Section ["Thermal Insulation"] ["Roof Insulation"] for thermal insulation installed under metal panels.

F. Division 07 Section "Air Barriers" for air barriers within roof assembly and adjacent to roof assembly.

G. Division 07 Section "Metal Wall Panels" for factory-formed metal wall [and soffit] panels.

H. Division 07 Section "Sheet Metal Flashing and Trim" for formed sheet metal copings, flashings, reglets, and roof drainage items in addition to items specified in this Section.

I. Division 07 Section "Manufactured Roof Specialties" for manufactured copings, reglets, and roof drainage items in addition to items specified in this Section.

J. Division 07 Section "Joint Sealants" for field-applied Joint Sealants.

K. Division 13 Section "Metal Building Systems" for steel framing supporting metal panels.

1.3 REFERENCES

A. American Architectural Manufacturer's Association (AAMA): www.aamanet.org:

1. AAMA 621 - Voluntary Specifications for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) & Zinc-Aluminum Coated Steel Substrates.
2. AAMA 809.2 - Voluntary Specification Non-Drying Sealants.

B. ASTM International (ASTM): www.astm.org:

1. ASTM A 653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
2. ASTM A 755 - Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.
3. ASTM A 792/A 792M - Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
4. ASTM C 645 - Specification for Nonstructural Steel Framing Members.
5. ASTM C 754 - Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
6. ASTM C 920 - Specification for Elastomeric Joint Sealants.

7. ASTM D 1003 - Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics.
8. ASTM D 2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
9. ASTM D 4214 - Test Methods for Evaluating Degree of Chalking of Exterior Paint Films.
10. ASTM E 283 - Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
11. ASTM E 331 - Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
12. ASTM E 1646 - Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference.
13. ASTM E 1680 - Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems.
14. ASTM E 1980 - Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

C. **FM Global (FM)**: www.fmglobal.com:

1. ANSI/FM 4471 - Approval Standard for Class 1 Panel Roofs.

D. International Accreditation Service (IAS):

1. IAS AC 472 – Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems, part B.

E. **Underwriters Laboratories, Inc.** (UL): www.ul.com:

1. UL 580 - Tests for Uplift Resistance of Roof Assemblies

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Prior to erection of framing, conduct preinstallation meeting at site attended by Owner, Architect, manufacturer's technical representative, inspection agency and related trade contractors.

1. Coordinate building framing in relation to metal panel system.
2. Coordinate openings and penetrations of metal panel system.
3. Coordinate work of Division 07 Sections "Roof Specialties" and "Roof Accessories" and openings and penetrations and manufacturer's accessories with installation of metal panels.

1.5 QUALITY ASSURANCE

A. Manufacturer/Source: Provide metal roof panel assembly and accessories from a single manufacturer providing fixed-base roll forming, and accredited under IAS AC 472 Part B.

B. Manufacturer Qualifications: Approved manufacturer listed in this Section with minimum five years experience in manufacture of similar products in successful use in similar applications.

1. Approval of Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:

a. Product data, including certified independent test data indicating compliance with requirements.
b. Samples of each component.
c. Sample submittal from similar project.

d. Project references: Minimum of five installations not less than five years old, with Owner and Architect contact information.
e. Sample warranty.
f. IAS AC 472 Certificate.

2. Substitutions following award of contract are not allowed except as stipulated in Division 01 General Requirements.
3. Approved manufacturers must meet separate requirements of Submittals Article.

C. Installer Qualifications: Experienced Installer with minimum of five years experience with successfully completed projects of a similar nature and scope.

1. Installer's Field Supervisor: Experienced mechanic, able to communicate with Owner, Architect, and installers, supervising work on site whenever work is underway.

1.6 ACTION SUBMITTALS

A. Product Data: Manufacturer’s data sheets for specified products.

B. Shop Drawings: Show layouts of metal panels. Include details of each condition of installation, panel profiles, and attachment to building. Provide details at a minimum scale 1-1/2-inch per foot of edge conditions, joints, fastener and sealant placement, flashings, openings, penetrations, roof accessories, lightning arresting equipment, and special details. Make distinctions between factory and field assembled work.

1. Indicate points of supporting structure that must coordinate with metal panel system installation.
2. Include data indicating compliance with performance requirements.
3. Include structural data indicating compliance with requirements of authorities having jurisdiction.

C. Samples for Initial Selection: For each exposed product specified including sealants. Provide representative color charts of manufacturer's full range of colors.

D. Samples for Verification: Provide 12-inch- (305 mm-) long section of each metal panel profile. Provide color chip verifying color selection.

1.7 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Indicating compliance of products with requirements, witnessed by a professional engineer.

B. Qualification Information: For Installer firm and Installer’s field supervisor.

C. Manufacturer's Warranty: Sample copy of manufacturer's standard warranty.

D. IAS Accreditation Certificate: Indicating that manufacturer is accredited under the provisions of IAS AC 472.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance data.

B. Manufacturer's Warranty: Executed copy of manufacturer's standard warranty.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect products of metal panel system during shipping, handling, and storage to prevent staining, denting, deterioration of components or other damage. Protect panels and trim bundles during shipping.

1. Deliver, unload, store, and erect metal panel system and accessory items without misshaping panels or exposing panels to surface damage from weather or construction operations.
2. Store in accordance with Manufacturer's written instructions. Provide wood collars for stacking and handling in the field.

1.10 COORDINATION

A. Coordinate sizes, profiles, and locations of roof curbs and other roof-mounted equipment and roof penetrations, based upon sizes of actual selected equipment.

1.11 WARRANTY

A. Special Manufacturer’s Warranty: On manufacturer’s standard form, in which manufacturer agrees to repair or replace metal panel assemblies that fail within one year from date of Substantial Completion.

B. Special Panel Finish Warranty: On Manufacturer’s standard form, in which Manufacturer agrees to repair or replace metal panels that evidence deterioration of factory-applied finish within [25] years from date of Substantial Completion, including:

1. **Fluoropolymer Two-Coat System**:

a. Color fading in excess of [5] [10] Hunter units per ASTM D 2244.
b. Chalking in excess of No. [8] [6] rating per ASTM D 4214.
c. Failure of adhesion, peeling, checking, or cracking.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Basis of Design Manufacturer: **MBCI Metal Roof and Wall Systems, Division of NCI Group, Inc.**; Houston TX. Tel: (877)713-6224; Email: info@mbci.com; Web: www.mbci.com.

1. Provide basis of design product[, or comparable product approved by Architect prior to bid].

2.2 PERFORMANCE REQUIREMENTS

A. General: Provide metal roof panel system meeting performance requirements as determined by application of specified tests by a qualified testing facility on manufacturer's standard assemblies.

B. Thermal Movements: Allow for thermal movements from variations in both ambient and internal temperatures. Accommodate movement of support structure caused by thermal expansion and contraction. Allow for deflection and design for thermal stresses caused by temperature differences from one side of the panel to the other.

C. Provide metal panel assemblies capable of withstanding the effects of indicated loads and stresses within limits and under conditions indicated:

1. Wind Loads: Determine loads based on uniform pressure, importance factor, exposure category, and basic wind speed indicated on drawings.

2. Deflection Limits: Withstand inward and outward wind-load design pressures in accordance with applicable building code with maximum deflection of [1/120] [1/180] [1/240] of the span with no evidence of failure.
3. Seismic Performance: Comply with ASCE 7, Section 9, "Earthquake Loads."

D. **Wind Uplift Resistance**: Comply with UL 580 for wind-uplift class [UL-90].

E. **FM Approvals Listing**: Comply with FM Approvals 4471 as part of a panel roofing system, and that are listed in FM Approvals' "RoofNav" for Class 1 construction. Identify materials with FM Approvals markings.

1. Fire/Windstorm Classification: [Class 1A-90].
2. Hail Resistance Rating: 1-SH.

F. **Air Infiltration**: ASTM E 1680: Maximum [0.006 cfm/sq. ft. (0.030 L/s per sq. m) at 6.24 lbf/sq. ft. (300 Pa)] static-air-pressure difference.

G. **Water Penetration**: ASTM E 1646: No uncontrolled water penetration at a static pressure of 20 lbf/sq. ft. (958 Pa).

2.3 METAL PANEL MATERIALS

A. **Aluminum-Zinc Alloy-Coated Steel Sheet**: ASTM A 792/A 792M, structural quality, Grade 50, Coating Class AZ55 (Grade 340, Coating Class AZM165) unpainted Galvalume Plus coating.

2.4 METAL ROOF PANELS

A. **Large Tapered-Rib-Profile, Exposed Fastener Metal Roof Panels**: Structural metal roof panel consisting of formed metal sheet with trapezoidal major ribs with intermediate stiffening ribs symmetrically placed between major ribs, installed by lapping edges of adjacent panels.

1. Basis of Design: **MBCI, PBR Panel,** www.mbci.com/pbr.html.
2. Coverage Width: 36 inches (914 mm).
3. Major Rib Spacing: 12 inches (305 mm) on center.
4. Rib Height: 1-1/4 inch (31.8 mm).
5. Nominal Coated Thickness: [0.022 inch/26 gage (0.56 mm)] Panel Surface: [Smooth]
6. Exterior Finish: [Unpainted exposed Galvalume Plus coating].
7. Color: [As selected by Architect from manufacturer's standard colors].

2.5 METAL WALL PANELS

A. **Large Tapered-Rib-Profile, Exposed Fastener Metal Wall Panels**: Structural metal roof panel consisting of formed metal sheet with trapezoidal major ribs with intermediate stiffening ribs symmetrically placed between major ribs, installed by lapping edges of adjacent panels.

1. Basis of Design: **MBCI, PBR Panel,** www.mbci.com/pbr.html.
2. Coverage Width: 36 inches (914 mm).
3. Major Rib Spacing: 12 inches (305 mm) on center.
4. Rib Height: 1-1/4 inch (31.8 mm).
5. Nominal Coated Thickness: [0.022 inch/26 gage (0.56 mm)] Panel Surface: [Smooth]
6. Exterior Finish:[Fluoropolymer two-coat system]. Color: [As selected by Architect from manufacturer's standard colors].

2.6 LIGHT TRANSMITTING WALL PANELS

A. **Large Tapered-Rib-Profile, Exposed Fastener Light Transmitting Panel**: **Wall Panels**: Structural metal roof panel consisting of formed metal sheet with trapezoidal major ribs with intermediate stiffening ribs symmetrically placed between major ribs, installed by lapping edges of adjacent panels.

1. Basis of Design: **MBCI, Light Transmitting Panel**: **Panel,** www.mbci.com/pbr.html.
2. Coverage Width: 36 inches (914 mm).
3. Major Rib Spacing: 12 inches (305 mm) on center.
4. Rib Height: 1-1/4 inch (31.8 mm).
5. **Light Transmitting Panel**: Manufacturer's standard UV-resistant translucent panel, formed to metal panel profile, white, with haze value of not less than 90 percent when measured per ASTM D 1003.

2.7 FORMED METAL WALL PANELS

A. Flush-Profile, Concealed Fastener Metal Wall Panels: Structural metal panels consisting of formed metal sheet with vertical panel edges and [flat pan] [one intermediate stiffening bead, symmetrically placed] [two intermediate stiffening beads, symmetrically placed], with flush joints between panels, field assembled with nested lapped edges, and attached to supports using concealed fasteners.

1. Basis of Design: **MBCI, FW-120-2 with Beads Panel.**

   a. Nominal Thickness: [20 gage] coated thickness, with [smooth] surface.

      1) Exterior Finish: [Fluoropolymer two-coat system]

      2) Color:[As selected by Architect from manufacturer's standard colors]

2. Panel Width: 12 inches (305 mm).
3. Panel Thickness: 1-1/2 inch (38 mm).

2.8 METAL ROOF PANEL ACCESSORIES

A. General: Provide complete metal roof panel assembly incorporating ridge, eave, rake, valley, and parapet trims, copings, fascias, gutters and downspouts, and miscellaneous flashings, in [manufacturer's standard profiles] [profiles as indicated]. Provide required fasteners, closure strips, support plates, and sealants as indicated in manufacturer's written instructions.

B. Flashing and Trim: Match material, thickness, and finish of metal panel face sheet.

C. Panel Fasteners: Self-tapping screws and other acceptable fasteners recommended by roof panel manufacturer.

1. Exposed Fasteners: Long life fasteners with EPDM or neoprene gaskets, with heads matching color of metal panels by means of factory-applied coating.

D. Self-Adhering, High-Temperature Underlayment: Self-adhering, cold-applied sheet underlayment, minimum 30 mils (0.76 mm), recommended by metal panel manufacturer for application. Provide primer when recommended by underlayment manufacturer.

E. Joint Sealers: Manufacturer's standard or recommended liquid and preformed sealers and tapes, and as follows:

1. Tape Sealers: Manufacturer's standard non-curing butyl tape, AAMA 809.2.
2. Concealed Joint Sealantst: Non-curing butyl, AAMA 809.2.
3. Exposed Joint Sealants: Urethane, single component, ASTM C 920.

F. **Steel Sheet Miscellaneous Framing Components**: ASTM C 645, with ASTM A 653/A 653M, G60 (Z180) hot-dip galvanized zinc coating.

G. **Light Transmitting Panel**: Manufacturer's standard UV-resistant translucent panel, formed to metal panel profile, white, with haze value of not less than 90 percent when measured per ASTM D 1003.

H. **Roof Accessories**: Approved by metal roof panel manufacturer. Provide "Roof Accessories" for requirements for curbs, equipment supports, and preformed flashing sleeves.

I. **Roof Jacks**: All roof penetrations for plumbing vents shall be roof jacks (rubber) DEKTITE type to match roof profile.

J. **Roof Curbs**: At roof penetrations for mechanical equipment that require roof curbs provide a custom fabricated roof curb to match roof profile as manufactured by LM Curbs with 20 year warranty.

2.9 FABRICATION

A. General: Provide factory fabricated and finished metal panels and accessories meeting performance requirements, indicated profiles, and structural requirements.

B. Panel Lengths: Form panels in continuous lengths for full length of detailed runs, except where otherwise indicated on approved shop drawings.

C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's written instructions, approved shop drawings, and project drawings. Form from materials matching metal panel substrate and finish.

2.10 FINISHES

A. Finishes, General: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

B. **Fluoropolymer Two-Coat System**: 0.2 – 0.3 mil primer with 0.7 - 0.8 mil 70 percent PVDF fluoropolymer color coat, AAMA 621[, meeting solar reflectance index requirements].

1. Roof Panels: **MBCI Galvalume Plus**.

2. Wall Panels: **MBCI, Signature 300 KYNAR 500.**

3. Light Transmitting Wall Panels: Manufacturer's standard UV-resistant translucent panel, formed to metal panel profile, white, with haze value of not less than 90 percent when measured per ASTM D 1003.

4. Metal Roof Accessories: Eaves, rakes, fascias, gutters and downspouts, and miscellaneous flashings, in [manufacturer's standard profiles]. **MBCI, Signature 300 KYNAR 500.**

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine metal panel system substrate and supports with Installer present. Inspect for erection tolerances and other conditions that would adversely affect installation of metal panel installation.

1. Inspect metal panel support substrate to determine if support components are installed as indicated on approved shop drawings. Confirm presence of acceptable supports at recommended spacing to match installation requirements of metal panels.
2. Panel Support Tolerances: Confirm that panel supports are within tolerances acceptable to metal panel system manufacturer but not greater than the following:

a. 1/4 inch (6 mm) in 20 foot (6.1 m) in any direction.
b. 3/8 inch (9 mm) over any single roof plane.

B. Correct out-of-tolerance work and other deficient conditions prior to proceeding with metal roof panel system installation.

3.2 PREPARATION

A. **Miscellaneous Supports**: Install subframing, girts, furring, and other miscellaneous panel support members according to ASTM C 754 and manufacturer's written instructions.

B. Flashings: Install flashings to cover exposed underlayment per manufactures recommendations.

3.3 METAL PANEL INSTALLATION

A. Exposed Fastener Metal Roof Panels: Install weathertight metal panel system in accordance with manufacturer's written instructions, approved shop drawings, and project drawings. Install metal roof panels in orientation, sizes, and locations indicated, free of waves, warps, buckles, fastening stresses, and distortions. Anchor panels and other components securely in place. Provide for thermal and structural movement.

B. Panel Sealants: Install manufacturer's recommended tape sealant at panel sidelaps and endlaps.

C. Panel Fastening: Attach panels to supports using screws, fasteners, and sealants recommended by manufacturer and indicated on approved shop drawings.

1. Fasten metal panels to supports at each location indicated on approved shop drawings, with spacing and fasteners recommended by manufacturer.
2. Provide weatherproof jacks for pipe and conduit penetrating metal panels of types recommended by manufacturer.
3. Dissimilar Materials: Where elements of metal panel system will come into contact with dissimilar materials, treat faces and edges in contact with dissimilar materials as recommended by manufacturer.

3.4 ACCESSORY INSTALLATION

A. General: Install metal panel trim, flashing, and accessories using recommended fasteners and joint sealers, with positive anchorage to building, and with weather tight mounting. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel assembly, including trim, copings, flashings, sealants, closure strips, and similar items.

2. Comply with details of assemblies utilized to establish compliance with performance requirements and manufacturer's written installation instructions.
3. Set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently weather resistant.

B. Joint Sealers: Install joint sealers where indicated and where required for weathertight performance of metal panel assemblies, in accordance with manufacturer's written instructions.

1. Prepare joints and apply sealants per requirements of Division 07 Section "Joint Sealants."

3.5 CLEANING AND PROTECTION

A. Remove temporary protective films immediately in accordance with metal roof panel manufacturer's instructions. Clean finished surfaces as recommended by metal roof panel manufacturer.

B. Replace damaged panels and accessories that cannot be repaired to the satisfaction of the Architect.

END OF SECTION

SECTION 07951
CAULKING

PART 1: GENERAL:

1.01 DESCRIPTION:

A. WORK INCLUDED: Throughout the project, caulk and seal all joints where shown on the Drawings and elsewhere as required to provide a positive barrier against passage of air and passage of moisture.

1.02 QUALITY ASSURANCE:

A. Qualifications of Installers:

1. Proper caulking and proper installation of sealants require that installer be thoroughly trained and experienced in the necessary skills and thoroughly familiar with the specified requirements.
2. For caulking and installation of sealants throughout the work, use only personnel who have been specifically trained in such procedures and who are completely familiar with the joint details shown on the Drawings and the installation requirements called for in this Section.

1.03 SUBMITTALS:

A. General: Comply with provisions of Section 01300.

B. Manufacturer's Data: Submit:

1. A complete materials list showing all items proposed to be furnished and installed under this Section.
2. Sufficient data to demonstrate that all such materials meet or exceed the specified requirements.

C. Samples: Accompanying the submittal required in Paragraph "B" submit samples of each sealant, each backing material, each primer, and each bond breaker proposed to be used.

1.04 PRODUCT HANDLING:

A. Delivery and Storage: Deliver all materials of this Section to the jobsite in the original unopened containers with all labels intact and legible at time of use. Store only under conditions recommended by the manufacturers. Do not retain on the jobsite any material which has exceeded the shelf life recommended by its manufacturer.

B. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation and to protect the work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2: PRODUCTS:

2.01 CAULKING:

A. General: Except as otherwise approved by the Architect, in writing, use only the type of caulking described in this Article.

B. Caulking Materials:

1. Around Fixed Glass "Storefront" Aluminum Frames use silicone based caulking in color matching the aluminum. This caulking furnished and installed by "storefront" aluminum installer.
2. Around Windows: (if any) Use DAP Acrylic Latex Caulk with Silicone, in color to match window color or approved equal.
3. Around Exterior Door Frames: Use DAP Acrylic Latex Caulk with silicone in "Clear" color or approved equal.
4. Miscellaneous Exterior Connections Between Dissimilar Materials: Use DAP Acrylic Latex Caulk with silicone in "Clear" color unless another standard color of the manufacturer would be more suitable.
5. Exterior Masonry Control Joints: Use Dow Corning 790 sealant or approved equal. Prime where

required by manufacturer. Provide foam backer rod approved for use by sealant manufacturer.

6. Interior Caulking: Use DAP Acrylic Latex Caulk with silicone or approved equal. Color as selected from manufacturer's standard colors.
7. Caulking Joints Not Otherwise Specified: Use DAP Acrylic Latex Caulk with silicone or approved equal.
8. Top-of-wall sealant for fire rated masonry wall sealant shall be: CP606, CP 672 with respective UL No. recommended by Hilti Company.
9. Fire rated wall penetrations shall be: FS-one intumescent fire stop sealant with respective UL No. recommended by Hilti Company.
10. Smoke and acoustical walls sealant shall be: CP506 Sealant by Hilti.
11. Exterior/Interior of Masonry Walls Dow Corning 790 silicone sealant.

C. Prime:
1. In accordance with sealant manufacturer recommendations.

PART 3: EXECUTION:

3.01 INSPECTION:

A. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to the proper and timely completion of the Work. Do not proceed until satisfactory conditions have been corrected.

3.02 PREPARATION:

A. All Surfaces:
1. All surfaces in contact with caulking shall be dry, sound, and well brushed and wiped free from dust, and oil or grease.
2. Use solvent, where necessary, to remove oil and grease, wiping the surfaces with clean rags.
3. Remove all mortar from the joint cavity.
4. Where backstop is required, insert the approved backup material in the joint cavity to the depth required.

3.03 INSTALLATION OF SEALANTS:

A. General: Prior to start of installation in each joint, verify the joint type, and verify that the required proportion of width of joint to depth of joint has been secured.

B. Equipment: Apply sealant under pressure with hand or power-actuated gun or other appropriate means. Guns shall have nozzle of proper size and shall provide sufficient pressure to completely fill joints as designed.

C. Masking: Thoroughly and completely mask all joints where the appearance of sealant on adjacent surfaces would be objectionable.

D. Installation of Sealant: Install the sealant in strict accordance with the manufacturer's recommendations thoroughly filling all joints to the recommended depth.

E. Tooling: Tool all joints to the profile recommended by the caulking manufacturer or as shown by details in the Drawings.

F. Cleaning Up:
1. Remove masking tape immediately after joints have been tooled.
2. Clean adjacent surfaces free from sealant as the installation progresses. Use solvent or cleaning agent as recommended by the sealant manufacturer.

END OF SECTION

SECTION 08110

STEEL DOORS AND FRAMES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 GENERAL REQUIREMENTS

A. Any door or frame shown on the floor plans and not specifically referenced in the door schedule shall be provided as identical to a similar opening and shall be included in the hollow metal supplier's base bid. If there is no similar opening, provide price to include a frame and door as recommended by the hollow metal manufacturer for that type of opening.

B. All fire rated doors and frames shall be provided to comply with the local code requirements whether drawn that way or not as part of the hollow metal supplier's base bid.

1.3 SUMMARY

A. This Section includes steel doors and frames.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 4 Section "Unit Masonry Assemblies" for building anchors into and grouting frames in masonry and drywall construction.
   2. Division 8 Section "Custom Steel Doors and Frames" for doors manufactured according to the Hollow Metal Manufacturers Association's standards.
   3. Division 8 Section "Flush Wood Doors" for solid-core wood doors installed in steel frames.
   4. Division 8 Section "Door Hardware" for door hardware and weatherstripping.
   5. Division 8 Section "Glazing" for glass in steel doors and sidelights.
   6. Division 9 Section "Gypsum Board Assemblies" for spot grouting frames in gypsum board partitions.
   7. Division 9 Section "Painting" for field painting primed doors and frames.

1.4 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings.

B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, temperature-rise ratings, and finishes.

B. Shop Drawings: Include the following:
   1. Elevations of each door design.
   2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
   3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
   4. Locations of reinforcement and preparations for hardware.
   5. Details of each different wall opening condition.
   6. Details of anchorages, joints, field splices, and connections.
   7. Details of accessories.
   8. Details of moldings, removable stops, and glazing.
   9. Details of electrical knockout boxes and preparations for power, signal, and control systems.

C. Other Action Submittals:

1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

D. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 (neutral pressure at 40" above sill) or UL 10C.
   1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
   2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.

C. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Label each individual glazed lite.

D. Smoke-Control Door Assemblies: Comply with NFPA 105.

E. Preinstallation Conference: Conduct conference at Project site for hollow metal frames requiring electrical knockout boxes to verify installation of conduit on frames.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

B. Deliver welded frames with two removable shipping braces across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch- (102-mm-) high wood blocking. Do not store in a manner that traps excess humidity.
   1. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.9 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with this section requirements, provide products by one of the following:

1. Ceco Door Products
2. Curries Company
3. Steelcraft
4. Deansteel
5. Amweld
6. Other SDI members will be considered only if prior approval is given in accordance with substitution request requirements per General Requirements section. Non-SDI members will not be considered.

2.2 MATERIALS

A. Cold-Rolled Steel Sheets: Carbon steel complying with ASTM A 366 (ASTM A 366M), commercial quality, or ASTM A 620 (ASTM A 620M), drawing quality, special killed.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; A60 (ZF180) metallic coating.

C. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z (12G) coating designation; mill phosphatized.
   1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

E. Glazing: Comply with requirements in Division 08 Section "Glazing."

2.3 STANDARD HOLLOW METAL DOORS

A. General: Provide 1 3/4" thick doors of design indicated, fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.
   1. Design: Flush panel
   2. Core Construction Exterior: Manufacturer's standard vertically steel-stiffened core.
   3. Core Construction Exterior (Insulated): Manufacturer's standard polyurethane core.

      a. Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with thermal-rated assemblies with R Factor 11 or better.
         1) Locations: Exterior doors or as required in the door schedule.

   4. Core Construction Interior: Manufacturer’s standard Polystyrene core.

      a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.

   5. Vertical Edges for Single-Acting Doors: Beveled edge

      a. Beveled Edge: 1/8 inch in 2 inches (3 mm in 50 mm).

   6. Vertical Edges for Double-Acting Doors: Round vertical edges with 2-1/8-inch (54-mm) radius.
   7. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- (1.0-mm-) thick, end closures or channels of same material as face sheets.
   8. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheets. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
   1. Level 3 and Physical Performance Level A (Extra Heavy Duty), minimum 16 gage (0.053-inch - 1.3-mm-) thick steel, Model 2 (Seamless face and edges).
   2. Edges to be continuously wire welded, dressed, ground smooth and primed with compatible air-drying, rust-inhibitive primer.

3. Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Top of door to be flush and completely sealed joints in top edges of doors against water penetration.

C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
   1. Level 2 and Physical Performance Level B (Heavy Duty), minimum 18 gage (0.042-inch - 1.0-mm-) thick steel, Model 2 (Seamless face and edges).
   2. Edges to be tack welded, dressed, ground smooth and primed with compatible air-drying primer.

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 STANDARD & CUSTOM HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Exterior Frames: Fabricated from metallic-coated steel sheets.
   1. Fabricate frames with mitered or coped corners.
   2. Fabricate frames as face welded joints, dressed, ground smooth and primed with compatible air-drying, rust-inhibitive primer, unless otherwise indicated.
   3. Frames for Level 3 Steel Doors: minimum 14 gage 0.067-inch- (1.7-mm-) thick steel sheet.
   4. Custom frames for metal buildings exterior applications. Profile as required.

C. Interior Frames: Fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated.
   1. Fabricate frames with mitered or coped corners.
   2. Fabricate frames as face welded joints, dressed, ground smooth and primed with compatible air-drying primer.
   3. Frames for Level 2 Steel Doors: minimum 16 gage 0.053-inch- (1.3-mm-) thick steel sheet.
   4. Frames 48-inches and wider in opening width are required to be minimum 14 gage 0.067-inch- (1.7-mm-) thick steel sheet.
   5. Frames for Wood Doors: minimum 16 gage 0.053-inch- (1.3-mm-) thick steel sheet.
   6. Frames for Borrowed Lights: minimum 16 gage 0.053-inch- (1.3-mm-) thick steel sheet.

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

A. Jamb Anchors:
   1. Masonry Type: T-shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (50 mm) wide by 10 inches (250 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
   2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.

B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch (1.0 mm) thick, and as follows:
   1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
   2. Separate Topping Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.6 STOPS AND MOLDINGS

A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch (0.8 mm) thick, fabricated from same material as door face sheet in which they are installed.

B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated.

C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch (0.8 mm) thick, fabricated from same material as frames in which they are installed.

2.7 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inches (0.4 mm) thick.

2.8 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8

C. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.

D. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 42-inch and wider with mortise/butt type hinges only at top hinge location to deter against hinge reinforcement sag.

E. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 8 Door Hardware.

F. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops; provide security head screws at exterior locations.

G. Grout Guards: Weld guard boxes to frame at back of mortise hardware prep in frames at all hinge, strike and other recessed hardware preps regardless of grouting requirements.

H. Provide A60 Galvannealed coating at frames in restrooms with showers/Jacuzzi, clean areas such as surgery rooms and surgical suites, clean rooms, and soil rooms.

I. Anchors:
   1. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
   2. Jamb Anchors: Provide number and spacing of anchors as follows:

      a. Masonry Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
         1) Two anchors per jamb up to 60 inches (1524 mm) high.
         2) Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
         3) Four anchors per jamb from 90 to 120 inches (2286 to 3048 mm) high.
         4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 120 inches (3048 mm) high.

      b. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
         1) Three anchors per jamb up to 60 inches (1524 mm) high.
         2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
         3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) high.
         4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 96 inches (2438 mm) high.

5) Two anchors per head for frames above 42 inches (1066 mm) wide and mounted in metal-stud partitions.

Door Silencers: Except on weather-stripped or gasketed doors, drill stops to receive door silencers as follows. Keep holes clear during construction. Silencers to be supplied by frame manufacture regardless if specified in division 8 Door Hardware.

c. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
d. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

J. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

K. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

L. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricators shop
1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that glazed lites are capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
4. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.
5. Gap for butted or mitered joints in glass stop should not exceed .0625-inch.

2.9 STEEL FINISHES

A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.
2. Exterior doors and frames to be primed with compatible air-drying, rust-inhibitive primer.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
   1. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   2. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
   3. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   4. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.
   1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

      a. At fire-protection-rated openings, install frames according to NFPA 80.
      b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
      c. Install frames with removable glazing stops located on secure side of opening.
      d. Install door silencers in frames before grouting.
      e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
      f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
      g. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.

   2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post installed expansion anchors.

      a. Floor anchors may be set with powder-actuated fasteners instead of post installed expansion anchors if so indicated and approved on Shop Drawings.

   3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
   4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
   5. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
   6. Field Supplied Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
   7. Grouting Requirements:
      a. Do not grout head of frames unless reinforcing has been installed in head of frame.
      b. Do not grout vertical or horizontal closed mullion members.

8. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
   a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
   c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:
   a. Jambs and Head: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
   b. Between Edges of Pairs of Doors: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
   c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch (9.5 mm).
   d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch (19 mm).

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
3. Smoke-Control Doors: Install doors according to NFPA 105.

D. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (50 mm) o.c. from each corner.
   a. Secure exterior removable stops with security head screws.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION

SECTION 08141

WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Solid-core doors and transom panels with wood-veneer faces.
2. Factory finishing wood doors.
3. Factory fitting wood doors to frames and factory machining for hardware.

B. Related Sections:

1. Division 6 Section "Interior Architectural Woodwork" for requirements for veneers from the same flitches for both wood doors and wood paneling.
2. Division 8 Section "Steel Doors and Frames" for astragals provided as part of a fire-rated labeled assembly and for door silencers provided as part of the frame.
3. Division 8 Section "Glazing" for glass view panels in wood doors.

1.3 SUBMITTALS

A. Product Data: For each type of door indicated. Include details of core and edge construction, louvers, and trim for openings. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate requirements for veneer matching.
4. Indicate doors to be factory finished and finish requirements.
5. Indicate fire-protection ratings for fire-rated doors.

C. Samples for Initial Selection: For factory-finished doors.

D. Samples for Verification (Provide the following required samples prior to placing an order for any doors):

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.

E. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain wood doors from single manufacturer wherever possible.

B. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, latest edition, "Industry Standard for Architectural Wood Flush Doors."

C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

D. Preinstallation Conference: Conduct conference at Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in plastic bags or cardboard cartons and wrap bundles of doors in plastic sheeting.

C. Mark each door on top rail with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
b. Telegraphing of core construction in wood face veneers exceeding 0.01 inch in a 3-inch span.
c. Telegraphing of core construction and delamination of face in decorative laminate-faced doors.

2. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 DOOR CONSTRUCTION, GENERAL

A. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

B. Particleboard-Core Doors:

1. Particleboard: ANSI A208.1.

C. Fire-Protection-Rated Doors: Provide core specified or mineral core as needed to provide fire-protection rating indicated.

1. Edge Construction: Provide 45, 60 and 90 minute fire-rated doors edge construction with intumescent seals concealed by outer stile (Category A). Comply with specified requirements for exposed edges.
2. Edge Construction: Provide 20 minute fire-rated doors as Category B, with smoke and fire seals (supplied by seal manufacturer) applied to frame for 20 minute openings.
3. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
4. Pairs: Provide formed-steel edges and astragals with intumescent seals.

    a. Finish steel edges and astragals with baked enamel.

D. Mineral-Core Doors:

1. Core: Non-combustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware.
3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

2.2 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Graham.
2. Algoma Hardwoods.
3. Eggers Industries.
4. Marshfield Door Systems, Inc.
5. V-T Industries Inc.
6. Oshkosh.

B. Interior Solid-Core Doors:

1. Grade: Premium, with Grade A faces.
2. Species: Select White Birch.
3. Cut: Rotary Cut.
4. Match between Veneer Leaves: Book Match.
5. Assembly of Veneer Leaves on Door Faces: Center Balance match.
6. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
7. Room Match: Match door faces within each separate room or area of building. Corridor-door faces do not need to match where they are separated by 10 feet or more.
8. Transom Match: Continuous match.
9. Exposed Vertical Edges: Same species as faces.
10. Core: Particleboard type LD-2, Mineral core.
11. Construction: Five plies. Stiles and rails are bonded to core, and then entire unit abrasive planed before veneering.

2.3 LOUVERS AND LIGHT FRAMES

A. Louvers for Fire-Rated Doors: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire-protection rating of 1-1/2 hours and less.

1. Manufacturers: Subject to compliance with requirements, provide door manufacturers standard louver to meet rating indicated.
2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked-enamel- or powder-coated finish.

B. Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold-rolled steel sheet; with baked-enamel or powder-coated finish; and approved for use in doors of fire-protection rating indicated.

2.4 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

1. Comply with requirements in NFPA 80 for fire-rated doors.

B. Electrical Raceways: Provide prewired raceways with standardized plug connectors to accommodate up to twelve (12) wires as required for electrified door hardware specified in hardware sets in Division 8 Door Hardware. Provide sufficient number of concealed wires to accommodate electric function of specified hardware. Wire nut connections are not acceptable.

C. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

D. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.

1. Fabricate door and transom panels with full-width, solid-lumber[**, rabbeted,**] meeting rails. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.

E. Openings: Cut and trim openings through doors in factory.

1. Light Openings: Trim openings with moldings of material and profile indicated.

2.5 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Finish doors at factory that are indicated to receive transparent finish. Field finish doors indicated to receive opaque finish.

C. Transparent Finish:

1. Grade: Premium.
2. Finish: WDMA TR-6 catalyzed polyurethane.
3. Staining: Clear.
4. Effect: Semi-filled finish, produced by applying an additional finish coat to partially fill the wood pores.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Division 8 Section "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.

1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Re-hang or replace doors that do not swing or operate freely.

END OF SECTION

SECTION 08332

INSULATED ROLLING SERVICE DOORS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Manual overhead insulated rolling doors.

B. Related Sections:
   1. 05500 Metal Fabrications. Door opening jamb and head members.
   2. 06100 Rough Carpentry. Door opening jamb and head members.
   4. 08711 Hardware. Padlocks. Masterkeyed cylinder.
   5. 09900 Painting. Field painting.

D. Alternate No. Two.

1.2 SYSTEM DESCRIPTION

A. Design Requirements:
   1. Wind Loading: Supply doors to withstand design criteria maximum wind load indicated on Structural drawings.
   3. Insulated Door Slat Material Requirements:
      a. Flame Spread Index of 0 and a Smoke Developed Index of 10 as tested per ASTM E84.
      b. Minimum Sound Transmission Class (STC) rating of 26 as tested per ASTM E90.
      c. Minimum R-value of 8.0 (U-factor of 0.125) as calculated using the ASHRAE Handbook of Fundamentals.
      d. Insulation to be CFC Free with an Ozone Depletion Potential (ODP) rating of zero.

1.3 SUBMITTALS

A. Reference Section 01300 Submittal Procedures; submit the following items:
   1. Product Data.
   2. Shop Drawings: Include special conditions not detailed in Product Data. Show interface with adjacent work.
   3. Quality Assurance/Control Submittals:
      a. Provide proof of manufacturer ISO 9001:2008 registration.
      b. Provide proof of manufacturer and installer qualifications - see 1.4 below.
      c. Provide manufacturer's installation instructions.
   4. Closeout Submittals:
      a. Operation and Maintenance Manual.
      b. Certificate stating that installed materials comply with this specification.

1.4 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer Qualifications: ISO 9001:2008 registered and a minimum of five years experience in producing doors of the type specified.
   2. Installer Qualifications: Manufacturer's approval.

1.5 DELIVERY STORAGE AND HANDLING

A. Reference Section 01600 Product Storage and Handling Requirements.

B. Follow manufacturer's instructions.

1.6 WARRANTY

A. Standard Warranty: Two years from date of shipment against defects in material and workmanship.

B. Maintenance: Submit for owner's consideration and acceptance of a maintenance service agreement for installed products.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Manufacturer: Cornell Iron Works, Inc., Crestwood Industrial Park, Mountaintop, PA 18707. Telephone: (800) 233-8366, Fax: (800) 526-0841. Underwriters Laboratories, Inc. (UL), ISO 9001:2008 Registered.

1. Harlingen Door Company
   26401 S. Palm Court Drive
   Harlingen, Texas 78552
   956-383-6011

B. Model: **ESD20**

C. Substitutions: Reference Section 01631 Product Substitution Procedures.

2.2 MATERIALS

A. Curtain:
1. Slat Material: No. 6F, (Listed Exterior/Interior):
   a. Galvanized Steel/Galvanized Steel: [22/22] gauge, Grade 40, ASTM A 653 galvanized steel zinc coating.
   b. Insulation: 7/8 inch (22 mm) foamed-in-place, closed cell urethane.
   c. Total Slat Thickness: 15/16 inch (24 mm).
   d. Slats have a Flame Spread Index of 0 and a Smoke Developed Index of 10 as tested per ASTM E84.
   e. Slat has an R-value of 8.0 and an STC rating of 26.
2. Bottom Bar: Reinforced extruded aluminum interior face with full depth insulation and exterior skin slat to match curtain material and gauge.

3. Fabricate interlocking sections with high strength [nylon] endlocks on alternate slats each secured with two ¼" (6.35 mm) rivets. Provide windlocks as required to meet specified wind load.

4. Exterior Slat Finish:
   a. GalvaNex™ Coating System to include an ASTM A 653 galvanized base coating treated with dual process rinsing agents in preparation of a chemical bonding, [light gray] [tan] [white] baked-on polyester base coat and a [light gray] [tan] [white] baked-on polyester finish coat. The scientific organic material composition and chemical bonding process of GalvaNex™ produces a superior finish against corrosion and abrasion. GalvaNex™ components include a limited two year finish warranty.

5. Interior Slat Finish:
    a. GalvaNex™ Coating System to include an ASTM A 653 galvanized base coating treated with dual process rinsing agents in preparation of a chemical bonding, [light gray], [Tan], [White] baked-on polyester base coat and a light gray baked-on polyester finish coat. The scientific organic material composition and chemical bonding process of GalvaNex™ produces a superior finish against corrosion and abrasion. GalvaNex™ components include a limited two year finish warranty.

6. Curtain Configuration
    a. Standard Curtain configuration.

7. Bottom Bar Finish:
    a. Exterior Face: Match slats.
    b. Interior Face: [Powder coat to match slats].
8. Bottom Bar Configuration:
    a. Standard Bottom Bar Configuration.

B. Guides: Fabricate with minimum 3/16 inch (4.76 mm) [structural steel] angles. Provide windlock bars of same material when windlocks are required to meet specified wind load. Top of inner and outer guide angles to be flared outwards to form bellmouth for smooth entry of curtain into guides. Provide removable guide stoppers to prevent over travel of curtain and bottom bar.

Top 16 ½" (419.10 mm) of coil side guide angles to be removable for ease of curtain installation and as needed for future curtain service.

1. Finish:
    a. Steel: Phosphate treatment followed by a [light gray] [tan] [white] baked-on polyester powder coat; minimum 2.5 mils (0.065 mm) cured film thickness.

C. Counterbalance Shaft Assembly:
1. Barrel: Steel pipe capable of supporting curtain load with maximum deflection of 0.03 inches per foot (2.5 mm per meter) of width.
2. Spring Balance: Oil-tempered, heat-treated steel helical torsion spring assembly designed for proper balance of door to ensure that maximum effort to operate will not exceed 25 lbs (110 N). Provide wheel for applying and adjusting spring torque.

D. Brackets: Fabricate from minimum 3/16 inch (5 mm) steel plate with permanently lubricated ball or roller bearings at rotating support points to support counterbalance shaft assembly and form end closures.
1. Finish:
    a. Steel: Phosphate treatment followed by a [light gray] [tan] [white] baked-on polyester powder coat; minimum 2.5 mils (0.065 mm) cured film thickness.

E. Hood: 24 gauge galvanized steel with reinforced top and bottom edges. Provide minimum 1/4 inch (6.35 mm) steel intermediate support brackets as required to prevent excessive sag.
1. Finish:
    a. GalvaNex™ Coating System to include an ASTM A 653 galvanized base coating treated with dual process rinsing agents in preparation of a chemical bonding, [light gray] [tan] [white] baked-on polyester base coat and a [light gray] [tan] [white] baked-on polyester finish coat. The scientific organic material composition and chemical bonding process of GalvaNex™ produces a superior finish against corrosion and abrasion. GalvaNex™ components include a limited two year finish warranty.

F. Weatherstripping:

1. Bottom Bar: Replaceable, bulb-style, compressible EDPM gasket extending into guides.

2.3 ACCESSORIES

A. Locking:

1. Masterkeyable cylinder operable from one side of bottom bar

2.4 OPERATION

A. Manual Chain Hoist: Provide chain hoist operator with endless steel chain, chain pocket wheel and guard, geared reduction unit, and chain keeper secured to guide.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates upon which work will be installed and verify conditions are in accordance with approved shop drawings.

B. Coordinate with responsible entity to perform corrective work on unsatisfactory substrates.

C. Commencement of work by installer is acceptance of substrate.

3.2 INSTALLATION

A. General: Install door and operating equipment with necessary hardware, anchors, inserts, hangers and supports.

B. Follow manufacturer's installation instructions.

3.3 ADJUSTING

A. Following completion of installation, including related work by others, lubricate, test, and adjust doors for ease of operation, free from warp, twist, or distortion.

3.4 CLEANING

A. Clean surfaces soiled by work as recommended by manufacturer.

B. Remove surplus materials and debris from the site.

3.5 DEMONSTRATION

A. Demonstrate proper operation to Owner's Representative.

B. Instruct Owner's Representative in maintenance procedures.

END OF SECTION

SECTION 08413

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: Kawneer Architectural Aluminum Storefront Systems, including perimeter trims, stools, accessories, shims and anchors, and perimeter sealing of storefront units.

1. Types of Kawneer Aluminum Storefront Systems include:
   a. **Trifab® VG 451T Storefront System – 2" x 4-1/2**" (50.8 mm x 114.3 mm) nominal dimension; Thermal; Center, Structural Silicone or Weatherseal Glazed (Type B); Screw Spline, Shear Block, Stick or Punched Opening Fabrication.

B. Related Sections:
1. Division 07951 “Caulking” for joint sealants installed as part of the aluminum storefront system system
2. Division 08413 "Aluminum-Framed Entrances and Storefronts"

1.3 DEFINITIONS

A. Definitions: For fenestration industry standard terminology and definitions refer to American Architectural Manufactures Association (AAMA) – AAMA Glossary (AAMA AG).

1.4 PERFORMANCE REQUIREMENTS

A. General Performance: Aluminum-framed storefront system shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:

1. Design Wind Loads: Determine design wind loads applicable to the Project from basic wind speed indicated in miles per hour, according to ASCE 7, Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.

   a. Basic Wind Speed (MPH): **Refer to structural drawings for design criteria.**
   b. Importance Factor (I, II, III): **Refer to structural drawings for design criteria.**
   c. Exposure Category (A, B, C, D): **Refer to structural drawings for design criteria.**

B. Storefront System Performance Requirements:

1. Wind loads: Provide storefront system; include anchorage, capable of withstanding wind load design pressures of (____) lbs./sq. ft. inward and (____) lbs./sq. ft. outward. The design pressures are based on the (____) Building Code; (____) Edition. **Refer to structural drawings for design criteria.**

2. Air Infiltration: The test specimen shall be tested in accordance with ASTM E 283. Air infiltration rate shall not exceed 0.06 cfm/ft^2 (0.3 l/s · m^2) at a static air pressure differential of 6.24 psf (300 Pa).

3. Water Resistance: The test specimen shall be tested in accordance with ASTM E 331. There shall be no leakage at a minimum static air pressure differential of 8 psf (383 Pa) as defined in AAMA 501.

4. Uniform Load: A static air design load of 20 psf (958 Pa) shall be applied in the positive and negative direction in accordance with ASTM E 330. There shall be no deflection in excess of L/175 of the span of any framing member. At a structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur.

5. Thermal Transmittance (U-factor): When tested to AAMA Specification 1503, the thermal transmittance (U-factor) shall not be more than:

   a. Glass to Center – 0.44 (low-e) or 0.61 (clear) or Project Specific (____) BTU/hr/ft^2/°F.

6. Condensation Resistance (CRF): When tested to AAMA Specification 1503, the condensation resistance factor shall not be less than:

   a. Glass to Center – 62 $_{frame}$ and 68$_{glass}$ (low-e) or 63 $_{frame}$ and 56 $_{glass}$ (clear).

1.5 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, hardware, finishes, and installation instructions for each type of aluminum frame storefront system indicated.

B. Shop Drawings: Include plans, elevations, sections, details, hardware, and attachments to other work, operational clearances and installation details.

C. Samples for Initial Selection: For units with factory-applied color finishes including samples of hardware and accessories involving color selection.

D. Samples for Verification: For aluminum framed storefront system and components required.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for each type of aluminum-framed storefront.

F. Fabrication Sample: Of each vertical-to-horizontal intersection of aluminum-framed systems, made from 12” (300 mm) lengths of full-size components and showing details of the following:

   1. Joinery, including concealed welds.
   2. Anchorage.
   3. Expansion provisions.
   4. Glazing.
   5. Flashing and drainage.

G. Other Action Submittals:

   1. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams.

Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An installer which has had successful experience with installation of the same or similar units required for the project and other projects of similar size and scope.

B. Manufacturer Qualifications: A manufacturer capable of providing aluminum framed storefront system that meet or exceed performance requirements indicated and of documenting this performance by inclusion of test reports, and calculations.

C. Source Limitations: Obtain aluminum framed storefront system through one source from a single manufacturer.

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum framed storefront system and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements." Do not modify size and dimensional requirements.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup for type(s) of storefront elevation(s) indicated, in location(s) shown on Drawings.

F. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

G. Structural-Sealant Glazing: Comply with ASTM C 1401, "Guide for Structural Sealant Glazing" for design and installation of structural-sealant-glazed systems.

H. Structural-Sealant Joints: Design reviewed and approved by structural-sealant manufacturer.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of aluminum framed storefront openings by field measurements before fabrication and indicate field measurements on Shop Drawings.

1.8 WARRANTY

A. Manufactures Warranty: Submit, for Owner’s acceptance, manufacturer’s standard warranty.
1. Warranty Period: Two (2) years from Date of Substantial Completion of the project provided however that the Limited Warranty shall begin in no event later than six months from date of shipment by manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product:
   1. Kawneer Company Inc.
   2. **Trifab® 451T (thermal) Storefront System**
   3. 2” x 4-1/2” (50.8 mm x 114.3 mm) System Dimensions
   4. Glass: Interior.

B. Subject to compliance with requirements, provide a comparable product by the following:
   1. Manufacturer: (_____)
   2. Series: (_____)
   3. Profile dimension: (_____)

C. Substitutions: Refer to Substitutions Section for procedures and submission requirements
   1. Pre-Contract (Bidding Period) Substitutions: Submit written requests ten (10) days prior to bid date.
   2. Post-Contract (Construction Period) Substitutions: Submit written request in order to avoid storefront installation and construction delays.
   3. Product Literature and Drawings: Submit product literature and drawings modified to suit specific project requirements and job conditions.
   4. Certificates: Submit certificate(s) certifying substitute manufacturer (1) attesting to adherence to specification requirements for storefront system performance criteria, and (2) has been engaged in the design, manufacturer and fabrication of aluminum storefronts for a period of not less than ten (10) years. (Company Name)
   5. Test Reports: Submit test reports verifying compliance with each test requirement required by the project.
   6. Samples: Provide samples of typical product sections and finish samples in manufacturer's standard sizes.

D. Substitution Acceptance: Acceptance will be in written form, either as an addendum or modification, and documented by a formal change order signed by the Owner and Contractor.

2.2 MATERIALS

A. Aluminum Extrusions: Alloy and temper recommended by aluminum storefront manufacturer for strength, corrosion resistance, and application of required finish and not less than 0.070” wall thickness at any location for the main frame and complying with ASTM B 221: 6063-T6 alloy and temper.

B. Fasteners: Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum window members, trim hardware, anchors, and other components.

C. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.

D. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.

E. Sealant: For sealants required within fabricated storefront system, provide permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.

F. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of storefront members are nominal and in compliance with AA Aluminum Standards and Data.

2.3 STOREFRONT FRAMING SYSTEM

A. **Thermal Barrier (Trifab® VG 451T)**:
1. Kawneer IsoLock® Thermal Break with a 1/4" (6.4 mm) separation consisting of a two-part chemically curing, high-density polyurethane, which is mechanically and adhesively joined to aluminum storefront sections.

a. Thermal Break shall be designed in accordance with AAMA TIR-A8 and tested in accordance with AAMA 505.

B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials. Where exposes shall be stainless steel.

D. Perimeter Anchors: When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action

E. Packing, Shipping, Handling and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

F. Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle storefront material and components to avoid damage. Protect storefront material against damage from elements, construction activities, and other hazards before, during and after storefront installation.

2.4 GLAZING SYSTEMS

A. Glazing: As specified in Division 08800 Section "Glazing."

B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, extruded EPDM rubber.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

E. Glazing Sealants: For structural-sealant-glazed systems, as recommended by manufacturer for joint type, and as follows:

1. Structural Sealant: ASTM C 1184, single-component neutral-curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by a structural-sealant manufacturer for use in aluminum-framed systems indicated.
a. Color: Black

2. Weatherseal Sealant: ASTM C 920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O; single-component neutral-curing formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and aluminum-framed-system manufacturers for this use.
   a. Color: Matching structural sealant.

2.5 ENTRANCE DOOR SYSTEMS

A. Entrance Doors:
   1. **Series: 500 Tuffline Entrances.**
   2. **Finish/Color: See part 2.8 finishes.**

B. Entrance Door Hardware: As specified in Division 08710 Section "Door Hardware."

2.6 ACCESSORY MATERIALS

A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 07 Section "Joint Sealants."

B. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30 mil (0.762 mm) thickness per coat.

2.7 FABRICATION

A. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:

   1. Profiles that are sharp, straight, and free of defects or deformations.
   2. Accurately fit joints; make joints flush, hairline and weatherproof.
   3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
   4. Physical and thermal isolation of glazing from framing members.
   5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
   6. Provisions for field replacement of glazing.
   7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

B. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

C. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.

D. Storefront Framing: Fabricate components for assembly using manufactures standard installation instructions.

E. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Factory Finishing:
   1. Medium Bronze 28 Anodized AA-M12C22A44 0.7 Mils.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weather tight framed aluminum storefront system installation.

   1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
   2. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches (76 mm) of opening.
   3. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
   4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing aluminum framed storefront system, accessories, and other components.

B. Install aluminum framed storefront system level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.

C. Set sill members in bed of sealant or with gaskets, as indicated, for weather tight construction.

D. Install aluminum framed storefront system and components to drain condensation, water penetrating joints, and moisture migrating within sliding door to the exterior.

E. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 FIELD QUALITY CONTROL

A. Field Tests: Architect shall select storefront units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter caulked and cured. Conduct tests for air infiltration and water penetration with manufacturer's representative present. Tests not meeting specified performance requirements and units having deficiencies shall be corrected as part of the contract amount.

1. Testing: Testing shall be performed by a qualified independent testing agency. Refer to Testing Section for payment of testing and testing requirements. Testing Standard per AAMA 503, including reference to ASTM E 783 for Air Infiltration Test and ASTM E 1105 Water Infiltration Test.
   a. Air Infiltration Tests: Conduct tests in accordance with ASTM E 783. Allowable air infiltration shall not exceed 1.5 times the amount indicated in the performance requirements or 0.09 cfm/ft^2, whichever is greater.
   b. Water Infiltration Tests: Conduct tests in accordance with ASTM E 1105. No uncontrolled water leakage is permitted when tested at a static test pressure of two-thirds the specified water penetration pressure but not less than 6.24 psf (300 Pa).

B. Manufacturer's Field Services: Upon Owner's written request, provide periodic site visit by manufacturer's field service representative.

3.4 ADJUSTING, CLEANING, AND PROTECTION

A. Clean aluminum surfaces immediately after installing aluminum framed storefronts. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

B. Clean glass immediately after installation. Comply with glass manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.

C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

END OF SECTION

SECTION 08710

FINISH HARDWARE

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Work under this section comprises of furnishing hardware specified herein and noted on drawings for a complete and operational system, including any electrified hardware components, systems, controls and hardware for aluminum entrance doors. Any door shown on the drawing and not specifically referenced in the hardware sets shall be provided with identical hardware as specified on other similar openings and shall be included in the General Contractor's base bid. All fire rated door shall be provided with fire rated hardware as required by local code Authority as part of the General Contractor's base bid. The hardware supplier shall verify all cylinder types specified for locking devices supplied as part of the door system with the door manufacturer and/or door supplies.

B. The General Contractor shall notify the Architect in writing of any discrepancies (five (5) days prior to bid date) that could and/or would result in hardware being supplied that is none functional, hardware specified and/or hardware that has not been specified that will result in any code violations and any door that is not covered in this specification. Failure of the General Contractor to address any such issue could be considered acceptance of the hardware specified and all discrepancies could be corrected at the General Contractor's expense.

C. Items include but are not limited to the following:

1. Hinges - Pivots
2. Flush Bolts
3. Exit Devices
4. Locksets and Cylinders
5. Push Plates - Pulls
6. Coordinators
7. Closers
8. Kick, Mop and Protection Plates
9. Stops, Wall Bumpers, Overhead Controls
10. Electrified Hold Open Devices
11. Thresholds, Seals and Door Bottoms
12. Silencers
13. Miscellaneous Trim and Accessories

1.02 RELATED DOCUMENTS, drawings and general provisions of contract, including General and Supplementary Conditions, and Division 1 Specification sections, apply to this section.

1.03 RELATED WORK specified elsewhere that should be examined for its effect upon this section:

A. Section 06 20 00 - Finish Carpentry
B. Section 08 11 13 – Steel Doors and Frames
C. Section 08 14 16 – Flush Wood Doors
D. Sections within 08 31 13 – Access Doors
E. Section within 08 41 13 – Aluminum Entrances, Storefront and Window Framing
F. Sections within 08 80 00 – Glass and Glazing

G. Sections within 09 91 00 - Painting
H. Division 26 – Electrical
I. Division 28 – Access Control

1.04 REFERENCES SPECIFIED in this section subject to compliance as directed:

A. NFPA - Standard for Fire Doors and Windows
B. NFPA-101 - Life Safety Code
C. ADA - The Americans with Disabilities Act - Title III - Public Accommodations
D. ANSI-A 117.1 - American National Standards Institute - Accessible and Usable Buildings and Facilities
E. ANSI-A 156.5 - American National Standards institute -Auxiliary Locks and Associated Products
F. UFAS - Uniform Federal Accessibility Standards
G. UL - Underwriter's Laboratories
H. WHI - Warnock Hersey International, Testing Services
I. State and Local Codes including Authority Having Jurisdiction
J. U.B.C.7-2-97 and UL10C
K. IBC-2012 – International Building Code
L. NFPA-70 – International Electrical Code

1.05 SUBMITTALS

A. HARDWARE SCHEDULES submit copies of schedule in accordance with Division 1, General Requirements. Schedule to be in vertical format, listing each door opening, including: handing of opening, all hardware scheduled for opening or otherwise required to allow for proper function of door opening as intended, and finish of hardware. At doors with door closers or door controls include degree of door opening. Supply the schedules all Finish Hardware within two (2) weeks from date purchase order is received by the hardware supplier.

B. Submit manufacturer's cut/catalog sheets on all hardware items and any required special mounting instructions with the hardware schedule.

C. Certification of Compliance:

1. Submit any information necessary to indicate compliance to all of these specifications as required.
2. Submit a statement from the manufacturer that electronic hardware and systems being supplied comply with the operational descriptions exactly as specified.

D. Submit any samples necessary as required by the Architect.

E. Templates for finish hardware items to be sent to related door and frame suppliers within three (3) working days of receipt of approved hardware schedule.

F. Doors and Frames used in positive pressure opening assemblies shall meet U.B.C. 7-2-97 and UL10C in areas where this specification includes Seals for smoke door.

1.06 QUALITY ASSURANCE

A. Hardware supplier to be a qualified, Factory Authorized, direct distributor of the products to be furnished. In addition, the supplier to have in their regular employment an AHC or AHC /CDC and/or a person of equivalent experience

(minimum fifteen (15) years in the industry) who will be made available at reasonable times to consult with the Architect/Contractor and/or the City of Edinburg Representative regarding any matters affecting the finish hardware on this project.

B. All hardware used in labeled fire or smoke rated openings to be listed for those types of openings and bear the identifying label or mark indicating UL. (Underwriter's Laboratories) approved for fire. Exit devices in non-labeled openings to be listed for panic.

1.07 DELIVERY, HANDLING AND PACKAGING

A. Furnish all hardware with each unit clearly marked and numbered in accordance with the hardware schedule. Include door and item number for each.

B. Pack each item of hardware completes with all necessary parts and fasteners.

C. Properly wrap and cushion each item to prevent scratches and dents during delivery and storage.

1.08 SEQUENCING AND SCHEDULING

Any part of the finish hardware required by the frame or door manufacturers or other suppliers that is needed in order to produce doors or frames is to be sent to those suppliers in a timely manner, so as not to interrupt job progress.

1.09 WARRANTY

All finish hardware shall be supplied with a One- (1) year warranty against defects in materials and workmanship, commencing with substantial completion of the project except as follows:

1. All Closers are to have a thirty- (30) year written warranty.
2. All Exit Devices (Grade 1) are to have a three- (3) year written warranty.
3. All Locksets (Grade 1, 4000 series) are to have a ten- (10) year written warranty.
4. All Locksets (Grade 1, 1000 series) are to have a three- (3) year written warranty.
4. All Continuous Hinges are to have a ten- (10) year written warranty.

PART 2 – PRODUCTS

2.01 FASTENERS

A. Furnish with finish hardware all necessary screws, bolts and other fasteners of suitable size and type to anchor the hardware in position for a long life under hard use.

B. Furnish fastenings where necessary with expansion shields, toggle bolts and other anchors designated by the Architect according to the material to which the hardware is to be applied and the recommendations of the hardware manufacturer. All closers and exit devices on labeled wood doors shall be through-bolted if required by the door manufacturer. All thresholds shall be fastened with wood screws and plastic anchors. Where specified in the hardware sets, security type fasteners of the type called for are to be supplied.

C. Design of all fastenings shall harmonize with the hardware as to material and finish.

D. All hardware shall be installed with the Manufacturers standard screws as provided. The use of any other type of fasteners shall not be permitted. The general contractor shall provide wood blocking in all stud walls specified and/or scheduled to receive wall stops, No Exception.

2.02 ENVIRONMENTAL CONCERN FOR PACKAGING

The hardware shall ship to the job site is to be packaged in biodegradable packs such as paper or cardboard boxes and wrapping.

2.03 HINGES

A. All hinges to be of one manufacturer as hereafter listed for continuity and consideration of warranty. Provide one of the following manufacturers Ives, Hager or Stanley.

B. Unless otherwise specified provide five-knuckle, heavy-duty, button tip, full mortise template type hinges with non-rising loose pins. Provide non-removable pins for out swinging doors at secured areas or as called for in this specification (Refer to 3.02 Hardware Sets).

C. Provide all out-swinging doors with non-removable pins or security studs as called for in 3.02 Hardware Sets. Furnish three (3) hinges up to 90 inches high and one (1) additional hinge for every 30 inches or fraction thereof.

D. Furnish three (3) hinges up to 90 inches high and one (1) additional hinge for every 30 inches or fraction thereof.

E. Provide size 4½” x 4½” for all 1¾” thick doors up to and including 36 inches wide. Doors over 1¾” through 2¼” thick, use 5” x 5” hinges. Doors over 36 inches use 5” x 4½” unless otherwise noted in 3.02 Hardware Sets.

F. Were required to clear the trim and/or to permit the doors to swing 180 degrees furnish hinges of sufficient throw.

G. Provide heavy weight hinges on all doors over 36 inches in width.

H. At labeled door’s stainless steel, bearing-type hinges shall be provided. For all doors equipped with closers provide bearing-type hinges.

2.04 LOCK AND LOCK TRIM

A. All of the locksets, latch sets, and trim to be of one manufacturer as hereafter listed for continuity of design and consideration of warranty. Locksets specified are Schlage “ND90 & L9000LV” series with the Rhodes lever and shall be provided as specified, unless prior written approval is granted per the General Conditions section of the specifications. Products manufactured by Best and/or Falcon will be acceptable if equal to the specified products.

B. Provide metal wrought box strike boxes and curved lip strikes with proper lip length to protect trim of the frame, but not to project more than 1/8 inch beyond frame trim or the inactive leaf of a pair of doors.

C. Mechanical Locks shall meet ANSI Operational Grade 1, Series 1000 & 4000 as specified.

1. Hand of lock is to be field reversible or non-handed.
2. All lever trim is to be through-bolted through the door.

2.05 CYLINDERS AND KEYING

A. Provide all exterior and interior locks or Exit Devices requiring cylinders keyed to the New Large Format Interchangeable Core Master Key System and which also complies with performance requirements of ANSI A156.5. All keys shall be of nickel silver material only. The hardware supplier shall meet with the General Contractor, the Architect and the City of Edinburg Representative at the project jobsite to determine all permanent keying requirements.

B. Cylinders shall be factory keyed and factory maintained as directed by the City of Edinburg Representative and the Architect. Provide three- (3) keys per cylinder and six- (6) master keys per master used.

C. Factory stamp all keys “Do not duplicate” and with key symbol as directed by the City of Edinburg Representative. Visual key control shall be provided on all permanent keys and cylinders.

D. Furnish all locks, cylinders and Exit devices with temporary keyed construction cores for the duration of construction. Provide ten (10) construction keys and two (2) construction control keys total. The general contractor shall within thirty (30) days of the installation of permanent cores return all construction cores to the hardware supplier for full credit.

2.06 EXIT DEVICES

A. All exit devices and trim, including electrified items, to be of one manufacturer as hereafter listed and in the hardware sets for continuity of design and consideration of warranty; electrified devices and trim to be the same series and design as mechanical devices and trim.

B. Exit Devices to be “UL” listed for life safety. All exit devices for labeled doors shall have “UL” label for “Fire Exit Hardware”. All devices mounted on labeled wood doors are to be through-bolted or per the manufacturer’s listing requirements. All devices shall conform to NFPA 80 and NFPA 101 requirements.

C. All exit devices to be of a heavy duty, chassis mounted design, with a one-piece removable covers, eliminating necessity of removing the device from the door for standard maintenance and keying requirements.

D. All trims to be through-bolted to the lock stile case. Lever design to be the same as specified with the lock sets.

E. Exit Devices shall be the modern push rail design. All exit devices shall be mounted with sex bolts.

F. All devices shall carry a three- (3) year warranty against manufacturing defects and workmanship. Exit devices shall be certified by an independent testing lab for a minimum of 1,000,000 cycles.

G. Furnish roller strikes for all rim and surface vertical rod exit devices. Internal springs shall be coil compression type. Furnish security dead latching for all active latch bolts. Latch bolts to have self lubricating coating to reduce friction and wear. Plated latch bolts not accepted.

H. All Exit Devices shall be field modifiable as incorporate an Electric Latch Retraction Feature without the purchase of new Panic Exit Hardware.

J. Exit Devices shall be the Von Duprin “98 & 33” series as specified unless prior written approval is granted per the General Conditions section of the specifications. Products manufactured by Precision will be acceptable if equal to the products specified.

2.07 SURFACE MOUNTED DOOR CLOSERS

A. All closers for this project shall be the products of a single manufacturer for continuity of design and consideration of warranty. All door closers shall be mounted as to achieve the maximum degree of opening (trim permitting).

A. All closers to be heavy duty, surface-mounted, fully hydraulic, rack and pinion action with high strength cast iron cylinder to provide control throughout the entire door opening cycle.

C. Size all closers in accordance with the manufacturer’s recommendations at the factory.

D. All closers to have adjustable spring power sizes 1 or 2 through 4 or 6 and separate tamper resistant, brass, non-critical regulating screw valves for closing speed, latching speed and back-check control as a standard feature unless specified other wise.

E. All closer covers to be rectangular, full cover type of non-ferrous, non-corrosive material painted to match closer. Provide closer covers only if provided as a standard part of the door closer package.

F. Closers shall have heavy-duty arms. All closer arms shall be of sufficient length to accommodate the reveal depth and to insure proper installation. The hardware supplier shall provide any and all required brackets, spacers or filler plates as required by the manufacture for a proper and functional installation as part of their base bid.

G. Supply appropriate arm assembly for each closer so that closer body and arm are mounted on non-public side of door opening and on the interior side of exterior openings, except where required otherwise in the hardware sets.

1. All parallel arm mounted closers to be factory indexed to insure proper installation.
2. Furnish heavy-duty cold forged parallel arms for all parallel arm mounted closers.

H. Provide closers with special application and heavy-duty arms as specified in the hardware sets or as otherwise called for to insure a proper operating, long lasting opening. Drop plates and any additional mounting brackets required for the proper installation of the door closer shall be included in the hardware supplier’s base bid.

I. Finish: Baked on Powder Coated finish shall match other hardware. Provide a special rust inhibitor as specified in the hardware set.

J. Provide and mount all door closers with sex bolts as provided by the manufacturer.

K. Closers shall be LCN 1461 series as specified unless prior written approval is granted per the General Conditions section of the specifications. Products manufactured by Falcon and/or Sargent will be acceptable if equal to the products specified.

2.08 DOOR STOPS AND HOLDERS

A. Door stops are to be furnished for every door leaf. Every door is to have a floor, wall, or an overhead stop.

B. Place doorstops in such a position that they permit maximum door swing, but do not present a hazard of obstruction. Furnish floor strikes for floor holders of proper height to engage holders of doors.

C. Where overhead stops and holders are specified, or otherwise required for proper door operation, they are to be heavy duty and of extruded brass, bronze or stainless steel with no plastic parts as specified**.** The General Contractor shall provide wood blocking in all stud walls specified and scheduled to receive wall stops.

D. Finish: Shall match other hardware where available.

E. Acceptable Products

1. Floor and wall stops as listed in hardware sets. Equivalent products as manufactured by Ives, ABH, Glynn Johnson and Trimco are acceptable.

2.09 PUSH PLATES, DOOR PULLS, AND KICKPLATES

A. All push plates, door pull, kick plates and other miscellaneous hardware as listed in hardware sets. Equivalent products as manufactured by Ives, Hager and Trimco are acceptable.

B. Kick plates to be 10 inches high and Mop plates to be 6 inches high, both by 2 inches or 1 inch less than door width (LDW) as specified. They are to be of 16 gauge thick base metal. For door with louvers or narrow bottom rails, kick plate height to be 1 inch less dimension shown from the bottom of the door to the bottom of the louver or glass.

C. Where required armor plates, edge guards and other protective hardware shall be supplied in sizes as scheduled in the hardware sets.

D. Finish: Same as other hardware where available.

2.10 FLUSH BOLTS AND COORDINATORS

A. Provide Flush bolts with Dust Proof Strikes as indicated in the individual hardware sets by Ives, Hager and Trimco are acceptable. Finish shall match the adjacent hardware.

2.11 THRESHOLDS AND SEALS

A. Provide materials and finishes as listed in hardware sets. National Guard Products has been specified to set a high level of quality, equivalent product by manufactured by Zero, and Pemko shall be acceptable. All thresholds must be in accordance with the requirements of the ADA and ANSI A117.1.

B. Provide thresholds with wood screws and plastic anchors. Supply all necessary anchoring devices for weather strip and sound seal.

C. Seals shall comply with requirements of U.B.C. 7-2-97 and UL10C. All thresholds, door bottoms and weather strip inserts shall be a silicone based product as specified in 3.02 Hardware Sets. Other materials used shall be rejected, unless originally specified.

D. Seals shall comply with the requirements of the Wood Door Manufacturer's certification requirements.

E. All thresholds shall be provided with none slip coating (SIA) as specified in the hardware sets.

2.12 FINISHES

A. Finishes for all hardware are as required in this specification and the hardware sets.

B. Special care is to be taken to make uniform the finish of all various manufactured items.

2.13 DOOR SILENCERS

A. Provide door silencers at all openings without gasket. Provide two- (2) each at pair of doors and three- (3) or four- (4) each for each single door (coordinate with the frame manufacturer).

2.14 PROPRIETARY PRODUCTS

A. References to specific products are used to establish quality standards of utility and performance. Unless otherwise approved provide only the specified product.

B. All other materials, not specifically described, but required for a complete and proper finish hardware installation, are to be selected by the Contractor, subject to the approval of the Architect and the City of Edinburg Representative.

C. Architect and the City of Edinburg Representative reserve the right to approve all the substitutions proposed for this specification. All requests for substitution to be made prior to bid in accordance with Division 1, General Requirements, and are to be in writing, hand delivered to the Architect. Two (2) copies of the manufacturer's brochures and a physical sample of each item in the appropriate design and finish shall accompany requests for substitution.

PART 3 - EXECUTION

3.01 INSTALLATION AND SERVICE ITEMS OF FINISH HARDWARE

A. All finish hardware shall be installed by an experienced finish hardware installer with at least ten (10) years experience after a pre-installation meeting between the contractor, hardware Manufacturers representative, the hardware supplier, the hollow metal supplier and the wood door supplier. The finish hardware installer shall be responsible for the proper installation and function of all doors and hardware.

B. The hardware supplier's office and/or warehouse shall be located within a one hundred fifty (150) mile radius of the project site as to better service the general contractor and the City of Edinburg Representative during the course of this project.

C. Check hardware against the reviewed hardware schedule upon delivery. Store the hardware in a dry and secure location to protect against loss and damage.

D. Install finish hardware in accordance with approved hardware schedule and manufacturers' printed instructions. Pre-fit hardware before finish is applied to door; remove and reinstall after finish is complete and dry. Install and adjust hardware so that parts operate smoothly, close tightly, and do not rattle.

E. Mortise and cutting to be done neatly, and evidence of cutting to be concealed in the finished work. Protect all Finish hardware from scratching or other damage.

F. The hardware supplier, general contractor and hardware installer shall after three (3) months of the City of Edinburg Representative's acceptance of the facility perform an on site survey of the finish hardware. Any item of finish hardware found to be defective or out of adjustment shall be replaced or adjusted for the proper function and operation of the door assembly at the contractor's, supplier's and/or installer's expense. The hardware supplier shall provide a written report of any and all affected items to the Architect and the City of Edinburg Representative (No Exceptions). The scheduled inspection date for the on site inspection and adjustment of finish hardware shall be provided to the Architect as a part of the general contractor and hardware supplies close-out documentation for this project.

3.02HARDWARE SETS
SPEXTRA: 128490

HARDWARE SET # 01

DOORS #
A100A

EACH TO HAVE:

ALL HARDWARE	PROVIDED BY THE HANGAR DOOR MFG.

SLIDING HANGER DOOR ASSEMBLY

HARDWARE SET # 02

DOORS #
A100C A100D

EACH TO HAVE:

2	EA	RIM CYLINDER	20-079/20-061 AS REQUIRED	626	SCH
2	EA	FSIC CORE	23-030	626	SCH
		BALANCE HARDWARE	PROVIDED BY OVERHEAD COUNTER DOOR MFG.		

OVERHEAD DOOR ASSEMBLY
HARDWARE SUPPLIER SHALL VERIFY LOCKING DEVICE REQUIRED (RIM CYLINDERS, MORTISE CYLINDERS OR PADLOCKS) AND PROVIDE ACCORDINGLY

HARDWARE SET # 03

DOORS #
A101

EACH TO HAVE:

6	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
2	EA	MANUAL FLUSH BOLT	FB458	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	ND96TD RHO 14-042	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	SURFACE CLOSER	1461 HD	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
2	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	SEALS	2525B-HEAD & JAMBS	BRN	NGP
1	SET	ASTRAGAL	9605A DOOR HEIGHT	CL	NGP

INSTALL DOORS WITH A MAXIMUM GAP OF 1/4" BETWEEN THE DOORS LEAFS

HARDWARE SET # 04

DOORS #
A100B A100E

EACH TO HAVE:

1	EA	CONT. HINGE	112HD-DOOR HEIGHT	628	IVE
1	EA	PANIC HARDWARE	99-NL-990-SNB	628	VON
1	EA	CYLINDER	20-079/20-061 AS REQUIRED	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	BLADE STOP SPACER	4040-61	689	LCN
1	EA	DRIP CAP	16A-FRAME WIDTH PLUS 4"	CL	NGP
1	SET	SEALS	162S-HEAD & JAMBS	AL	NGP
1	EA	DOOR SWEEP	1015VA DOOR WIDTH	CL	NGP
1	EA	THRESHOLD	896S SIA-FRAME WIDTH	AL	NGP

HARDWARE SET # 05

DOORS #
A102B A106A

EACH TO HAVE:

1	EA	CONT. HINGE	112HD-DOOR HEIGHT	313	IVE
1	SET	PUSH/PULL BAR	9190-12 X LENGTH & MOUNTING AS REQUIRED	613	IVE
1	EA	DEADLOCK	MS1850ANSI 1-1/2” BS X STRIKE	313	ADA
1	EA	THUMB TURN CYLINDER	985T X CAM AS REQUIRED	613	FAL
1	EA	CYLINDER	20-061 X CAM AS REQUIRED	613	SCH
1	EA	FSIC CORE	23-030	606	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH X 4040-18PA	695	LCN
1	EA	BLADE STOP SPACER	4040-61 X 4040-30	695	LCN
1	EA	DOOR SWEEP	1015VA DOOR WIDTH	DKB	NGP
1	EA	THRESHOLD WEATHER STRIP	896S SIA-FRAME WIDTH PROVIDED BY DOOR MFG.	DKB	NGP

HARDWARE SET # 06

DOORS #
A105 A106C

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ENTRANCE LOCK	ND92TD RHO	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	1461 HD	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	SEALS	2525B-HEAD & JAMBS	BRN	NGP

HARDWARE SET # 07

DOORS #
A103 A104

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK	ND40S RHO	626	SCH
1	EA	SURFACE CLOSER	1461 HD	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	COAT HOOK	582M	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE SET # 08

DOORS #
A102A A106B

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	ENTRANCE LOCK	ND92TD RHO	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	1461 SCUSH TBSRT	689	LCN

1	EA	BLADE STOP SPACER	1460-61	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	SET	SEALS	2525B-HEAD & JAMBS	BRN	NGP
1	EA	DOOR SWEEP	200SA-DOOR WIDTH	CL	NGP
1	EA	THRESHOLD	896S SIA-FRAME WIDTH	AL	NGP

HARDWARE SET # 09

DOORS #
A107A A107B

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM LOCK	ND94TD RHO	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	1461 SCUSH TBSRT	689	LCN
1	EA	BLADE STOP SPACER	1460-61	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	SET	SEALS	2525B-HEAD & JAMBS	BRN	NGP
1	EA	DOOR SWEEP	200SA-DOOR WIDTH	CL	NGP
1	EA	THRESHOLD	896S SIA-FRAME WIDTH	AL	NGP

HARDWARE SET # 10

DOORS #
A200

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM LOCK	ND94TD RHO	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	1461 HDPA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

END OF SECTION

SECTION 08800

GLASS AND GLAZING

PART 1: GENERAL

1.01 DESCRIPTION

A. Work included: Provide all glass and glazing, complete, in place, as shown on the drawings, specified herein, or needed for a complete and proper installation.

B. Related work described elsewhere:

1. Glass and glazing are required under various Sections of these specifications.
2. Toilet room mirrors are-specified in Section 10830.

1.02 QUALITY ASSURANCE

A. Standards: Comply with standards specified in this Section and as listed in Section 01085.

B. Qualifications of installers: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.03 SUBMITTALS

A. General: Comply with the provisions of Section 01300.

B. Product data: Submit:

1. Complete materials list showing all items proposed to be furnished and installed under this Section.
2. Sufficient data to demonstrate that all such materials meet or exceed the specified requirements.

1.04 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation and to protect the work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2: PRODUCTS

2.01 GLASS

A. ***Exterior doors and windows***.

Type: Solar Control Low-E Clear Insulating Glass
"Solarban®" 70XL (2) "Solargray" **+ Clear** by PPG Industries, Inc.

Outdoor Lite: ***"Solargray"*** Tempered Glass by PPG Industries, Inc., Sputter Coated on second surface (2)
Indoor Lite: Clear Tempered Glass
Low-E Coating: ***"Solarban"*** 70XL Solar Control (Sputtered) by PPG Industries, Inc.
Location: Second Surface (2)

Performance Values

Visible Light Transmission	U-Value Winter	U-Value Summer	SHGC	Shading Coefficient	Outdoor Visible Light Reflectance
31%	0.28	0.26	0.19	0.22	7%

Approved Manufacturers: PPG Certified Fabricator
Certification: Both lites to be Cradle to Cradle certified, minimum Silver Level, by McDonough Braungart Design Chemistry, LLC (MBDC www.mbdc.com).
Outdoor Appearance: Cool Gray
Insulating Unit Construction: ¼" (6mm) glass + ½" (13mm) air space + ¼" (6mm) glass

B. Where type of glass indicated on the drawings the following applies:

1. ***Fire rated interior doors and windows: Pyrostop by TGP or equal. Refer to section 08817 for glass thickness requirements.***
2. ***Non-fire rated interior doors and windows: ¼" thick laminated, clear.***
3. ***At all hollow metal doors: ¼" thick clear laminated glass.***

2.02 GLAZING COMPOUNDS AND SEALANTS

A. General: Use glazing compounds and preformed glazing sealants approved for the application and, except as otherwise specified, conforming to the Glazing Materials portion of the FGMA Glazing Manual.

B. Use of metal sash putty will not be permitted, but compound conforming to Fed. Spec. TT-G-410 will be permitted. The use of nonskinning compounds, nonresilient type preformed sealers, and preformed impregnated type gaskets will not be permitted.

C. Other requirements:

1. Use flexible vinyl gasket material where indicated on the drawings, conforming to CS 230.
2. Use materials with aluminum frames that are aluminum colored, nonstaining, and that do not require painting.
3. Use other materials, exposed to view and painted, color selected for custom color.

2 03 GLAZING ACCESSORIES

A. Provide all glazing accessories required to supplement those accessories which accompany the items to be glazed, and as needed to provide a complete installation, including glazing points, clips, shims, angles, beads, settling blocks, and spacer strips. Use ferrous metal, which will be exposed in the finished work, which has a finish that will not corrode or stain while in service.

PART 3: EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which work of this Section will be installed. Correct conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Selection of glass: Where plate glass is indicated or specified, float glass may be used.

B. Distortion: Cut and install glass with the visible lines or waves running with the horizontal direction.

C. Fix movable items securely, or in a closed and locked position, until glazing compound has thoroughly set.

D. Glass setting:

1. Items to be glazed shall be shop-glazed or field-glazed with glass of the quality and thickness specified.

2. Prepare surrounds and glass, unless otherwise directed, in conformance with the details and general conditions governing glazing in the FGMA Glazing Manual.
3. Aluminum windows and wood doors may be glazed in conformance with one of the glazing methods described in the standards under which they are produced.
4. Use beads or stops furnished with the items to be glazed to secure the glass in place.
5. Use insulating units which do not have corners or edges ground, nipped, cut, or fitted after leaving the factory. Do not subject units to springing, forcing, or twisting during setting. Handle so as not to strike the setting frames or other objects.

3.03 CLEANING

A. In addition to the requirements of Section 01710 of these specifications, and prior to acceptance of the work, thoroughly clean all glass and remove all labels, paint spots, putty, and other defacements.

END OF SECTION

SECTION 08817
FIRE-RATED GLASS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fire-rated glazing materials installed as vision lights in fire-rated doors.
   2. Fire-rated glazing materials installed as [sidelites] [transoms] [borrowed lites] in fire-rated frames and [wall applications].

B. Related Sections include the following:
   1. Section 08110 “Metal Doors and Frames” for vision panels in interior doors and interior vision panel (borrowed lites) frames.
   2. Section 08141 “Flush Wood Doors” for vision panels in interior doors.
   3. Section 09260 “Gypsum Board Assemblies” for gypsum board and metal stud framed area separation partition walls.
   4. Section 08800 Glass & Glazing for reference.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM E 119: Fire Tests of Building Construction and Materials.
   2. ASTM E2074-00: Standard Test Method for Fire Tests of Door Assemblies, Including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies.
   3. ASTM E2010-01: Standard Test Method for Positive Pressure Fire Tests of Window Assemblies.

B. American National Standards Institute (ANSI):
   1. ANSI Z97.1: Standard for Safety Glazing Materials Used in Buildings

C. Consumer Product Safety Commission (CPSC):
   1. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials

D. Glass Association of North America (GANA):
   1. GANA – Glazing Manual.
   2. FGMA – Sealant Manual.

E. National Fire Protection Association (NFPA):
   1. NFPA 80: Fire Doors and Windows.

F. Underwriters Laboratories, Inc. (UL):
   1. UL 263: Fire tests of Building Construction and Materials

G. Standard Council of Canada:
   1. ULC Standard CAN4-S104: Fire Tests of Door Assemblies.
   2. ULC Standard CAN4-S106: Fire Tests of Window Assemblies.
   3. CAN/ULC-S101M: Standard Methods of Fire Endurance Tests.

H. International Building Code Latest Addition.

1.3 PERFORMANCE REQUIREMENTS

A. Fire-rated, clear and wireless glazing material for use in locations such as doors, sidelites, transoms, borrowed lites, and wall applications with fire rating requirements ranging from 45 minutes to 2 hours with required hose stream test; for use in interior and exterior applications.

B. Provides protection by reducing the radiant and conductive heat transfer

1.4 SUBMITTALS

A. Comply with requirements of Section 01300.

B. Product data: Submit manufacturer's technical data for each glazing material required, including installation and maintenance instructions.

C. Certificates of compliance from glass and glazing materials manufacturers attesting that glass and glazing materials furnished for project comply with requirements. Separate certification will not be required for glazing materials bearing manufacturer's permanent label designating type and thickness of glass, provided labels represent a quality control program involving a recognized certification agency or independent testing laboratory acceptable to authority having jurisdiction.

D. Product Test Listings: From UL indicating fire-rated glass complies with requirements, based on comprehensive testing of current product.

E. Samples: Submit, for verification purposes, approx. 8-inch by 10-inch sample for each type of glass indicated.

1.5 QUALITY ASSURANCE

A. Glazing Standards: FGMA Glazing Manual and Sealant Manual.

B. Fire Resistance Rated Glass: Each lite shall bear permanent, nonremovable label of UL certifying it for use in tested and rated fire resistive assemblies.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials under provisions of Section 01600.

B. Deliver materials to specified destination in manufacturer or distributor's packaging, undamaged, complete with installation instructions.

C. Pilkington Pyrostop® must not be exposed outside the range -40 degrees F to 120 degrees F (-40 degree C to +50 degrees C) during storage and transportation.

D. Store off ground, under cover, protected from weather and construction activities.

E. Do not expose the non-PVB side of glass to UV light.

F. Store sheets of glass vertically. DO NOT lean.

1.7 WARRANTY

A. Provide manufacturer's limited warranty under provision of section 01740.

B. Warranty period: Five years from date of shipment by manufacturer.

PART 2 - PRODUCTS

2.1 FIRE-RATED GLAZING MATERIALS

A. Manufacturer: Pilkington Pyrostop® as manufactured by the Pilkington Group and distributed by Technical Glass Products, 8107 Bracken Place SE, Snoqualmie, WA 98065, voice 1-800-426-0279, fax 1-800-451-9857, e-mail sales@fireglass.com, Web site www.fireglass.com.

B. Composition: Composed of multiple sheets of "Optiwhite" high visible light transmission glass laminated with an intumescent interlayer.

C. Properties:
1. Thickness: For Interior Use: [3/4", #45-200], [7/8", #60-101], [1-9/16", #120-202], [1-7/16, #90-102], [2-1/8", #120-104].
   a. For Exterior Use, Single Glazing: [3/4", #45-200], [1-1/16", #60-201], [1-9/16", #120-202].
   b. For Exterior Use, Insulated Glass Unit: [1-5/16", #45-260], [1-5/16", #45-360], [1-5/8", #60-261], [1-5/8", #60-361], [2-1/8" or 2-3/8", #120-262], [2-1/8" or 2-3/8", #120-362]
2. Weight: Varies with thickness (approximate range 9 to 22 lbs./sq. ft.).
3. Approximate Visible Transmission: Varies with thickness (approximate range 88 to 75 percent).
4. Fire-rating: Up to 2 hours.
5. Impact Safety Resistance: ANSI Z97.1 and CPSC 16CFR1201 (Cat. I and II).
6. STC Rating: Up to 46 dB.
7. Exterior Grade: PVB layer on exterior surface.

D. Permanently label each piece of Pilkington Pyrostop® with the appropriate marking.

E. Fire Rating – 60 Minutes and Greater: Fire rating listed and labeled by UL for fire rating scheduled at opening locations on drawings, when tested in accordance with ASTM E 119 and UL 263.

F. Substitutions: No substitutions allowed.

2.2 GLAZING COMPOUND FOR FIRE-RATED GLAZING MATERIALS

A. Glazing Tape: Closed cell polyvinyl chloride foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2 percent, designed for compression of 25 percent to effect an air and vapor seal.

B. Silicone Sealant: One-part neutral curing silicone, medium modulus sealant, Type S; Grade NS; Class 25 with additional movement capability of 50 percent in both extension and compression (total 100 percent); Use (Exposure) NT; Uses (Substrates) G, A, and O as applicable. Available Products:
1. Dow Corning 795 - Dow Corning Corp.
2. Silglaze-II 2800 - General Electric Co.
3. Spectrem 2 - Tremco Inc.

C. Setting Blocks: Hardwood or calcium silicate; glass width by 4 inches by 3/16 inch thick.

D. Spacers: Neoprene or other resilient blocks of 40 to 50 Shore A durometer hardness, adhesive-backed on one face only, tested for compatibility with specified glazing compound.

E. Cleaners, Primers, and Sealers: Type recommended by manufacturer of glass and gaskets.

2.3 FABRICATION

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine glass framing, with glazier present, for compliance with the following:
   1. Manufacturing and installation tolerances, including those for size, squareness, offsets at corners.
   2. Minimum required face or edge clearances.
   3. Observable edge damage or face imperfections.

B. Do not proceed with glazing until unsatisfactory conditions have been corrected.

C. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

3.2 INSTALLATION (GLAZING)

A. Comply with referenced GANA standards and instructions of manufacturers of glass, glazing sealants, and glazing compounds.

B. Protect glass from edge damage during handling and installation. Inspect glass during installation and discard pieces with edge damage that could affect glass performance.

C. Cut glazing tape to length and set against permanent stops, flush with sight lines to fit openings exactly, with stretch allowance during installation.

D. Place setting blocks located at quarter points of glass with edge block no more than 6-inches from corners.

E. Glaze vertically into labeled fire-rated metal frames or partition walls with the same fire rating as glass and push against tape for full contact at perimeter of pane or unit.

F. Place glazing tape on free perimeter of glazing in same manner described above.

G. Do not remove protective edge tape.

H. Install removable stop and secure without displacement of tape.

I. Do not pressure glaze.

J. Glaze exterior openings with PVB layer toward the exterior of the building.

K. Knife trim protruding tape.

L. Apply cap bead of silicone sealant along void between the stop and the glazing, to uniform line, with bevel to form watershed away from glass. Tool or wipe sealant surface smooth.

M. Provide minimum 3/16 inch edge clearance.

N. Install in vision panels in fire-rated doors to requirements of NFPA 80.

O. Install so that appropriate UL and Pilkington Pyrostop® markings remain permanently visible.

3.3 PROTECTION AND CLEANING

A. Protect glass from contact with contaminating substances resulting from construction operations. Remove any such substances by method approved by glass manufacturer.

B. Wash glass on both faces not more than four days prior to date scheduled for inspections intended to establish date of substantial completion. Wash glass by method recommended by glass manufacturer.

NOTE: SEE GLAZING SCHEDULE ON FOLLOWING TWO PAGES

3.4 GLAZING SCHEDULE

A. Interior Use:

Fire Rating	Manufacturer Designation	Supply Form	Thickness	Weight Approx. (lb/ft2)	U-Value	Daylight Trans. Approx. (%)	STC Rating Approx. (dB)	Assembly	Max. Exposed Area (Sq. In.)	Max. Width Of Exposed Glazing (In.)	or	Max. Height Of Exposed Glazing (In.)
45 min.	45-200	Single Glazing	3/4" (19 mm)	9.22	.86	86	40	Other than doors Door	4,500 3,724	95-1/4 41-5/8		95-1/4 89-3/4
60 min.	60-101	Single Glazing	7/8" (23 mm)	11.3	.83	87	41	Other than doors Door	5,605 3,724	96 41-5/8		96 89-3/4
90 min.-2 hrs	120-202	Single Glazing	1-9/16" (40 mm)	19.5	.72	85	46	Other than doors	3,724	111		111
90 min.	90-102	Single Glazing	1-7/16" (37 mm)	17.6	.74	84	45	Door	3,724	41-5/8		89-3/4
2 hr.	120-104	I.G. Units	2-1/8" (54 mm)	21.7	.44	74	46	Other than doors	3,724	111		111

B. Exterior Use:

Fire Rating	Manufacturer Designation	Supply Form	Thickness	Weight Approx. (lb/ft2)	U-Value	Daylight Trans. Approx. (%)	STC Rating Approx. (dB)	Assembly	Max. Exposed Area (Sq. In.)	Max. Width Of Exposed Glazing (In.)	or	Max. Height Of Exposed Glazing (In.)
45 min.	45-200	Single Glazing	3/4" (19 mm)	9.2	.86	86	40	Other than doors Doors	4,500 3,724	95-1/4 41-5/8		95-1/4 89-3/4
45 min.	45-260	I.G. Units	1-5/16" (33 mm)	12.5	.49	77	40	Other than doors Door	4,500 3,724	96 41-5/8		96 89-3/4
45 min.	45-360*	I.G. Units	1-5/16" (33 mm)	12.5	.37-..39	59-71	40	Other than doors Doors	4,500 3,724	95-1/4 41-5/8		95-1/4 89-3/4
60 min.	60-201	Single Glazing	1-1/16" (27 mm)	12.5	.83	86	44	Other than doors Door	5,605 3,724	96 41-5/8		96 89-3/4
60 min.	60-261	I.G. Units	1-5/8" (41 mm)	15.8	.48	77	44	Other than doors Door	5,605 3,724	96 41-5/8		96 89-3/4
60 min.	60-361*	I.G. Units	1-5/8" (41 mm)	15.8	.37-.39	59-70	44	Other than doors Door	5,605 3,724	96 41-5/8		96 89-3/4
90 min. -2 hr.	120-202	Single Glazing	1-9/16 (40 mm)	19.5	.72	85	46	Other than doors Door	3,724 3,724	111 41-5/8		111 89-3/4
90 min. -2 hr.	120-262	I.G. Units	2-1/8" (54 mm) or 2-3/8" (60 mm)	22.1	.44	74	46	Other than doors	3,724	111		111
90 min. - 2 hr.	120-362*	I.G. Units	2-1/8" (54 mm) or 2-3/8" (60 mm)	22.1	.35	33-68	46	Other than doors	3,724	111		111

Performance values vary for exterior I.G. units based upon the coating on surface #2. Coatings available are Eclipse Advantage Clear, Solar-E™ Solar Control Low-E and Energy Advantage Low-E. Length/thickness tolerances available upon request.

FOR APPROVED FRAMING SYSTEMS FOR USE WITH PILKINGTON PYROSTOP, VISIT FIREGLASS.COM OR CALL 800.426.0279.
END OF SECTION

SECTION 09260

GYPSUM DRYWALL

PART 1: GENERAL

1.01 SCOPE

A. Perform all work required to complete the Gypsum Drywall indicated by the Contract Documents and furnish all supplementary items necessary for its proper installation.

B. The requirements of Division O - "Bidding and Contract Requirements" and Division 1 - "General Requirements" of this Project Manual shall apply to all work required for this section.

C. Applicable requirements of the following sections of this Project Manual apply to all work required for this section.

D. Installation of the tape and bedding of gypsum drywall is specified in the Painting Section and is not required in the work for this section.

1.02 DELIVERY AND STORAGE

A. Deliver materials to the job site in their original unopened packages, containers, and bundles bearing the manufacturer's name and brand name.

B. Store material in an enclosed space protected from damage and exposure to the elements. Remove damaged material from the premises.

PART 2: PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Material manufactured by any of the following manufacturers is acceptable, provided it complies with the Contract Documents

1. DRYWALL SYSTEMS:
   - Certain Teed Company
   - Georgia-Pacific Corporation
   - National Gypsum Company
   - United States Gypsum Company
   - Temple-Inland

2.02 MATERIALS

A. NONRATED GYPSUM WALLBOARD: ASTM C36, tapered edge, 5/8 inch thick, unless otherwise indicated.

B. FIRE-RATED GYPSUM WALLBOARD: ASTM C36, Type "X", UL labeled, tapered edge, 5/8 inch thick, unless otherwise indicated.

C. WATER – RESISTANT WALL BOARD: ASTM C360, (Fire code where required) 5/8” thick, unless otherwise indicated. Shall be installed in all wet wall locations.

PART 3: EXECUTION

3.01 PREPARATION

A. Examine spaces and correct defects that could interfere with proper installation. Starting work shall be construed as acceptance of spaces.

B. Maintain in cold weather uniform controlled range temperature between 55 deg. to 70 deg. F. during the installation. Provide adequate ventilation to eliminate excessive moisture.

C. Install gypsum drywall systems in accordance with the Gypsum Drywall Contractors International Underwriters Laboratory and the manufacturer of the Drywall material.

3.02 INSTALLATION

A. Metal Stud Framing:

1. Align partitions accurately according to partition layout. Align top and bottom tracks and secure to concrete slab with concrete stub nails or power driven anchors spaced 24" on centers.
2. Position studs in track by rotating into place for friction fit. Space studs at 16 inches on center, unless otherwise indicated. Locate studs no more than 16" from partition intersections and corners and secure with screws through both flanges of studs and tracks. Lap studs a minimum of 8" where splicing is necessary and secure with screws.
3. Place two metal studs back-to-back on each side o£ door and window frames. Fasten studs securely to anchors on each side o£ frame with bolts or screws. Locate third stud six inches from double studs.
4. Locate section of runner across frame head at doors and other openings and screw slit flanges to vertical studs. Erect short intermediate studs 16" on centers between ceiling runner and door frame head runner.
5. Stud Framing:
   a. For interior partitions use metal studs, 22 ga., screw type, width as required for partition width indicated maximum stud spacing to be 16" o. c.
   b. For exterior wall application, use galvanized steel studs, 6" wide, with maximum spacing of 16" o c., 18 ga. studs for walls over 12' high and 20 ga. for walls under 12' high.

B. Wallboard:

1. Install wallboard to walls with long edge parallel to supporting members using full length sheets. Stagger joints on opposite sides of partition. Provide support for all edges and screw wallboard to bottom runners. Apply sealant to perimeter of wallboard at floor and ceiling.
2. Butt joints loosely, maximum gap l/4". Sand edges that have been cut. Attach wallboard to metal supports with self-drilling screws, using an electric screw driving gun and Phillips bit. Drive screws to slightly dimple surface but not to break paper.
3. Space screws 16”; on centers in the field and 8" on centers staggered along the vertical abutting edges. Start field screwing near center and work towards edges. Space screws not less than 3/8" from wallboard edges. Space screws for fire rated partitions as required by U.L.
4. Attach wallboard on one side of partition by screwing to every other stud. Complete wallboard application to entire side of partition in this manner. Cut first panel 2 foot wide on opposite side so joints will be staggered. Fasten wallboard panels to all studs on this side of panel. Return to first side and complete attaching screws to previously unattached studs.
5. Install insulation to inside face of first side of partition with staples or mastic. Anchor batt in each corner and in center. Fit joints snugly against adjoining batts and framing members.
6. Apply face layer in laminated construction vertical with adhesive per manufacturer's recommendations. Hold in place with supplemental fastening until adhesive is dry. Offset face layer joints so they do not fall over backing board joints.
7. Fit wallboard snugly into steel door frames. Cut wallboard neatly to fit around all outlets and switch boxes. Install metal edge trim along top edge of all wallboard at ceiling and wherever wallboard edge is exposed, or abuts another material. Install corner bead at all exterior corners.

3.03 CLEANING AND PATCHING:

A. Clean exposed surfaces of wallboard free from soil and stain that would affect finish. Repair, or remove and replace defective work. Remove excess materials and debris from site.

END OF SECTION

SECTION 09300
TILING

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. Tile and Accessories:
   1. Wall Glazed.
   2. Mosaics Floor.
   3. Trim and Accessories.
   4. Setting Materials.

1.2 REFERENCES:

A. American National Standards Institute (ANSI):

   1. ANSI A108.01 General Requirements – Subsurfaces and Preparations By Other Trades.
   2. ANSI A108.1A - Specifications for Installation of Ceramic Tile in the Wet-Set Method with Portland cement Mortar.
   3. ANSI A108.1B - Specifications for Installation of Ceramic Tile on a Cured Portland cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar.
   4. ANSI A108.10 - Specifications for Installation of Grout in Tilework.
   5. ANSI A137.1 Standard Specification For Ceramic Tile.

B. ASTM International (ASTM):
   1. ASTM C 50 - Standard Practice for Sampling, Sample Preparation, Packaging, and Marking of Lime and Limestone Products.

C. Tile Council of North America (TCNA): TCA Handbook for Ceramic Tile Installation, 2013.

1.3 PERFORMANCE REQUIREMENTS:

A. Dynamic Coefficient of Friction: Tile on walkway surfaces shall be provided with the following values as determined by ANSI A137.1 Section 9.6:
   1. Tile shall have a DCOF of .42.

1.4 SUBMITTALS:

A. Submit under provisions of Section 01300.

B. [Product Data]: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.

D. Selection Samples: Color charts illustrating full range of colors and patterns.

E. Selection Samples: Samples of actual tiles for selection.

F. Samples: Mount tile and apply grout on two plywood panels, illustrating pattern, color variations, and grout joint size variations.

G. Manufacturer's Certificate:
   1. Certify that products meet or exceed specified requirements.
   2. For each shipment, type and composition of tile provide a Master Grade Certificate signed by

the manufacturer and the installer certifying that products meet or exceed the specified requirements of ANSI A137.1.

H. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

1.5 QUALITY ASSURANCE:

A. Installer Qualifications: Company specializing in performing the work of this section with minimum two years experience.

B. Single Source Responsibility: Obtain each type and color of tile from a single source. Obtain each type and color of mortar, adhesive and grout from the same source.

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Deliver and store products in manufacturer's unopened packaging until ready for installation.

B. Protect adhesives and liquid additives from freezing or overheating in accordance with manufacturer's instructions.

C. Store tile and setting materials on elevated platforms, under cover and in a dry location and protect from contamination, dampness, freezing or overheating.

1.7 ENVIRONMENTAL REQUIREMENTS:

A. Do not install adhesives in an unventilated environment.

B. Maintain ambient and substrate temperature of 50 degrees F (10 degrees C) during tiling and for a minimum of 7 days after completion.

1.8 EXTRA MATERIALS:

A. Provide for Owner's use a minimum of 2 percent of the primary sizes and colors of tile specified, boxed and clearly labeled.

PART 2 PRODUCTS:

2.1 MANUFACTURERS:

A. Acceptable Manufacturer: DalTile Corporation, which is located at: 7834 C.F. Hawn Fwy. P. O. Box 170130 ; Dallas, TX 75217; Toll Free Tel: 800-933-TILE; Tel: 214-398-1411; Fax: 214-309-4584; Email: todd.lehr@daltile.com; Web: www.daltileproducts.com

B. American Olean Company.

C. Requests for substitutions will be considered in accordance with provisions of Section 01631.

2.2 TILE:

A. General: Provide tile that complies with ANSI A137.1 for types, compositions and other characteristics indicated. Provide tile in the locations and of the types colors and pattern indicated on the Drawings and identified in the Schedule and the end of this Section. Tile shall also be provided in accordance with the following:
   1. Factory Blending: For tile exhibiting color variations within the ranges selected under Submittal of samples, blend tile in the factory and package so tile taken from one package shows the same range of colors as those taken from other packages.
   2. Mounting: For factory mounted tile, provide back or edge mounted tile assemblies as standard

with the manufacturer, unless otherwise specified.

3. Factory Applied Temporary Protective Coatings: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with a continuous film of petroleum paraffin wax applied hot. Do not coat unexposed tile surfaces.

A. Wall Glazed Tile:

4. ***Moisture Absorption: Less than .5 percent to less than 20 percent.***
5. ***Size and Shape: 4 ¼"x4 ¼"x 1/8"thick nominal.***
6. ***Surface Finish: Glazed vitreous body colored, matte finish.***
7. ***Colors: 70% color group 2, 20% color group 4 (accent) colors and 10% color group 5 (accent) colors.***
8. ***Patters: As selected by architect.***
9. ***Trim Units: Matching cove base, cove base corner, bullnose, outside cove corner shapes in sizes coordinated with field tile.***

B. Mosaic Porcelain Floor Tile:

1. ***Moisture Absorption: Less than .5 percent to less than 20 percent.***
2. ***Size and Shape: 2"x2"x 3/16"thick nominal.***
3. ***Surface Finish: Unglazed Vitreous body.***
4. ***Colors: 70% Group 2, 20% Group 4 and 10% Group 5 (accent) colors.***
5. ***Pattern: As selected by architect***
6. ***Trim Units: Matching cove base, cove base corner, bullnose, outside cove corner shapes in sizes coordinated with field tile shall be part of the wall tile selections.***

2.3 TRIM AND ACCESSORIES:

A. Acceptable Manufacturers:
1. Schluter Systems.
2. Custom Building Products.

B. Non-Ceramic Trim: Satin natural anodized extruded aluminum, style and dimensions to suit application, for setting using tile mortar or adhesive; use in the following locations:
1. Open edges of floor tile.
2. Transition between floor finishes of different heights.
3. Thresholds at door openings.
4. Expansion and control joints, floor and wall.

2.4 SETTING MATERIALS:

A. Acceptable Manufacturers:
1. Bostik Inc.
2. Custom Building Products.
3. Laticrete International Inc.

B. Mortar Bed Materials:
1. Portland cement: ÅSTM C150, type 1,
Colors: Charcoal Color for floors and white for walls.
2. Hydrated Lime: ÅSTM C207, Type S.
3. Sand: ÅSTM C144, fine.
4. Latex additive: As approved.
5. Water: Clean and potable.

C. Mortar Bond Coat Materials:
1. Dry-Set Portland Cement type: ANSI A118.1.
2. Latex-Portland Cement type: ANSI A118.4.
3. Chemical-Resistant Furan Mortar & Grout: ANSI A118.5 ***where required by application.***

D. Standard Grout: Cement grout, sanded or unsanded, as specified in ANSI A118.6; color as selected.

E. Silicone Sealant: Silicone sealant, moisture and mildew resistant type, white; use for shower floors and shower walls.

F. Where required provide Cleavage Membrane:
   1. No. 15 (6.9 kg) asphalt saturated felt, ASTM D226, Type 1.
   2. Polyethylene film, ÅSTM D4397, 4.0 mil thickness.

G. Where required provide Waterproofing Membrane at Floors: Membrane in accordance with ANSI A118.10 and as follows:
   1. Chlorinated Polyethylene Sheet with polyester fabric reinforcing.
   2. Fabric Reinforced, Fluid-Applied elastomeric membrane.
   3. Un-Reinforced, Fluid-Applied elastomeric membrane.
   4. Polyethylene Sheet Product.
   5. Fabric-Reinforced, Modified-Bituminous Sheet Product.
   6. Urethane Waterproofing and Tile-Setting Adhesive Product.

H. Membrane at Walls: No. 15 (6.9 kg) asphalt saturated felt, ASTM D226, Type 1.

I. Membrane at Walls: 4 mil (0.1 mm) thick polyethylene film, ÅSTM D4397.

J. Membrane at Walls: Reinforced asphalt paper.

K. Reinforcing Mesh: 2 by 2 inch (50 by 50 mm) size weave of 16/16 wire size; welded fabric, galvanized.

L. Metal Lath: ASTM C847, Flat expanded diamond mesh, not less than 2.5 lbs/SY, galvanized finish.

M. Where required provide Cementitious Backer Board: ANSI A118.9; High density, cementitious, glass fiber reinforced with 2 inch (50 mm) wide coated glass fiber tape for joints and corners:
   1. Thickness: 5/8 inch (16 mm). Dense Shield Tile Backer Board.

PART 3 EXECUTION:

3.1 EXAMINATION:

A. Verify that wall surfaces are free of substances which would impair bonding of setting materials, smooth and flat within tolerances specified in ANSI A137.1, and are ready to receive tile.

B. Verify that sub-floor surfaces are dust-free, and free of substances which would impair bonding of setting materials to sub-floor surfaces, and are smooth and flat within tolerances specified in ANSI A108.01.

C. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.

D. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION:

A. Protect surrounding work from damage.

B. Remove any curing compounds or other contaminates.

C. Vacuum clean surfaces and damp clean.

D. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

E. Install cementitious backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of dry-set mortar to a feather edge.

F. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

3.3 INSTALLATION – GENERAL:

A. Install tile and grout in accordance with applicable requirements of ANSI A108.1 through A108.13, manufacturer's instructions, and TCA Handbook recommendations.

B. Lay tile to pattern indicated. Arrange pattern so that a full tile or joint is centered on each wall and that no tile less than 1/2 width is used. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.

E. Form internal angles square and external angles bullnosed.

F. Install ceramic accessories rigidly in prepared openings.

G. Install non-ceramic trim in accordance with manufacturer's instructions.

H. Install thresholds where indicated.

I. Sound tile after setting. Replace hollow sounding units.

J. Keep expansion joints free of adhesive or grout. Apply sealant to joints.

K. Allow tile to set for a minimum of 48 hours prior to grouting.

L. Grout tile joints. Use standard grout unless otherwise indicated.

M. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.4 INSTALLATION - FLOORS - THIN-SET METHODS:

A. Over exterior concrete substrates, install in accordance with TCA Handbook Method F102, with standard grout.

B. Over interior concrete substrates, install in accordance with TCA Handbook Method F113, dry-set or latex-portland cement bond coat, with standard grout, unless otherwise indicated.
   1. Where waterproofing membrane is indicated, install in accordance with TCA Handbook Method F122, with latex-portland cement grout.
   2. Where epoxy bond coat and grout are indicated, install in accordance with TCA Handbook Method F131.

C. Over wood substrates, install in accordance with TCA Handbook Method F150, with standard grout, unless otherwise indicated.
   1. Where epoxy bond coat and grout are indicated, install in accordance with TCA Handbook Method F143.

3.5 INSTALLATION - FLOORS - MORTAR BED METHODS:

A. Over exterior concrete substrates, install in accordance with TCA F101, bonded, with standard grout.

B. Over interior concrete substrates, install in accordance with TCA Handbook Method F111, with cleavage membrane, unless otherwise indicated.
   1. Where waterproofing membrane is indicated, with standard grout or no mention of grout type, install in accordance with TCA Handbook Method F121.
   2. Where epoxy bond coat and grout are indicated, install in accordance with TCA Handbook Method F132, bonded.
   3. Where epoxy or furan grout is indicated, but not epoxy or furan bond coat, install in accordance with TCA Handbook Method F114, with cleavage membrane.

C. Over wood substrates, install in accordance with TCA Handbook method F141, with standard grout, unless otherwise indicated.

D. Cleavage Membrane: Lap edges and ends.

E. Waterproofing Membrane: Install as specified in ANSI A108.13.

F. Mortar Bed Thickness: 1-1/2 to 2 inch maximum, unless otherwise indicated.

3.6 INSTALLATION WHERE REQUIRED - SHOWERS AND BATHTUB WALLS:

A. At tiled shower receptors install in accordance with TCA Handbook Method B415, mortar bed floor, and W244, thin-set over cementitious backer unit walls.

B. At bathtub walls install in accordance with TCA Handbook Method B412, over cementitious backer units with waterproofing membrane.

C. Grout with standard grout as specified above.

D. Seal joints between tile work and other work with sealant specified in Section 07900.

3.7 INSTALLATION - WALL TILE:

A. Over cementitious backer units on studs, install in accordance with TCA Handbook Method W244, using membrane at toilet rooms.

B. Over gypsum wallboard on wood or metal studs install in accordance with TCA Handbook Method W243, thin-set with dry-set or latex-portland cement bond coat, unless otherwise indicated.
   1. Where mortar bed is indicated, install in accordance with TCA Handbook Method W222, one coat method.
   2. Where waterproofing membrane is indicated other than at showers and bathtub walls, install in accordance with TCA Handbook Method W222, one coat method.

C. Over interior concrete and masonry install in accordance with TCA Handbook Method W202, thin-set with dry-set or latex-portland cement bond coat.

D. Over wood studs without backer install in accordance with TCA Handbook Method W231, mortar bed, with membrane where indicated.

E. Over metal studs without backer install in accordance with TCA Handbook Method W241, mortar bed, with membrane where indicated.

3.8 CLEANING & SEALING:

A. Clean wall tile and grout surfaces with cleaning agents recommended by manufacturer.

B. Mosaic floor tile shall be cleaned with Aqua Mix Ex-Treme as per manufacturers' recommendations.

C. Mosaic floor tile shall be sealed with Aqua Mix Gold as per manufacturers' recommendations.

3.9 PROTECTION OF FINISHED WORK:

A. Do not permit traffic over finished floor surface for 72 hours after installation.

B. Cover floors with kraft paper and protect from dirt and residue from other trades.

C. Where floor will be exposed for prolonged periods cover with plywood or other similar type walkways

END OF SECTION

SECTION 09501

ACOUSTICAL CEILINGS STEEL EXPOSED SUSPENSION SYSTEM AND DRY WALL GRID SYSTEM

PART 1: GENERAL

1.01 SCOPE

A. Perform all work required to complete the Acoustical Ceilings Steel & Alum. Exposed Suspension System indicated by the Contract Documents and furnish all supplementary items for the proper installation.

B. The requirements of Division 0 - "Bidding and Contract Requirements" and Division 1 - "General Requirements" of this Project Manual apply to all work required for this Section.

1.02 SUBMITTALS:

A. Samples: Submit 12"x12" samples of suspension system showing cross tee connection to main bean. Submit 12" long sample of angle molding.

B. Shop Drawings: Show erection details and location of all openings in system.

PART 2: PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Material manufactured by any of the following manufacturers is acceptable provided it complies with the Contract Documents:

1. SUSPENSION SYSTEMS:
   a. ARMSTRONG
   b. CHICAGO METALLIC
   c. USG COMPANY
   d. Certain Teed

2.02 MATERIALS

A. STEEL EXPOSED SUSPENSION SYSTEM: USG CHICAGO ONE HOUR FIRE RATED SYSTEM, cleansed, electrogalvanized and bonderized, with high-baked enamel finish on all parts and painted white enamel finish on expose surfaces, ASTM C-635, maximum deflection 0.133 inch, Intermediate Duty.

1. Main Beams: .017 inch minimum commercial grade steel, bulb section, l-1/2" web and 15/16" flange, 12 lbs. per lineal foot simple span minimum load limit. Rout beams at 12" on center.
2. Cross Tees: .017 inch minimum steel, 1¼" web and 15/16" flange, forced TAB-LOCK ends for attachment to adjoining beam cross tee, providing minimum torsional movement and lateral displacement. Rout tees at 12" on center.
3. Beam Cross Tees: .017 inch minimum steel, 1½" web and 15/16" flange formed TAB-LOCK ends for attachment to adjoining main beam, providing minimum torsional movement and lateral displacement, 12 lbs. per lineal foot simple span minimum load limit. Rout tees at 12".
4. Angle Molding: .020 inch minimum cold rolled steel, 15/16"x15/16".
5. Accessories: Specifically designed as an integral part of the grid system.
6. Fire rating install at all fire rated ceilings, meeting fire rated assemblies.

B. STEEL EXPOSED SUSPENSED GRID SYSTEM AT ALL NON-FIRE RATED CONSTRUCTION, (CHICAGO METALLIC 200 SNAP-GRID) Chemically cleansed, electrogalvanized and bonderized, with

high-baked enamel finish on all parts and painted white enamel finish on expose surfaces, ASTM C-635, maximum deflection 0.133 inch, intermediate Duty.

C. WIRE: 12 gauge galvanized, soft annealed, mild steel wire.

D. AT KITCHEN CEILING PROVIDE AND INSTALL ALUMINUM BEAMS AND CROSS TEES.

PART:3: EXECUTION

3.01 PREPARATION

A. Examine spaces and correct defects that could interfere with proper installation. Installed suspension system shall meet requirements of "Specifications for Acoustical Tile and Lay-in Panel Ceiling Suspension System," published by the Acoustical Materials Association.

B. Install acoustical treatment after moist materials have been installed. Maintain temperature and humidity conditions closely approximating the interior conditions which will exist when the building is occupied but not less than 50 Deg. or more than 85 Deg. F. before, during and after installation.

C. Layout spaces and arrange suspension system in a regular pattern parallel or perpendicular to surrounding walls. Arrange system symmetrically about room centerlines in both directions equalizing borders. No border shall be less than one-half the tile width.

3.02 STEEL EXPOSED SUSPENSION SYSTEM INSTALLATION

A. Install angle molding around perimeters and abutting surfaces, at proper level for finished ceiling height. Miter angle molding at exterior corners; cut flanges and bend web to form interior corners.

B. Suspend main beams spaced 4'-0" on center from structure with wire hangers spaced 4'-0" on center (5'-0" o.c where supported by purlins) Install main beams level within l/8 inch in 12 feet with hanger wire taut and tightly wrapped to prevent vertical movement or rotation. Do not make local kinks or bends in hanger wires as a means of leveling. Join beams with approved splice unit. Install at 2'-0" o.c. where 24"x24" tile is used.

C. Install beam cross tees at right angles to main beams, space at 2'-0" on center and join to main beams with positive interlock. Install beam cross tees to within l/33 inch of their required location and within 0.015 inch of the same horizontal plane as main beam, and never below continuous member.

D. Lay ends of main beams and cross tees on angle moldings at vertical surfaces. Provide additional hanger wires at each corner of recessed light troffers and other concentrated load conditions to prevent deflection in excess of 1/240th of the span.

E. Install cross tees at right angles to beam cross tees to support ends of light fixtures, diffusers or grilles.

3.03 CLEANING AND PROTECTION

A. Protect acoustical materials and treatment from damage before, during and after installation. Clean to remove soil and stain. Remove and replace damaged units and units which cannot be cleaned. Remove excess materials and debris from Site.

B. Do not use toothpaste, baby powder or similar material to disguise blemishes.

3.04 NON-FIRE RATED DRYWALL GRID SYSTEM

A. Manufacturers:

Chicago Metallic (660-C) heavy duty double web suspension system.

B. Suspension System Components

C. Furring Runners: Manufactured from 0.020 inch thick steel, 1-3/8 inch wide knurled face by 1-1/2 inches high by 144 inches long with factory punched cross tee slots, hanger holes, and non-directional bayonet end tab couplings.

D. Furring Tees: Manufactured from (0.020) inch thick, 1-3/8 inch wide, knurled face by 1-1/2 inches high by 48 inches long with (stab-type end tab) (hook-type end tab) couplings, factory punched cross tee slots, and hanger holes.

E. Furring Cross Channel:

1. Manufactured from 0.020 inch thick steel, 1-3/8 inch wide knurled face by 7/8 inches high by 48 inches long with straight locking end tabs.

F. Cross Tees:

1. Manufactured from 0.020 inch thick steel, 15/16 inch wide by 1-1/2 inches high by 48 inches long with stab-type end tab couplings, factory punched cross tee slots, and hanger holes.
2. Coated with factory applied white baked-on enamel paint finish.

G. Wall Track:

1. Manufactured from 0.020 inch thick steel 1-9/16 inches high by 120 inches long with a 1 inch top and bottom flange.

3.05 EXAMINATION

Examine area receiving suspension system to identify conditions which will adversely affect installation. Do not begin installation until adverse conditions have been remedied.

3.06 INSTALLATION - NON FIRE RATED SYSTEM

A. Furring Runners: Installed 48 inches on center, by direct suspension from existing structure, with not less than 12 gauge hanger wires spaced 48 inches on center along main runner length. Wrap hanger wires tightly 3 full turns at each end.

B. Furring Tees: Installed perpendicular to furring runners (16)(24) inches on center to form 24 by 24 modules.

C. Cross Tees: Installed adjacent to each unsupported side of recessed fixtures.

D. Wall Track: Installed on vertical surfaces, intersecting suspension components, by appropriate method in accordance with industry accepted practice.

E. Additional Hanger Wires: Wrapped tightly 3 full turns to structure and component at locations where imposed loads could cause deflection exceeding 1/360 span.

3.07 REPAIR

Remove damaged components, replace with undamaged components.

3.08 FIRE RATED DRYWALL GRID SYSTEM

A. Manufacturers

Chicago Metallic (670-C) heavy duty double web suspension system.

B. Suspension System Components

C. Furring Runners: Manufactured from 0.020 inch thick steel, 1-3/8 inch wide knurled face by 1-1/2 inches high by 144 inches long with factory punched cross tee slots, hanger holes, and non-directional bayonet end tab couplings.

D. Furring Tees: Manufactured from (0.020) inch thick, 1-3/8 inch wide knurled face by 1-1/2 inches high by 48 inches long with (stab-type end tab) (hook-type end tab) couplings, factory punched cross tee slots, and hanger holes.

E. Furring Cross Channel:

1. Manufactured from 0.020 inch thick steel, 1-3/8 inch wide knurled face by 7/8 inches high by 48 inches long with straight locking end tabs.

F. Cross Tees:

1. Manufactured from 0.020 inch thick steel, 15/16 inch wide by 1-1/2 inches high by 48 inches long with stab-type end tab couplings, factory punched cross tee slots, and hanger holes.

2. Coated with factory applied white baked-on enamel paint finish.

G. Wall Track:

1. Manufactured from 0.020 inch thick steel, 1-9/16 inches high by 120 inches long with a 1 inch top and bottom flange.

3.09 EXAMINATION

Examine area receiving suspension system to identify conditions which will adversely affect installation. Do not begin installation until adverse conditions have been remedied.

3.10 INSTALLATION

A. Furring Runners: Installed 48 inches on center, by direct suspension from existing structure, with not less than 12 gage hanger wires spaced 48 inches on center along main runner length. Wrap hanger wires tightly 3 full turns at each end.

B. Furring Tees: Installed perpendicular to furring runners (16)(24) inches on center to form 24 by 24 modules.

C. Cross Tees: Installed adjacent to each unsupported side of recessed fixtures.

D. Wall Track: Installed on vertical surfaces, intersecting suspension components, by appropriate method in accordance with industry accepted practice.

E. Additional Hanger Wires: Wrapped tightly 3 full turns to structure and component at locations where imposed loads could cause deflection exceeding 1/360 span.

3.11 INSTALLATION-FIRE RATED SYSTEM

A. Installed in accordance with U.L. assemblies.

3.12 REPAIR

Remove damaged components, replace with undamaged components.

END OF SECTION

SECTION 09511

ACOUSTICAL CEILING LAY-IN PANELS

PART 1: GENERAL

1.01 SCOPE

A. Perform all work required to complete the Acoustical Ceiling Lay-In Panels indicated by the Contract Documents and furnish all supplementary items for their proper installation.

B. The requirements of Division O - "Bidding and Contract Requirements" and Division 1 - "General Requirements" of this Project Manual shall apply to all work required for this Section.

1.02 SUBMISSIONS

A. Samples: Submit 12"x12" samples of each type acoustical unit specified. Submit 12" long sample of angle molding.

B. Shop Drawings: Show complete pattern layout, setting diagrams and arrangement of acoustical units. Show erection details and location of all openings in system.

PART 2: PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Material manufactured by any of the following manufacturers is acceptable provided it complies with the Contract Documents

1. ACOUSTICAL UNITS:

Armstrong Building Products
CertainTeed Ceilings
United States Gypsum

2.02 MATERIALS:

A. Armstrong Design Basis:

1.	School Zone Fine Fissured	24” x 24” x 3/4”, Item #1713.
2.	School Zone Fine Fissured, fire rated UL assembly	24” x 24” x 3/4”, Item #1810.

B. CertainTeed Design basis ceiling tiles:

1.	Fine Fissured	24” x 24” x 3/4”, HHF-457 HNRC
2.	Fine Fissured fire rated UL assembly	24” x 24” x 5/8”, PFF-157

PART 3: EXECUTION

3.01 PREPARATION

A. Examine spaces and correct defects that could interfere with proper installation. Installed ceiling system shall meet requirements of "Specifications for Acoustical Tile and Lay-In Panel Ceiling Suspension System," published by the Acoustical Materials Association.

B. Install acoustical treatment after-moist materials have been installed. Maintain temperature and humidity conditions closely approximating the interior conditions which will exist when the building is occupied but not less than 50°F. or more than 85°F. before, during and after installation.

3.02 ACOUSTICAL PANEL INSTALLATION

A. Rest acoustical units on flanges of inverted tees with units neatly fitted against abutting surfaces. Fit acoustical units closely and accurately around recessed lighting fixtures, grilles and other fixtures or equipment passing through or in the plane of acoustical finish.

B. Hold acoustical units in place with a minimum of four hold-down clips per unit at entrances and over partitions. Provide additional hold-down clips where acoustical units do not fit snug to system flanges.

3.03 INSULATION INSTALLATION

A. Install sound attenuation blankets above ceilings where indicated with all joints butted tightly. Completely cover entire surface with blankets free from wrinkles, sags, tears, ruptures, etc. Lay batts flat in the ceiling without being compressed. Place snug against each other so as to leave no space between batts.

3.04 CLEANING AND PROTECTION

A. Protect acoustical materials and treatment from damage before, during and after installation. Clean to remove soil and stain. Remove and replace damaged units and units which cannot be cleaned. Remove excess materials and debris from Site.

B. Do not use toothpaste, baby powder or similar material to disguise blemishes.

END OF SECTION

SECTION 09658

RUBBER BASE AND RUBBER ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. Provisions of Division 01 apply to this section.

B. Section Includes:
   1. Topset coved rubber base for installation with surface flooring.
   2. Rubber accessories.

C. Related Sections:
   1. Section 09651: Rubber Flooring and Stair Covering.
   2. Section 09652: Vinyl Composition Tile.
   3. Section 09653: Linoleum Tile.
   4. Section 09654: Resilient Sheet Flooring.
   5. Section 09681: Carpet.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's published technical data describing materials, construction and recommended installation instructions. Submit technical data and installation instructions for each adhesive material.

B. Maintenance Instructions: Submit manufacturer's recommendations for maintenance, care and cleaning of base.

C. Samples: Submit Samples of top set base in each available color. Following color selections, submit Samples, not less than 12 inches long of each selected color and type. Submit pint cans of each type adhesive.

D. Maintenance Materials: Before Substantial Completion, deliver at least 50 lineal feet and 5 outside corner units of each color of rubber base installed. Deliver the materials in unopened factory containers or in sealed cartons with labels identifying the contents, matching installed materials. Include unopened cans of adhesives adequate to install the maintenance materials.

1.03 QUALITY ASSURANCE

A. Qualifications of Installer: Minimum 5 years experience in successfully installing the same or similar flooring materials.

B. Comply with the following as a minimum requirement:
   1. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.
   2. ASTM F 1861: Standard Specification for Resilient Wall Base.
   3. California High Performance Schools (CHIPS) Low-Emitting Materials Table: Materials submitted for rubber base assemblies must be listed as low emitting on the CHPS website, www.CHPS.net, or must be tested by an independent laboratory to meet CHPS Section 01350. All components of an assembly must meet Section 01350 individually or in an assembly. Rubber assemblies include tile and adhesive.

4. All chemically based products such as sealers, primers, fillers, adhesives, etc. must be approved by Owner's Office of Environmental Health and Safety (OEHS).
5. Each selected color and configuration shall be from same dye lot and color.

1.04 DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered to the Project site in original unopened manufacturer's packaging clearly labeled with manufacturer's name. Store materials at room temperature, but not less than 70 degrees F, for a minimum of 48 hours before installation, unless otherwise indicated in manufacturer's printed instructions.

1.05 PROJECT CONDITIONS

A. Ventilation and Temperature: Verify areas that are to receive rubber base are ventilated to remove fumes from installation materials, and areas are within temperature range recommended by the various material manufactures for site installation conditions.

1.06 WARRANTY

A. Manufacturer shall provide a 2 year material warranty.

B. Installer shall provide a 2 year labor warranty.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Roppe, Pinnacle Rubber Base.

B. Flexco Company, Wallflower Premium Rubber Wall Base.

C. Burke Base, Premium Rubber Wall Base

D. Johnsonite Rubber Wall Base

2.02 MATERIALS

A. Rubber base: Conform to ASTM F 1861; Group 2, solid (homogeneous); Type 1, TS, (thermoset) vulcanized rubber, Style A, 4 inch high unless otherwise indicated, integral colors as selected, non-shrinking, 1/8 inch thick, with jobsite formed outside corners.

B. Rubber base will be PVC free with the ability to be recycled at the end of cove base life.

C. Base Adhesive: Water based, low odor type, as recommended by manufacturer of rubber base.

2.03 RUBBER ACCESSORIES

A. Edge Guards, adapter and transitions, reducers, coved caps and stair nosings.
   1. Provide respective rubber accessories from the entire stock of style and sizes of the manufacturer. Install rubber accessories at dissimiliar flooring materials, height to match flooring material by roppe or equal. Color as selected by Architect.

B. Stair tread and riser one-piece shall be a raised circular vantage design #96 with riser with abrasive nosing 50/51 by roppe or equal. Color as selected by Architect.

PART 3 - EXECUTION

3.01 COORDINATION

A. Coordinate the Work of this section with other sections to provide a level, smooth and clean finish surfaces to receive rubber base.

3.02 EXAMINATION

A. Field verify dimensions and other conditions affecting the Work of this section before commencing the Work of this section.

B. Before Work is started, examine surfaces that are to receive rubber base. Deficiencies shall be corrected before starting the Work of this section.

3.03 PREPARATION

A. Do not start preparation until adjacent concrete floor slabs are at least 90 days old and finish flooring is installed.

B. Install rubber base when ambient temperature is 70 degrees F. or higher.

3.04 INSTALLATION

A. Install top set base at all hard floors, including resilient flooring, concrete and wood, carpet and other soft floors, unless otherwise indicated on drawings.

B. Securely fasten and cement base to backing in long lengths in accordance with manufacturer's recommendations. Lay out lengths so that not less than 18 inches long filler pieces are provided. Assure that top and toe continuously contact the wall and floor, and that all joints are tight. Install jobsite formed outside corners at all offsets. All inside corners shall be coped; wrapped corners are not acceptable.

C. Use of adhesive gun is prohibited. Apply adhesive directly to substrate using the appropriate notched trowel or spreader according to manufacturer's instructions. Maintain 1/8 inch gap from top of base to prevent adhesive oozing onto adjacent surfaces.

D. Base and outside corners shall be rolled with a seam roller before adhesive sets.

3.05 CLEANING

A. Maintain clean base surfaces as installation progresses. Clean rubber base when adhesive is properly cured and remove foreign substances.

B. Clean adjacent surfaces of adhesive or other defacement. Replace damaged and/or defective Work to the specified condition.

3.06 CLEAN UP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

3.07 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 09660

RESILIENT FLOORING

PART 1: GENERAL

1.01 DESCRIPTION

A. Work included: Provide all resilient flooring, complete in place, as indicated on the drawings, specified herein, or otherwise needed for a complete and proper installation of the work of this Section. Where indicated match existing type and color.

B. Related work described elsewhere:
CARPETING: SECTION 09680

1.02 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.03 SUBMITTALS

A. General: Comply with pertinent provisions of Section 01300.

B. Manufacturers' data - Submit:

1. Complete materials list of all items proposed to be furnished and installed under this Section.
2. Manufacturers' specifications and other data required to demonstrate compliance with the specified requirements.
3. Samples of each item, color, and pattern available in the specified products from the proposed manufacturer.
4. Manufacturers' recommended methods of installation. {The manufacturers' recommended methods of installation, will become the basis for inspecting and accepting or rejecting actual installation methods used on the work.}

1.04 PRODUCT HANDLING

A. Delivery and storage: Deliver materials to the job site and store in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturers' recommendations.

B. Protection: Use all means necessary to protect materials of this Section before, during, and after installation and to protect installed work and materials of all other trades.

C. Replacement: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

D. Additional tile: Furnish to the Owner one carton of each pattern or color of replacement vinyl composition tile.

PART 2: PRODUCTS

2.01 MATERIALS - GENERAL

A. COLORS AND PATTERNS shall be as selected by the Architect from colors and patterns available from the approved manufacturer in the specified types. Approved manufacturers include Armstrong Cork Co., Azrock, Manington Tarkett Gafstar ***Thru-Chip Tile*** or approved equal, in 1/8" thickness ***80% field color group 20% accent color group..***

B. ADHESIVES shall be a waterproof and stabilized type as recommended by the manufacturer of the approved resilient material. Asphalt emulsions and other non-waterproof types will not be acceptable. Adhesives shall not contain asbestos.

C. CONCRETE SLAB PRIMER shall be a non-staining type as recommended by the manufacturer of the resilient material to be applied over it at all transition from V.C.T. to another flooring..

D. EDGING STRIPS install edge strips at all dissimilar floor transitions shall be 3 mm (1/8") thick, homogeneous rubber composition, tapered or bullnose type, as approved by the Architect.

E. VINYL COMPOSITION TILE, Item (F.1) on schedule, shall be 30 cm x 30 cm (12"x12") square 3.175 mm (1/8") thick "Thru-Chip", {or an equal approved in advance by the Architect, in colors selected by the Architect from standard colors of the approved manufacturer.}

2.02 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this Section, shall be as recommended by the manufacturer of the resilient materials used, and as approved by the Architect.

PART 3: EXECUTION

3.01 INSPECTION

A. General: Examine the areas and conditions under which resilient flooring is to be placed. Correct conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

B. Surface shall be smooth, level, at the required finish elevation, without more than 3 mm (1/8") in 3 m (10'-0") variation from level or slopes shown.

3.02 PREPARATION

A. Subfloors: Prior to start of laying tile units, broom clean or vacuum all surfaces to be covered and inspect the subfloors. Start of laying tile will indicate acceptance of subfloor conditions.

B. Concrete primer: Apply concrete slab primer if recommended by tile manufacturer, prior to application of the adhesive. Apply in compliance with manufacturer's directions.

3.03 INSTALLATION:

A. General:

1. Install tile only after all finishing operations, including painting, have been completed and permanent heating system is operating. Moisture content of concrete slabs, building air temperature and relative humidity must be within limits recommended by tile manufacturer.
2. Place tile units with adhesive cement in strict compliance with the manufacturer's recommendations. BUTT TILE UNITS TIGHTLY TO VERTICAL SURFACES, thresholds, nosings and edgings.

Scribe as necessary around obstructions and to produce neat joints, laid tight, even and in straight, parallel lines.

3. Extend tile units into toe spaces, door reveals, and in closets and similar openings.
4. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on the finish tile as marked in the subfloor. Use chalk or other non-permanent marking device.
5. Lay tile from center marks established with principal walls, discounting minor off-sets, so that tile at opposite edges of the room are of equal width. Adjust as necessary to avoid use of cut widths less than 7.5 cm (3”) at room perimeters. Lay tile square to room axles.

B. Matching:

1. Match tiles for color and pattern by using tile from cartons in the same sequence as manufactured and packaged. Cut tile neatly to and around all fixtures. Broken, cracked, chipped or deformed tile are not acceptable.
2. Tightly cement tile to sub-base without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks through tile, or other surface imperfections
3. Unless otherwise noted, lay tile in checkerboard pattern with grain in tile running in alternate direction.

C. Edgestrips: Place the resilient edgestrips tightly butted to tile, and secure with adhesive. Provide edgestrips at all unprotected edges of tile and at floor material transitions, unless otherwise shown.

3.04 CLEANING AND PROTECTION

A. Move excess adhesive or other surface blemishes from tile, using neutral type cleaners recommended by the tile manufacturer. Protect installed flooring from damage until acceptance by the Owner.

3.05 FINISHING

A. After completion of the work and just prior to final inspection, thoroughly clean tile floors and accessories. Apply wax and buff, with the type of wax, number of coats, and buffing procedures recommended by the tile manufacturer.

END OF SECTION

SECTION 09900

PAINTING

PART 1: GENERAL

1.01 SCOPE

A. Perform all work required to complete the Finish Painting indicated by the Contract Documents and furnish all supplementary items necessary for its proper installation.

B. The requirements of Division O - "Bidding and Contract Requirements" and Division 1 - "General Requirements" of this Project Manual shall apply to all work required for this section.

C. Paint to completion of all exposed surfaces throughout the Project, both interior and exterior with the exception of the following:

1. Surfaces which are delivered to the job site with a factory finish, unless indicated to be painted.
2. Nonferrous metals.
3. Integral color Concrete, Stucco or Cementitious Coatings.
4. Exposed concrete floors.
5. Face brick.

1.02 SUBMITTALS

A. Detailed Painting Schedule

1. Furnish a "Detailed Painting Schedule" for approval by the Architect. Indicate type of surface, type of paint material, and number of coats required, as set forth in the "Painting Requirements" hereinafter specified.
2. Submit brand designation and grade of the indicated type produced by the approved manufacturer for each application listed or required.
3. Submit product analyses and performance characteristics for all paint materials as requested by the Architect.
4. Submit approval of the "Detailed Painting Schedule" before delivering material to the job site.
5. No claim by the Painting Contractor as to the unsuitability or unavailability of any material specified or his unwillingness to use same or his inability to produce first-class work with same will be entertained, unless such claims are made in writing and submitted with his bid.
6. The Architect will check the "Detailed Painting Schedule" and if any painting material listed therein does not represent, in the opinion of the Architect, such highest quality of the manufacturer, the Architect may direct its replacement with an acceptable painting material at no additional cost to the Owner.
7. Owners maintenance manual : Upon conclusion of the project, the Contractor or paint manufacturer/supplier shall furnish a coating maintenance manual, such as Sherwin Williams “Custodian Project Color and Product Information” report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product date pages, Material Safety Data Sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

B. Samples

1. Submit duplicate samples of each type paint finish proposed for use.
2. Samples shall be 3"x6" on suitable materials and shall be as true a representation of finished work as

is practicable.

3. Label each sample and show various stages of finish on each sample.

1.03 PRODUCT HANDLING

A. Delivery

1. Deliver material to job site in original, unopened containers and packages bearing manufacturers name, type of paint, stock number and color.
2. Deliver all paints ready-mixed unless otherwise directed by the Architect.

B. Storage

1. Keep storage area neat, clean and adequately protected from paint spillage. Repair damage caused to surfaces within storage areas.
2. Dispose of all cloths and cotton waste which might constitute a fire hazard at the end of each work day.

1.04 ENVIRONMENTAL CONDITIONS

A. Do not apply paint or varnish under conditions that could adversely affect drying of final finish. Apply all materials under adequate illumination and ventilation.

B. Do not apply paint or varnish when temperature is less than 50 deg. F. or more than 90 deg. F., or when excess humidity is present.

1.05 PROTECTION

A. Protect or remove hardware, escutcheons, fixtures, plates, covers, and other items subject to damage or discoloration from painting.

B. Carefully and adequately protect, as required, all surfaces not requiring painting in areas where painting is being carried on. Use tarpaulins or other suitable covers, with supports, if needed, to protect adjacent or underlying surfaces

C. Maintain all wrappings or other factory-applied protection furnished with finishing hardware or other items provided by other trades and installed in areas where painting is required. If wrappings are displaced or removed, protect surfaces for the duration of painting work.

PART 2: PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Material manufactured by The Sherwin Williams Company is the acceptable standard of quality. Coating systems from other listed manufacturers shall match the systems specified provided it complies with the Contract Documents.

1. PAINT:
   Sherwin-Williams Company
   Glidden Professional
   Pratt and Lambert, Inc.
   PPG Industries, Inc.
   Benjamin Moore

2.02 MATERIALS

A. PREPARED PAINTS AND COATINGS: All by the same manufacturer, unless otherwise specified.

B. TINTING COLORS: By manufacturer of Prepared Paint.

C. SPACKLING COMPOUND: Finely ground, grit-free when dry will set with no shrinkage to a smooth, hard, white surface and will sand properly and receive any finish.

D. PATCHING PLASTER: White, nonshrinking, containing no lime and uniform in set and quality.

E. TAPE AND BED MATERIALS:

1. JOINT TAPE: USF Perf-A-Tape
2. EMBEDDING AND FINISHING COMPOUND: USG Ready-Mixed Joint Compound All Purpose.

F. PRIMERS:

1. FERROUS METAL PRIMER: Sherwin Williams Pro-Cryl Universal Water Based Primer B66-310.
Glidden Professional: Devflex 4020PF DTM Primer/Finish
2. ALKYD ENAMEL PRIMER: Sherwin Williams Pro-Cryl Universal Water Based Primer B66-310.
Glidden Professional: 4160 Devguard DTM Primer
3. ALKYD WOOD PRIMER: Sherwin Williams Premium Wall and Wood Primer B28W8111.
Glidden Professional: Coverstain Oil Based Primer
4. OIL PAINT PRIMER: Sherwin Williams Premium Wall and Wood Primer B28W8111.
Glidden Professional: Coverstain Oil Based Primer
5. LATEX WALL PAINT PRIMER: Sherwin Williams Prep Rite High Build Primer B28W601 with texture to produce fine finish plaster appearance on Drywall.
Glidden Professional: 1040 Fill & Seal High-Build Primer
6. SPOT PRIMER: Sherwin Williams Pro-Cryl Universal Water Based Primer B66-310.
Glidden Professional: Devflex 4020 PF DTM Primer/Finish
7. GALVANIZED PRIMER: Sherwin Williams Pro-Cryl Universal Water Based Primer B66-310.
Glidden Professional: Devflex 4020 PF DTM Primer/Finish
8. WATERPROOF EXTERIOR PRIMER/FINISH: Sherwin Williams Loxon XP.
Glidden Professional: Gripper 3210-1200

G. FILLERS/SEALERS:

1. WOOD FILLER: Sherwin Williams Wood Filler.
2. KNOT SEALER: Formula WP0578 of the Western Pine Association.

H. ALKYD/OIL BASE PAINTS:

1. ALKYD GLOSS ENAMEL: Sherwin Williams Industrial Enamel B54 Series.
Glidden Professional: Industrial Gloss Alkyd 4308
2. ALKYD SEMIGLOSS ENAMEL: Sherwin Williams Pro Mar Alkyd Semi-Gloss
Glidden Professional: Alkyd Semi-Gloss 1516

I. LATEX PAINTS:

1. LATEX FLAT WALL PAINT: Sherwin Williams Pro Mar 200, Antimicrobial, Zero VOC, Latex Finish, Flat, Eg-Shell and Semi-Gloss.
Glidden Professional: Lifemaster No VOC (flat, eggshell, semi-gloss)

2. LATEX MASONRY PAINT, ACRYLIC: Sherwin Williams Loxon XP.
Glidden Professional: Gripper 3210-1200
3. VINYL LATEX EMULSION: Sher-Tex medium texture.
Glidden Professional: Textured Coatings Flat 3230

J. LACQUER: Fed. Spec. TTP-P-143.

K. WOOD STAIN: Sherwin Williams Semi-Transparent Polyurethane Exterior Stain A15T5.
Glidden Professional: Flood Semi-Transparent Polyurethane Stain

L. WOOD STAIN: Sherwin Williams Woodscapes Solid Color Acrylic House Stain A15 Series.
Glidden Professional: Flood Acrylic Stain

M. OIL: Watco Danish Oil

M. WAX: Watco Satin Carnauba Liquid Wax

O. (1) INTERIOR EPOXY : One (1) coat Sherwin Williams Heavy Duty block-filler; then Sherwin Williams Pro Industrial Water Based Epoxy B73 Series.
Glidden Professional: 4000 Bloxfil Heavy Duty Block Filler, finish coat: Tru Glaze 4426 Semi-Gloss (or 4428 Tru Glaze Gloss)

P. EXTERIOR Elastomeric: Sherwin Williams two (2) coat Loxon block surface A24W200. Two (2) coats conflex XL high build elastomeric coating A5-400.
Glidden Professional: Decra Flex 300 Smooth Flat 2260

Q. FIRE RETARDANT PAINT: Sherwin Williams or Glidden Professional: Flame Control No. 20-20 interior fire retardant flat latex, shall be used on all exposed painted wood except doors and millwork.

2.03 MIXING:

A. Tint prime coats and undercoats approximately to the shade of the final coat, but each with a slight variation in color to distinguish them from the preceding coat.

B. Apply paint of consistency recommended by manufacturer. Additional thinning permitted only with specified approval.

C. Use factory mixed colors, shades, and tints with finish paints matching the approved color samples. Job mixing permitted only with specific approval.

2.04 FINISH AND COLORS:

A. Paint colors shall be as selected by the Architect. Before any work is begun, the Architect will furnish the Painting Contractor with a color schedule and/or chips showing where the ***various*** colors shall be used.

B. ***60% of wall paint shall cover field wall and accent walls and surfaces terminating at corners floor and ceilings, 40% of wall paint shall be accent stripping, wall patterns, logo or graphics as selected by architect.***

PART 3: EXECUTION

3.01 CONDITION OF SURFACES

A. Examine surfaces to receive painting before beginning work and correct defects that could affect quality of finished work. Prepare surfaces, as necessary, to receive painting as specified. Retouch shop coats and prime coats as necessary.

B. Starting painting work shall be construed as evidence of acceptance of conditions under which work will be done.

C. Clean surfaces to be painted and spaces in which painting will be done, broom-clean and dust-free. Remove soil, prints, stains, and adhered materials that would affect finish painting.

D. If acids have been used for cleaning, all traces of acid shall be thoroughly neutralized and rinsed and dried before any paint is applied.

E. Meet requirements of other portions of specifications for preparation of specific items.

F. Apply primer or first coat immediately after surface preparation to prevent contamination of the surface.

3.02 PREPARATION

A. Shop Painted Ferrous Metal

1. Clean surfaces free of concrete, mortar, plaster, rust, shavings, dirt, dust and other objectionable materials. Remove grease and oil with gasoline, benzine or other similar volatile cleaner. Use cleaner when space is properly ventilated and not in the presence of any open flame.
2. Touch up abraded or marred shop coats with spot primer specified.

B. Unpainted Ferrous Metal

1. Clean surfaces free of loose scale, rust, shavings, filings, dirt, dust and other objectionable material with wire brushes or other proper and acceptable means.
2. Remove grease and oil with gasoline, benzine or other similar volatile cleaner. Sandblast or wire brush to base metal all rusted areas on exposed exterior members. Use cleaner when space is properly ventilated and not in the presence of any open flame.

C. Zinc-Coated Metal (Galvanized)

1. Clean surfaces free of loose particles and other objectionable material. Remove grease and oil with mineral spirits or other similar cleaner.
2. Coat welded, chipped or abraded surfaces with "Galvalloy" galvanizing stick compound or ZRC Zinc Coating after wire brush cleaning.
3. Treat surfaces with an approved chemical compound such as a phosphoric acid-wash. Remove chemical compound completely with clean, fresh water and thoroughly dry surfaces prior to priming.

D. Gypsum Board

l. Mix and apply tape and bedding system in accordance with the manufacturer's recommendations.
2. Apply joint compound (embedding coat) to internal angles and butt joints approximately 3" wide and sufficiently thick to hide board surfaces. Cover screw heads and depressions with compound.
3. Apply tape to angles and joints, centered and seated into compound leaving sufficient compound under tape to provide proper bond. Apply a skim coat of compound over tape and clean excess compound from wallboard surface.
4. When first coat has thoroughly dried, apply second coat (fill coat) over embedding coat, filling board taper flush with board surface. For joints without taper, feather out 4" on either side of tape.

5. When second coat has thoroughly dried, apply third coat (finishing coat) tapered beyond edges of second coat and feathered to a smooth uniform finish which does not protrude beyond the plane of the board surface.
6. Apply at least two coats of compound to flanges of corner beads and metal edging. Extend compound approximately 8 to 10 inches either side of exposed metal. Apply three coats of compound in succession for all dimples at fastener heads
7. Sand all coats after each application has dried and leave wallboard and treated areas uniformly smooth, ready to receive decoration.

E. Plaster: **Integral color or painted; refer to drawings**.

F. Wood

1. Clean knots, pitch streaks or visible sap spots free of residue and treat with Knot Sealer. Apply second coat of sealer no less than two hours after the application of the first coat.
2. Fill nail holes and other indentations with wood filler after first coat, matching color of stain or paint. Finish flush with adjacent surfaces.
3. Sand wood surfaces smooth with No. 00 sand paper and remove dust prior to painting.

G. Factory Finished Items

1. Factory finished items requiring painting shall be etched or otherwise prepared in an approved manner to receive final finish coat.

H. Insulation

1. Clean surfaces of pipe, duct and equipment insulation, such as canvas jackets and troweled-on insulation and of rigid wall or ceiling insulation where items are required to be painted.
2. Remove all loose, foreign and objectionable material prior to the application of any paint materials.

I. Copper Piping

1. Wash surfaces with a 5 percent acetic acid solution and allow to dry. Do not damage adjacent surfaces due to acid spillage.

J. Aluminum: Prefinished (or anodized) aluminum shall not be painted.

1. Remove oil or grease film by washing surfaces with mineral spirits or turpentine. Allow new, bare aluminum to weather for a month or roughen with steel wool before painting.

3.03 APPLICATION

A. Do not open containers until required for use. Thoroughly mix paint before application and frequently stir during application so as to maintain pigment satisfactorily in suspension.

B. Do not thin paint in excess of the printed directions of the manufacturer. Do not allow caking or setting of pigment into a hard mass.

C. Apply paint uniformly without visible laps, sags, curtains, holidays or objectionable brushmarks. Exercise care so that paint does not splatter on surfaces not required to be painted. Remove promptly paint applied or splattered on surfaces not required to be painted.

D. Insure that all primer and intermediate coats of paint are unscarred and completely integral at the time of

application of each succeeding coat. Allow sufficient time between coats to ensure proper drying.

E. Sand between all coats on wood and-metal surfaces prior to the application of succeeding coats.

F. Remove doors for painting tops and bottoms. Finish top and bottom edges of doors the same as faces, after fitting.

G. Match final coat of paint in color, tint and hue with the color displays approved by the Architect.

H. Paint edges of doors occurring between rooms or spaces having different finishes the same as the room or space from which the same are visible when the door is in a partly opened position.

I. Paint factory finished access panels, registers, grilles, diffusers, electrical panel boxes, connector covers and similar items the same color as adjoining walls or ceilings. Use color as directed where adjacent surfaces do not require painting.

J. Finish all closets the same as the adjoining rooms, unless otherwise specified. Finish all other surfaces the same as nearest or adjoining surfaces unless otherwise shown.

K. Paint exposed insulated and non-insulated piping, conduits, duct work and hangers a color and texture to match walls or ceilings adjacent to it. Where adjacent surfaces are unpainted, use color as directed.

L. Back-prime all interior wood trim before installation, with alkyd primer or Okene Preservative.

M. Protect all accent colors on walls with a coating of pale varnish as approved by the Architect.

N. Application of Oil Finish:

1. Apply Watco oil for saturated coat with brush or rag. Let set 30 minutes. Repeat procedure and let set 5 to 10 minutes. Wipe off excess with clean dry rag.
2. Let set overnight. Repeat entire procedure.
3. Let set overnight. Sand with light sandpaper. Apply coat of liquid wax and buff with clean dry rag.
4. Match sample in Architect's office.

3.04 FIELD QUALITY CONTROL

A. When painting is to be started, the manufacturer whose materials have been approved for use shall furnish competent technical assistance on the job to ensure that his materials are being applied properly. Manufacturer's assistance shall be available at all times until completion of the work.

B. Each coat must be inspected and approved before application of the succeeding specified coat, otherwise no credit for the coat applied will be given and the Contractor automatically assumes the responsibility to recoat the work in question.

C. Application equipment shall be cleaned a minimum of daily and no work shall be done with equipment which leaves adulterants in the coat of paint being applied.

3.05 CLEANING

A. Remove from the premises upon completion of the work all staging, scaffolding and containers.

B. Remove misplaced paint spots, oil or stains upon adjacent surfaces and leave the entire work in a clean condition. Touch up and restore finish where damaged.

3.06 PAINTING SCHEDULE

A. EXTERIOR WORK

1. Iron and Steel

1st coat	Sherwin Williams Pro-Cryl Universal Metal Primer
	Glidden Professional: Devguard 4160 DTM Primer
2nd coat	Sherwin Williams DTM Acrylic Semi-Gloss
	Glidden Professional: Devflex 4216 Semi-Gloss (Maintenance)
3rd coat	Sherwin Williams DTM Acrylic Semi-Gloss
	Glidden Professional: Devflex 4216 Semi-Gloss

2. Galvanized Iron and Steel

1st coat	Sherwin Williams Pro-Cryl Universal Metal Primer
	Glidden Professional: Devguard 4160 DTM Primer
2nd coat	Sherwin Williams DTM Acrylic Semi-Gloss
	Glidden Professional: Devflex 4216 Semi-Gloss (Maintenance)
3rd coat	Sherwin Williams DTM Acrylic Semi-Gloss
	Glidden Professional: Devflex 4216 Semi-Gloss

3. Machinery and Equipment.

Spot Prime	Sherwin Williams Pro-Cryl Universal Metal Primer
	Glidden Professional: Devguard 4160 DTM Primer
2nd Coat	Sherwin Williams Industrial Enamel
	Glidden Professional: Industrial Gloss Enamel 4308

4. Exterior CMU

2 coats	Sherwin Williams loxon block surfacer A24W200
	Glidden Professional: 3210-1200 Gripper
2 coats	Sherwin Williams conflex XL high build elastomeric coating A5-400
	Glidden Professional: Decra Flex 300 Elastomeric 2260

5. Exterior Masonry — Blok-Guard & Graffiti Control by Prosoco Clear

B. INTERIOR WORK

1. Miscellaneous Iron and Steel

1st coat	Sherwin Williams Pro-Cryl Universal Metal Primer
	Glidden Professional: Devguard 4160 DTM Primer
2nd coat	Sherwin Williams Pro Mar Alkyd Semi-Gloss
	Glidden Professional: Industrial Gloss 4308 (Maintenance)
3rd coat	Sherwin Williams Pro Mar Alkyd Semi-Gloss
	Glidden Professional: Industrial Gloss 4308 (Maintenance)

2. Primer Miscellaneous Iron and Steel

spot prime	Sherwin Williams Pro-Cryl Universal Metal Primer
	Glidden Professional: Devguard 4160 DTM Primer
1st coat	Sherwin Williams Pro Mar Alkyd Semi-Gloss
	Glidden Professional: Industrial Gloss 4308 (Maintenance)
2nd coat	Sherwin Williams Pro Mar Alkyd Semi-Gloss
	Glidden Professional: Industrial Gloss 4308 (Maintenance)

3. Galvanized Iron and Steel

	1st coat	Sherwin Williams Pro-Cryl Universal Metal Primer
		Glidden Professional: Devguard 4160 DTM Primer
	2nd coat	Sherwin Williams Pro Mar Alkyd Semi-Gloss
		Glidden Professional: Industrial Gloss 4308 (Maintenance)
	3rd coat	Sherwin Williams Pro Mar Alkyd Semi-Gloss
		Glidden Professional; Industrial Gloss 4308

4. Bonderized Steel

	1st coat	Sherwin Williams Pro-Cryl Universal Metal Primer
		Glidden Professional: Devguard 4160 DTM Primer
	2nd coat	Sherwin Williams Pro Mar Alkyd Semi-Gloss
		Glidden Professional: Industrial Gloss 4308 (Maintenance)
	3rd coat	Sherwin Williams Pro Mar Alkyd Semi-Gloss
		Glidden Professional: Industrial Gloss 4308 (Maintenance)

5. Gypsum Drywall

	1st coat	Sherwin Williams Prep Rite Hi-Build Primer
		Glidden Professional: High Build Primer 1000-1200 (Maintenance)
	2nd coat	Sherwin Williams Pro Mar 200 Zero VOC Latex Eggshell B20W2600
		Glidden Professional: Lifemaster No VOC Eggshell 9300
		Speed Wall 1452 (Maintenance-not equivalent)
	3rd coat	Sherwin Williams Pro Mar 200 Zero VOC Latex Eggshell B20W2600
		Glidden Professional: Lifemaster No VOC Eggshell 9300
		Speed Wall 1452 (Maintenance-not equivalent)

6. Portland Cement Plaster & Stucco (that is not integral color)

	1st coat	Sherwin Williams Prep Rite Masonry Primer
		Glidden Professional: 1000 High Hide Primer
	2nd coat	Sherwin Williams Pro Mar 200 Zero VOC Latex Eggshell B20W2600
		Glidden Professional: Lifemaster 9300 0VOC
	3rd coat	Sherwin Williams Pro Mar 200 Zero VOC Latex Eggshell B20W2600
		Glidden Professional: Lifemaster 9300 0VOC

7. Wood Surfaces (Natural Finish)

	1st coat	Oil
	2nd coat	Oil
	3rd coat	Oil
	4th coat	Wax

8. Wood Surfaces (Stained)

	1st coat	Stain
	2nd coat	Filler (open grain wood, only)
	3rd coat	Lacquer Sanding Sealer
	4th coat	Dull Rubbed Lacquer
	5th coat	Dull Rubbed Lacquer

9. Machinery and Equipment

	Spot Prime	Sherwin Williams Pro-Cryl Primer
		Glidden Professional: Devguard 4160 DTM Primer
	2nd Coat	Sherwin Williams Industrial Enamel
		Glidden Professional: 4308 Industrial Gloss (Maintenance)

10. Exposed Canvas Covered Piping

	1st coat	Sherwin Williams Drywall Latex Primer B28W8100
		Glidden Professional: Gripper 3210 (Maintenance)

2nd coat To match paint specified for
3rd coat coats adjoining surfaces

11. Exposed Rigid Insulation
    1st coat Primer as recommended by the manufacturer of the finish coats
    XIM, UMA 400 Bonding Primer
    2nd coat Sherwin Williams Pro Mar Alkyd Eggshell Enamel
    Glidden Professional: Ultra Hide 150 1512 Alkyd Eggshell

12. Exposed-High: Temperature Metal Piping

    1st coat Sherwin Williams Kem Hi Temp Heat Resistant Paint
    2nd coat Sherwin Williams Kem Hi Temp Heat Resistant Paint

13. CMU
    1st coat Sherwin Williams Heavy Duty Block Filler or Loxon Block Surfacer
    Glidden Professional: Bloxfil 4000 Heavy Dut Block Filler
    2nd coat Sherwin Williams Pro Mar 200 Zero VOC, Latex Semi-Gloss, B31W2651 or
    Pro Industrial Water Based Catalyzed Epoxy B73-300 Series Where indicated on drawings
    Glidden Professional: Devflex 4216 Semi Gloss or
    Ultra Hide 150 0 VOC 1415 Semi Gloss
    3rd coat Sherwin Williams Pro Mar 200 Zero VOC, Latex Semi-Gloss, B31W2651 or
    Pro Industrial Water Based Catalyzed Epoxy B73-300 Series Where indicated on drawings
    Glidden Professional: Devflex 4216 Semi Gloss or
    Ultra Hide 150 0 VOC 1415 Semi Gloss

14. Where indicated on drawings except at Hangar Area interior concrete floors shall be trowel smooth finish and shall be etched with 10% muriatic acid, flush with water and allowed to dry thoroughly.
    1st coat Sherwin Williams solvent base H & C Concrete Clear or color selected by architect Sealer
    2nd coat Sherwin Williams solvent base H & C Concrete Clear or color selected by architect Sealer
    3rd coat Sherwin Williams solvent base H & C Concrete Clear or color selected by architect Sealer provide Anti-slip grit on the final coat.

15. Exposed Structural Steel Ceilings
    1 – 2 coats Sherwin Williams Low VOC Waterborne Acrylic Dryfall B42 Series

16. Hangar Area Concrete Floor:
    Prepare concrete flooring as per manufactures recommendations
    1st coat Sherwin Williams B65C00060-ArmorSeal Rexthane I Floor Coating Clear
    2nd coat Sherwin Williams B65C00060-ArmorSeal Rexthane I Floor Coating Clear

3.07 PIPE IDENTIFICATION

A. Conform to requirements of ASA A13, "Scheme for the Identification of Pipe Systems," as published by the American Society of Mechanical Engineers. Provide complete painting of piping in mechanical rooms only.

B. Color Coding:

1. Domestic Water, Cold or Hot – Green SW4085
2. Chilled, Heating or Condenser - Water - Green SW4085
3. Gas - Orange SW4083
4. Air - White SW4087
5. Condensate - Black SW4090
6. Electric Conduit - Yellow SW4084
7. Oil - Orange SW4083
8. Drain Lines - Black SW4090
9. Steam - Orange SW4083
10. Fire Protection Sprinkler – Red SW4081

3.08 SMOKE AND FIRE WALLS

A. Contractor shall identify all one hour smoke walls and horizontal exit walls, by painting with stencil on both sides of wall, the rating which applies to the wall, Identifications shall be 11'-0" above finish floor, or above finish ceiling where wall does not extend above 11'-0", and shall be spaced at maximum distance of 29'-0" o.c. Height of letters shall be 4". Color of paint for letters will be Black.

END OF SECTION

SECTION 10155

PLASTIC LAMINATE TOILET COMPARTMENTS

PART l: GENERAL

1.01 SCOPE

A. Perform all work required to complete the Toilet Compartments indicated by the Contract Documents and furnish all supplementary items necessary for their proper installation.

B. The requirements of Division 0 - "Bidding and Contract Requirements" and Division 1 - "General Requirements" of this Project Manual apply to all work required for this section.

1.02 SUBMITTALS

A. Shop Drawings

1. Show locations, sizes, quantities, door swings, methods of supporting, methods of anchoring, markings, finishes and operating hardware.

B. Samples

1. Submit sample corner of typical door panel showing details of construction and finish. Submit samples of all hardware.

2. Submit samples of standard colors for color selection.

PART 2: PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Material manufactured by any of the following manufacturers is acceptable, provided it complies with the Contract Documents.

Ampco Products, Inc.
Global Steel Products Corp.
American Sanitary Partition Corporation
Bobrick

2.02 MATERIAL

A. TYPE: Similar to Global "EMBASSY"; floor mounted, overhead braced.

B. PARTITIONS: 1" thick high pressure plastic laminated bonded to particle board.

C. DOORS: Same materials as partitions.

D. FLOOR MOUNTED PILASTERS: 1-1/4" thick plastic-laminate covered.

E. PLINTH: No. 4 satin stainless steel.

2.03 FABRICATION

A. Doors.and Partitions

1. Construct doors and partitions l" thick with two sheets of plastic laminate assembled over and cemented under pressure to rigid core.

B. Floor Mounted Pilasters

1. Construction pilasters 1-1/4 inch thick from two sheets of plastic laminate. Finish as specified for partitions and doors.

2. Provide a jack leveling screw at the bottom of pilasters to carry the weight of the compartment and to provide a secure mechanical anchorage to the floor with adjustable floor fittings.

C. Headrail

1. Continuous extruded aluminum, anti-grip profile, with clear satin anodized aluminum finish.
Hold headrail in place inside top of pilaster with screw applied through the pilaster into the headrail on the inside of the stall.

2. Extend headrail full length of installation and over end compartments. Fasten headrail into wall brackets and cap exposed ends.

D. Hardware and Fittings

1. Attach dividing partitions and pilasters to one another and to the wall with full height brackets made of heat-treated and anodized extruded aluminum alloy.

2. Conceal attachment of pilaster with a one-piece 3" high polished, stainless steel trim, made theft-proof by securing in place with concealed spring anchor clips without the use of exposed screws.

3. Equip door with concealed, controlled gravity type hinges, mounted on upper and lower hinge pilaster brackets of heat-treated high tensile cast aluminum alloy, factory-mounted on the pilaster in position.

4. Recess top hinge pivot door bracket into edge of door approximately 2" below top with a stainless steel pivot pin mounted within the door structure, supported both above and below the pivot bracket.

5. Carry door weight on a thrust bearing fixed in place by stationary vertical pintle concealed within the door structure. Control door operation by opposing Zytel cams mounted on the fixed vertical pintle.

6. Provide adjustable hinge to permit the door to rest at any angle, or to hold the door open or closed when not latched. Make all moving parts self lubricating and completely concealed within the l" thickness of the door. Provide top and bottom door hinge castings of heavy, one-piece cast nonferrous alloy.

7. Equip doors with a cast alloy chrome-plate coat hook and bumper, applied with one-,way head screws; and a concealed latch, with face mortised flush with edging strip. Make all working parts completely concealed within the thickness of the door.

8. Make latch bolts of stainless steel and exposed escutcheon plate and handle of polished chrome-plated cast alloy nonferrous metal.

9. Provide a one-piece, heavy cast, nonferrous alloy stop and keeper with a polished chrome-plated

finish and rubber bumper locked in place. Stop and keeper to be thru-bolted with one-way head, sex bolts to the pilasters.

PART 3: EXECUTION

3.01 INSTALLATION

A. Erect partition plumb, square and true with walls and adjoining trim; true to line and level, in accordance with the drawings and approved setting diagrams. Rigidly secure each unit to surfaces and each adjoining part or member in a manner to render the work permanently secure in precise location.

B. Neatly install hardware and accessories with necessary fastenings matching the specified finish. Adjust all operating parts and set hinges properly for door wing to remain slightly open when compartment is not occupied.

C. Adequately protect during erection against damage of every nature and finish free from scratches, dents, permanent discolorations and other defects in workmanship or material.

D. Plastic laminate compartments are to be installed in all Staff and Student Toilets as indicated on plans.

3.02 CLEANING:

A. Remove all manufacturer's temporary labels or marks of identification and wash surfaces thoroughly clean of oil, grease and foreign material.

B. Clean and polish plated surfaces and leave entire work in a neat, orderly, clean and acceptable condition approved by the Architect.

END OF SECTION

SECTION 10441

IDENTIFICATION SIGNAGE

PART 1: GENERAL:

1.01 SCOPE:

A. Perform all work required to complete IDENTIFICATION SIGNAGE indicated by the Contract Documents and furnish all supplementary items necessary for its proper installation.

B. The requirements of Division 0 - "Bidding and Contract Requirements" and Division 1 - "General Requirements" of this Project Manual shall apply to all Work required for this Section.

1.02 SUBMITTALS:

A. SAMPLES:

1. Submit for approval samples of typical accessories showing construction and finish specified.

B. SHOP DRAWINGS:

1. Submit manufacturer's literature and mark sufficiently to indicate compliance with these specifications. Show locations, methods of supporting, methods of anchoring and finishes of each accessory.

PART 2: PRODUCTS:

2.01 ACCEPTABLE MANUFACTURERS:

A. Material manufactured by any of the following manufacturers is acceptable, provided it complies with the Contract Documents:

1. ACCESSORIES: SOUTHWELL COMPANY, or approved equal.

2.02 MATERIALS:

A. IDENTIFYING DEVICES:

1. At each door, cased opening found on door schedule and room schedule provide 8" x 2" ADA 82NS, for names or numbers. Wall mounted on strike side of door 60" to center line. A.F.F. strike side of door.

2. At each restroom provide 6" x 8" ADA restroom signs No. SS7 and SS4 as applicable. Wall mounted on strike side of door 60" to the center line A.F.F.

B. All identification signage must meet the following guidelines:

1. Vendor to provide signs that comply with the Americans with Disability Act Accessibility Act Guidelines and these specifications.

2. CONSTRUCTION: Braille, lettering, and pictographic are to be an integral part of the sign.

3. BRAILLE CHARACTERS: Grade 2;Raised 1/32" ,placed below tactile characters.

4. TACTILE CHARACTERS: Raised 1/32", Upper case letters.

5. TYPESTYLES: Vendor shall supply Architect with typestyles available.

6. CHARACTER HEIGHT: Largest size applicable to number of characters and size of plate with Braille below or to side.

7. SPACING: Spacing between vertical elements of the characters shall be 1/8" min. Spacing between characters and braille shall be 3/16" min.

8. DIMENSIONS FOR BRAILLE: Dot diameter- .059 in., Inter-dot spacing - .090 in., Horizontal separation between cells -.241 in., Vertical separation between cells - .395 in.

9. PICTOGRAMS: Raised 1/32", Written description with accompanied braille placed directly below the symbol.

10. FINISH and CONTRAST: Non-glare finish. White characters on a solid background. Color to be selected by Architect, from standard colors.

11. ASSURANCE: A written assurance that all Braille is correct is required.

12. Certification by the manufacturer that its product design and construction complies with Section 4.30 of the ADA Accessibility Guidelines must accompany bid.

13. INSTALLATION: The signs are to be wall mounted in frame on the wall adjacent to the latch side of the door. Where there is no wall space to the latch side of the door, signs shall be placed on the nearest adjacent wall. Mounting height shall be 60" above the finish floor to the centerline of the sign. Mounting location shall be so that a person may approach within 3" of signage without encountering protruding objects or standing within the swing of a door.

PART 3: EXECUTION:

3.01 CLEANING:

A. Remove all manufacturer's temporary labels or marks of identification. Clean and polish to remove all oil, grease, and foreign material. Leave in a neat, orderly and clean condition acceptable to the Architect.

END OF SECTION

SECTION 10520

FIRE EXTINGUISHERS

PART 1: GENERAL

1.01 SCOPE

A. Perform all work required to complete the Fire Extinguishers indicated by the Contract Documents and furnish all supplementary items necessary for their proper installation.

B. The requirements of Division 0 - "Bidding and Contract Requirements" and Division 1 - "General Requirements" of this Project Manual shall apply to all Work required for this Section.

1.02 SUBMITTALS

A. Samples
   1. Submit for approval samples of typical accessories showing construction and finish specified.

B. Shop Drawings
   1. Submit manufacturer's literature and mark sufficiently to indicate compliance with these specifications. Show locations, methods of supporting, methods of anchoring and finishes of each accessory.

PART 2: PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Material manufactured by any of the following manufacturers is acceptable, provided it complies~ with the Contract Documents.
   1. FIRE EXTINGUISHERS
      J.L. Industries
      Larsen's Manufacturing Co.
      Muckle Mfg. Co. - Div. of Technico, Inc.
      Profile International, Inc.
      Seco Mfg., Inc.

2.02 MATERIALS

A. FIRE EXTINGUISHERS. ***J.L. Industries "Cosmic Model 10E, UL 4A-60BC (A, B, C fire class) refer to drawings for quantities.***

B. FIRE EXTINGUISHER CABINETS: ***J.L. Industries Ambassador 1017G10 ADAC OPTION with continuous hinge solid door. White expoxy coated cold rolled steel tubs, trim and door. Fire Rated Cabinet – EX OPTION. Provide wall bracket where indicated on drawings.***

C Require number of extinguishers and cabinets noted on drawings.

PART 3: EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's latest written requirements and details.

END OF SECTION

SECTION 10800

TOILET ROOM ACCESSORIES

PART 1 - GENERAL:

1.1 SCOPE:

A. Perform all work required to complete the Toilet Room Accessories indicated by the Contract Documents and furnish all supplementary items necessary for their proper installation.

B. The requirements of Division 0 - "Bidding and Contract Requirements" and Division 1 - "General Requirements" of this Project Manual shall apply to all Work required for this Section.

1.2 SUBMITTALS:

A. SAMPLES:
   1. Submit for approval samples of typical accessories showing construction and finish specified.

B. SHOP DRAWINGS:
   1. Submit manufacturer's literature and mark sufficiently to indicate compliance with these specifications. Show locations, methods of supporting, methods of anchoring and finishes of each accessory.

PART 2: PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Material manufactured by any of the following manufacturers is acceptable, provided it complies with the Contract Documents.
   1. ACCESSORIES

Bradley Corporation	The Bobrick Company
The Charles Parker Company	American Dispenser Company, Inc.

2.2 MATERIALS:

(Schedule of Accessories - BOBRICK numbers are used herein).

A. At each Water Closet: Contractor shall install & furnish toilet tissue dispenser #B-274.

B. At each room marked "CUSTODIAN" or "JANITOR" (located above service sink) provide and install one {1} B-223 stainless steel mop and broom holder.

C. At each lavatory or sink furnish & install surface mounted soap dispenser #B-5050.

D. At each handicapped Water Closet and handicap showers:
   1) Grab Bars:
      a} Provide and install BOBRICK, or approved equal, B-610x48", 42", 36", or 24" x 1½" Ø stainless steel grab bars. Bars shall be mounted as indicated on the Drawings, parallel to finish floor, exactly 1½" clearance from wall to inside of bar. Bar surface shall be peened. Refer to Drawings for locations and sizes.
      b} Bars shall be manufactured and installed in complete compliance with State of Texas Senate Bill No. 111-61st Legis. as amended by H.B. 1319 - 62nd Legis. and S.B. 613 - 63rd Legis.

F. ***At each lavatory or sink furnish & install a Paper Towel Dispensers BOBRICK #B-359***

G. ***At each lavatory or sink furnish & install a Waste Receptacles BOBRICK #B-3644.***

PART 3: EXECUTION

3.1 INSTALLATION:

A. Install accessories according to manufacturer's instructions and approved shop drawings. Install accessories plumb, square, level and true with wall or surfaces. Install grab bars where scheduled to support a minimum load of 300 pounds downward pull.

B. Frames of recessed accessories shall neatly the opening. Gaps and voids between frames and finished walls will not be allowed. Exposed and concealed fastening shall match finish of fixtures and shall be stainless steel, theft proof type.

C. Install concealed anchor plates to wall construction for mounting all accessories. Provide grounds or rough bucks to rigidly secure accessories.

3.2 CLEANING:

A. Remove all manufacturers temporary labels or marks of identification. Clean and polish to remove all oil, grease and foreign material. Leave accessories in a neat, orderly and clean condition acceptable to the Architect.

END OF SECTION

SECTION 10830

MIRROR UNITS

PART 1:- GENERAL

1.01 DESCRIPTION

A. Perform all work required to complete the mirror units indicated by the Contract Documents and furnish all supplementary items necessary for their proper installation.

B. The requirements of Division O - "Bidding and Contract Requirements" and Division 1 - "General Requirements" of this Project Manual shall apply to all work required for this section.

1.02 SUBMITTALS

A. Samples
   1. Submit for approval samples of typical mirrors showing construction and finish specified.

B. Shop Drawings
   1. Submit manufacturer's literature and mark sufficiently to indicate compliance with these specifications. Show locations, methods of supporting, methods of anchoring and finishes.

PART 2: PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Material manufactured by any of the following manufacturers is acceptable, provided it complies with the Contract Documents.

A & J United Machine & Metal Products Corp.
American Specialties, Inc.
Bobrick Washroom Equipment, Inc.
Bradley Corp.
Hallmack-NuTone/Div. Scovil
G. M. Ketcham Company, Inc.
F. H. Lawson Co.
Meek Manufacturing Co., Inc.
McKinney/Kidde, Inc.
Parker - Scovill
P. D. Metal Industries
Tubular Specialties Mfg., Inc.
Watrous, Inc.

2.02 MATERIALS

A. At each lavatory or sink furnish and install an 18" x 36" mirror unless other wise noted.

B. Mirror Glass: 1/4" thick, Type I, Glass 1, Quality Q2, conforming to FS DD-G-451, with silvering, copper coating, and protective organic coating complying with FS DD-M-411.

C. Framing: Manufacturer's standard alloy aluminum. Smooth corners. Bobrick #B-165 Series.

2.03 FABRICATION

A. General:

1. Edge Protection: Fabricate frames for glass mirrors to accommodate wood, felt, plastic, or other glass edge protection material.
2. Backing: Provide mirror backing and support system which will permit rigid, Damperproof glass installation and prevent accumulation of moisture, as follows:
   a. Galvanized steel backing sheet, not less than 22 gage and full mirror size, with non-absorptive filler material. Corrugated cardboard is not an acceptable filler material.

3. Hangers: Provide system of mounting mirror units which will permit rigid, tamperproof and theftproof installation, as follows:
   a. One-piece galvanized steel wall hanger device with spring action locking mechanism to hold mirror unit in position with no exposed screws or bolts, OR, AT CONTRACTOR'S OPTION:

   b. Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring special tool to remove.

PART 3: EXECUTION

3.01 INSTALLATION

A. Secure mirrors to walls in concealed, tamperproof manner with special hangers, toggle bolts, or screws. Set units plumb, level, and square at locations indicated, in accordance with manufacturer's instructions for type of substrate involved.

B. Installation height to be reflective surface.

3.02 ADJUST AND CLEAN

A. Clean exposed surfaces of mirror units in compliance with manufacturer's recommendations.

END OF SECTION

SECTION 13121

PRE-ENGINEERED BUILDINGS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes pre-engineered, shop fabricated structural steel building frame.

1.2 REFERENCES

A. American Institute of Steel Construction:
1. AISC S335 - Specification for Structural Steel Buildings Allowable Stress Design, and Plastic Design.
2. AISC S342L - Load and Resistance Factor Design Specification for Structural Steel Buildings.
3. AISC S344L - Metric Load and Resistance Factor Design Specification for Structural Steel Buildings.

B. ASTM International:
1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
3. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
4. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
5. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
6. ASTM A490 - Standard Specification for Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength.
7. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
8. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
9. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality.
10. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
11. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
12. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

13. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
14. ASTM C991 - Standard Specification for Flexible Glass Fiber Insulation for Pre-Engineered Metal Buildings.
15. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
16. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
17. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

C. American Welding Society:
1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
2. AWS D1.1 - Structural Welding Code - Steel.

D. Metal Building Manufacturers Association:
1. MBMA - Low Rise Building Systems Manual.

E. National Fire Protection Association:
1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

F. SSPC: The Society for Protective Coatings:
1. SSPC - Steel Structures Painting Manual.
2. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).

G. Underwriters Laboratories Inc.:
1. UL - Building Materials Directory.
2. UL 723 - Tests for Surface Burning Characteristics of Building Materials.

1.3 SYSTEM DESCRIPTION

A. Single span rigid frame.

1.4 DESIGN REQUIREMENTS

A. Provide drainage to exterior for water entering or condensation occurring within wall or roof system.

B. Size and fabricate wall and roof systems free of distortion or defects detrimental to appearance or performance.

1.5 PERFORMANCE REQUIREMENTS

A. Conform to applicable codes for submission of design calculations, reviewed shop and erection drawings, required for acquiring permits.

B. Cooperate with regulatory agency or authority and provide data as requested authority having jurisdiction.

1.6 SUBMITTALS

A. Section 01330 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate assembly dimensions, locations of structural members, connections, attachments, openings, cambers, loads, and reactions; wall and roof system dimensions, panel layout, general construction details, anchorages and method of anchorage, method or installation; framing anchor bolt settings, sizes, and locations from datum, and foundation loads; indicate welded connections with AWS A2.4 welding symbols; indicate net weld lengths; provide professional seal and signature.

C. Erection Drawings: Indicate members by label, assembly sequence, and temporary erection bracing.

PART 2 PRODUCTS

2.1 FABRICATION - FRAMING

A. Fabricate members in accordance with AISC Specification for plate, bar, tube, or rolled structural shapes.

B. Provide framing for door window louver skylight, ventilator openings.

PART 3 EXECUTION

3.1 ERECTION - FRAMING

A. Erect framing in accordance with AISC Specification.

B. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation of permanent bracing.

C. Set column base plates with non-shrink grout to achieve full plate bearing.

D. Do not field cut or alter structural members without approval of Architect/Engineer.

E. After erection, prime welds, abrasions, and surfaces not shop primed.

3.2 ERECTION TOLERANCES

A. Framing Members: 1/4 inch from level;1/8 inch from plumb.

END OF SECTION

SECTION 15010
SUMMARY OF MECHANICAL WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections and other Division 15 Specification Sections, apply to this Section.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. The following Summary of Work is intended as an aid to achieve an understanding of the various elements of work included in the project, as is not intended to be all-inclusive. Detailed descriptions of work and requirements are given in drawings and specifications.

B. Mechanical Contract Documents were prepared for the Project by:

Trinity MEP Engineering, LLC
3533 Moreland Dr. Ste. A
Weslaco, Texas 78596
Phone Number: (956) 973-0500
Contact Person: Leonardo Munoz, P.E.

C. General Scope of Work:

1. Install AC equipment and ductwork as shown on the contract documents. Refer to drawings for schedule of equipment that will be installed. After installing equipment, connect power to unit.

2. HVAC: Provide all materials and labor associated with a complete operational installation of new HVAC systems including, but not limited to:

- DX Split System Units
- Exhaust fans
- Sheet metal, Ductwork
- Diffusers and Grilles
- Duct accessories, including grilles, and louvers
- Air Test and Balance

3. Plumbing: Provide all materials and labor associated with a complete operational installation of new Plumbing systems including, but not limited to:

- Plumbing Fixtures for facility
- Piping for Sanitary Sewer and Vent Systems
- Piping for Domestic water and Hot Water Systems.

1.3 CONTINGENCY

1. Refer to architectural specifications for Mechanical Contingencies.

1.4 ALLOWANCES

1. Refer to architectural specifications for Allowances.

1.5 COORDINATION

A. All mechanical work shall be done under sub-contract to a General Contractor. Mechanical Contractor shall coordinate all work through General Contractor, even in areas where only mechanical work is to take place.

B. Coordination between all trades shall take place on a regular basis to avoid conflicts between disciplines and equipment clearances.

C. Work shall take place with minimal disruption to Owner's operations in areas surrounding the new building.

D. Cooperate fully with other contractors so that work under those contracts may be carried out smoothly, without interfering with or delaying work under this Contract.

E. Fully coordinate with electrical contractor for providing power to mechanical equipment.

F. Mechanical Contractor is responsible for all control wiring including thermostat(s). This includes all conduit, wire, and accessories both low voltage and source voltage for the controls' system. Mechanical Contractor will provide all the necessary actuators, relays, software, hardware, and all necessary accessories required for a fully functional controls' system.

1.6 UTILITIES

1. Coordinate with power, water, telephone, cable and gas utilities to locate all utilities prior to digging in any area.
2. Obtain any approvals required from utilities to relocate utilities.
3. Cost of relocating or bypassing utilities indicated on drawings shall be included in Base Bid.

1.7 CONTRACTOR USE OF PREMISES

A. Use of the Site: Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.

1. Owner Occupancy: Allow for Owner occupancy and use by the public.
2. Driveways and Entrances: Keep driveways and entrances serving the premises, clear and available to the Owner, the Owner's employees, and emergency vehicles at all time. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

B. Site Safety: Take every precaution to ensure the site does not present a threat to the safety of occupants and/or workers. Minimal safety requirements include, but are not limited to the following:

1. Temporary fencing around construction areas.
2. Yellow caution tape and construction barricades along open trenches during the day. Trenches shall be covered at night and warning lights provided on construction barricades.
3. Temporary fencing around equipment while site work is in progress.

1.8 SUBMITTALS

1. To extradite the submittal process more efficiently, DO NOT piece-meal the submittals. Submit entire mechanical or plumbing in a bound enclosure. This will eliminate delays in the submittal process.

END OF SECTION

SECTION 15050
BASIC MECHANICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following basic mechanical materials and methods to complement other Division 15 Sections.

1. Piping materials and installation instructions common to most piping systems.
2. Concrete base construction requirements.
3. Escutcheons.
4. Dielectric fittings.
5. Flexible connectors.
6. Mechanical sleeve seals.
7. Equipment nameplate data requirements.
8. Nonshrink grout for equipment installations.
9. Field-fabricated metal and wood equipment supports.
10. Installation requirements common to equipment specification sections.
11. Cutting and patching.
12. Touchup painting and finishing.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:
1. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene propylene diene terpolymer rubber.

1.4 SUBMITTALS

A. Product Data: For dielectric fittings, flexible connectors, mechanical sleeve seals, and identification materials and devices.

B. Coordination Drawings: Detail major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Indicate if sequence and coordination of installations are important to efficient flow of the Work. Include the following:

1. Planned piping layout, including valve and specialty locations and valve-stem movement.
2. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.
3. Sizes and location of required concrete pads and bases.
4. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
5. Reflected ceiling plans to coordinate and integrate installation of air outlets and inlets, light fixtures, communication system components, sprinklers, and other ceiling-mounted items.

1.5 QUALITY ASSURANCE

A. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

B. Equipment Selection: Equipment of higher electrical characteristics, physical dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. Additional costs shall be approved in advance by appropriate Contract Modification for these increases. If minimum energy ratings or efficiencies of equipment are specified, equipment must meet design and commissioning requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and prevent entrance of dirt, debris, and moisture.

B. Protect stored pipes, ductwork, equipment, and tubes from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.

C. Protect flanges, fittings, and piping specialties from moisture and dirt.

D. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate mechanical equipment installation with other building components.

B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.

C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.

D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.

E. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

F. Coordinate requirements for access panels and doors if mechanical items requiring access are concealed behind finished surfaces. Access panels and doors are specified in Division 8.

G. Coordinate installation of identifying devices after completing covering and painting, if devices are applied to surfaces. Install identifying devices before installing acoustical ceilings and similar concealment.

1.8 OPERATION PRIOR TO ACCEPTANCE

A. When any equipment is operable, and it is to the advantage of the Contractor to operate the equipment, he may do so provided that he properly supervises the operation, and retains full responsibility for the equipment operated.

B. Regardless of whether or not the equipment has or has not been operated, the Contractor shall clean the equipment properly, make required adjustments, and complete punch list items before final acceptance by the Owner.

C. The date of acceptance by the Engineer, for beneficial use by the Owner, shall be the beginning date of the warranty period.

1.9 SPACE AND EQUIPMENT ARRANGEMENT

A. The size of each item of mechanical equipment shown on the Drawings is based on the dimensions of a particular manufacturer as indicated. While other manufacturers may be acceptable, it shall be the responsibility of the Contractor to determine whether or not the equipment he proposes to furnish will fit into the space. Shop drawings shall be prepared when required by the engineer to indicate a suitable arrangement.

B. Install equipment in a manner to permit access to all surfaces. Install valves, motors, drives, lubricating devices, filters, and other accessory items in a position to allow removal for service without requiring the disassembly of another part.

C. Provide access panels acceptable to the Engineer for equipment that is concealed above ceiling space.

D. Large equipment assemblies or components which will be installed in the building, and which are too large to permit access through doorways, stairways or shafts, shall be brought to the site and placed in the appropriate spaces before the enclosing structure is completed. Provisions shall be implemented by the Contractor to insure that the equipment will not be damaged in any way during the associated construction procedures.

1.10 START-UP OF EQUIPMENT AND SYSTEMS

A. Whenever the manufacturer of a particular item of equipment or a particular system makes available a start-up service after completion of the installation, such manufacturer's start-up service (rendered by the manufacturer or his authorized representative) shall be provided.

B. Witnessing and explanations of start-up services shall be included as part of the "Instruction of Owner's Personnel" as specified below.

1.11 INSTRUCTION OF OWNER'S PERSONNEL

A. Provide the services of competent engineers or technicians acceptable to the Engineer to instruct representatives of the Owner in complete and detailed operation and maintenance of each item of equipment, and each system. These instructions shall be provided for whatever periods may be necessary to accomplish the desired results. Upon completion of these instructions, the Contractor shall obtain a letter of release, acknowledged by the Owner or his authorized representative, stating the dates on which the various kinds of instruction were given, and the personnel to whom the instructions were given.

B. The Contractor shall be fully responsible for proper maintenance of equipment and systems until the instructions have been given to the Owner's personnel and the letter of release acknowledged.

C. In providing the instructions to the Owner's personnel, the written operating and maintenance manuals shall be followed in all instances, and the Owner's personnel shall be familiarized with such manuals. Operating and maintenance manuals used for instructions shall include piping diagrams, valve identification charts, control and interlocking wiring diagrams, manufacturers' operation and maintenance manuals, parts lists (with sources identified), and other data as appropriate for each system, and as required elsewhere in the Specifications to be furnished to the Owner prior to final acceptance of the project.

D. Provide the Owner with three (3) complete sets of all maintenance manuals, pamphlets, brochures or instructions. This material shall be catalogued, indexed and bound into books.

1.12 ACCEPTABLE MANUFACTURERS

A. Provide equipment and materials from listed manufacturers listed within this specification. Deviations from this specification will not be acceptable. When one manufacturer is listed, alternate materials and equipment may be provided "equal to" the listed. When more than one manufacturer is listed, equipment and material must be provided by one of the listed manufacturers.

PART 2 - PRODUCTS

2.1 STANDARD PRODUCTS

A. Each item of equipment furnished under this Division of the Specifications shall be essentially the standard product of the manufacturer. Where two or more units of the same kind or class of equipment are required, these shall be the products of a single manufacturer; however, the component parts of the equipment need not be the products of one manufacturer.

B. Materials and equipment shall be of the base quality normally used in good commercial practice, and shall be the products of reputable domestic manufacturers unless otherwise specified. Each major component shall bear a nameplate giving the name and address of the manufacturer, and the catalog number or designation of the component.

2.2 QUALITY AND CLASSIFICATION OF MATERIALS

A. Materials and equipment shall be new and of the quality specified, and shall be free from defects at the time of installation. Materials or equipment damaged in shipment or otherwise damaged prior to installation shall not be repaired at the job site, but shall be replaced with new materials or equipment identical with those damaged.

B. Wherever a UL standard has been established for a particular type of material or equipment, each such material or equipment provided on this project shall meet the requirements of the UL standard in every way and shall be UL listed and labeled.

2.3 LOCAL PARTS AND SERVICE

A. Each item of equipment furnished on this project shall have local representation, factory-authorized service, and an adequate stock of repair parts. "Local" shall be defined, for this purpose, as "within 50 miles of the project site."

2.4 FLAME SPREAD PROPERTIES OF MATERIALS

A. Materials used for insulation, acoustical linings, adhesives, jackets and coatings, and combinations of these materials, shall each have a flame spread rating of 25 or less, and a smoke developed rating of 50 or less, as determined by an independent testing laboratory in accordance with NFPA-255.

2.5 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Dielectric Unions:

   a. Watts Industries, Inc.; Water Products Div.
   b. Zurn Industries, Inc.; Wilkins Div.

2. Mechanical Sleeve Seals:

   a. Calpico, Inc.
   b. Metraflex Co.
   c. Thunderline/Link-Seal.

2.6 PIPE AND PIPE FITTINGS

A. Refer to individual Division 15 piping Sections for pipe and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.7 JOINING MATERIALS

A. Refer to individual Division 15 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness, unless thickness or specific material is indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B 32.

1. Alloy Sn95 or Alloy Sn94: Approximately 95 percent tin and 5 percent silver, with 0.10 percent lead content.

F. Brazing Filler Metals: AWS A5.8.

1. BCuP Series: Copper-phosphorus alloys.
2. BAg1: Silver alloy.

G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

H. Solvent Cements: Manufacturer's standard solvent cements for the following:

1. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
2. PVC to ABS Piping Transition: ASTM D 3138.

I. Plastic Pipe Seals: ASTM F 477, elastomeric gasket.

J. Flanged, Ductile-Iron Pipe Gasket, Bolts, and Nuts: AWWA C110, rubber gasket, carbon-steel bolts and nuts.

K. Couplings: Iron-body sleeve assembly, fabricated to match OD of plain-end, pressure pipes.

1. Sleeve: ASTM A 126, Class B, gray iron.
2. Followers: ASTM A 47 malleable iron or ASTM A 536 ductile iron.
3. Gaskets: Rubber.
4. Bolts and Nuts: AWWA C111.
5. Finish: Enamel paint.

2.8 DIELECTRIC FITTINGS

A. General: Assembly or fitting with insulating material isolating joined dissimilar metals, to prevent galvanic action and stop corrosion.

B. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld-neck end types and matching piping system materials.

C. Insulating Material: Suitable for system fluid, pressure, and temperature.

D. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

2.9 MECHANICAL SLEEVE SEALS

A. Description: Modular design, with interlocking rubber links shaped to continuously fill annular space between pipe and sleeve. Include connecting bolts and pressure plates.

2.10 PIPING SPECIALTIES

A. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:

1. Steel Sheet Metal: 0.0239-inch minimum thickness, galvanized, round tube closed with welded longitudinal joint.
2. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends.
3. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
4. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

    a. Underdeck Clamp: Clamping ring with set screws.

B. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type if required to conceal protruding fittings and sleeves.

1. ID: Closely fit around pipe, tube, and insulation of insulated piping.
2. OD: Completely cover opening.
3. Cast Brass: One piece, with set screw.

    a. Finish: Rough brass.
    b. Finish: Polished chrome-plate.

4. Cast-Iron Floor Plate: One-piece casting.

2.11 GROUT

A. Nonshrink, Nonmetallic Grout: ASTM C 1107, Grade B.

1. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psig, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. General: Install piping as described below, unless piping Sections specify otherwise. Individual Division 15 piping Sections specify unique piping installation requirements.

B. General Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, unless deviations to layout are approved on Coordination Drawings.

C. Install piping at indicated slope.

D. Install components with pressure rating equal to or greater than system operating pressure.

E. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.

F. Install piping free of sags and bends.

G. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.

H. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.

I. Install piping to allow application of insulation plus 1-inch clearance around insulation.

J. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

K. Install fittings for changes in direction and branch connections.

L. Install couplings according to manufacturer's written instructions.

M. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:

1. Chrome-Plated Piping: Cast brass, one piece, with set screw, and polished chrome-plated finish.
2. Uninsulated Piping Wall Escutcheons: Cast brass or stamped steel, with set screw.
3. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.
4. Insulated Piping: Cast brass or stamped steel; with concealed hinge, spring clips, and chrome-plated finish.
5. Piping in Utility Areas: Cast brass or stamped steel, with set-screw or spring clips.

N. Sleeves are not required for core drilled holes.

O. Install sleeves for pipes passing through concrete and masonry walls, and concrete floor and roof slabs.

P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

   a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

2. Build sleeves into new walls and slabs as work progresses.
3. Install sleeves large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:Steel Pipe Sleeves: For pipes smaller than 6-inch NPS.
   b. Steel, Sheet-Metal Sleeves: For pipes 6-inch NPS and larger, penetrating gypsum-board partitions.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealants. Refer to Division 7 for materials.

5. Use Type S, Grade NS, Class 25, Use O, neutral-curing silicone sealant, unless otherwise indicated.

Q. Aboveground, Exterior-Wall, Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe or pipe insulation and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches in diameter and larger.
3. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.

R. Underground, Exterior-Wall, Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.

S. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestopping materials. Refer to Division 7 for materials.

T. Verify final equipment locations for roughing-in.

U. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

V. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping specification Sections:

1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
3. Soldered Joints: Construct joints according to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube"; or CDA's "Copper Tube Handbook."
4. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
5. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

    a. Note internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
    b. Apply appropriate tape or thread compound to external pipe threads, unless dry seal threading is specified.
    c. Align threads at point of assembly.
    d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
    e. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

6. Welded Joints: Construct joints according to AWS D10.12, "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe," using qualified processes and welding operators according to "Quality Assurance" Article.
7. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as

possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.

8. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join pipe and fittings according to the following:

    a. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
    b. PVC Nonpressure Piping: ASTM D 2855.
    c. PVC to ABS Nonpressure Transition Fittings: Procedure and solvent cement according to ASTM D 3138.

9. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657 procedures and manufacturer's written instructions.

    a. Plain-End Pipe and Fittings: Use butt fusion.
    b. Plain-End Pipe and Socket Fittings: Use socket fusion.

W. Piping Connections: Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping 2-inch NPS and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS or smaller threaded pipe connection.
2. Install flanges, in piping 2-1/2-inch NPS and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.
3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.2 EQUIPMENT AND MATERIAL INSTALLATION - COMMON REQUIREMENTS

A. Install equipment and material to provide maximum possible headroom, if mounting heights are not indicated.

B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to Architect.

C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

D. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

E. Install equipment and ductwork giving right of way to piping installed at required slope.

F. Install flexible connectors on equipment side of shutoff valves, horizontally and parallel to equipment shafts if possible.

3.3 PAINTING AND FINISHING

A. Refer to Division 9 for paint materials, surface preparation, and application of paint.

B. Do not paint piping specialties with factory-applied finish.

C. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3000-psig, 28-day compressive-strength concrete and reinforcement or as specified in Division 3.

3.5 ERECTION OF METAL SUPPORTS AND ANCHORAGE

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

B. Field Welding: Comply with AWS D1.1, "Structural Welding Code--Steel."

3.6 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair cut surfaces to match adjacent surfaces.

3.7 GROUTING

A. Install nonmetallic, nonshrink, grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's written instructions.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placing of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases to provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout according to manufacturer's written instructions.

END OF SECTION

SECTION 15060
HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes hangers and supports for mechanical system piping and equipment.

B. Related Sections include the following:

1. Division 5 Sections for materials for attaching hangers and supports to building structure.
2. Division 13 Sections on fire-suppression piping for fire-suppression pipe hangers.
3. Division 15 Section "Mechanical Vibration Controls and Seismic Restraints" for vibration isolation and seismic restraint devices.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society for the Valve and Fittings Industry.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 PERFORMANCE REQUIREMENTS

A. Design channel support systems for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

B. Design heavy-duty steel trapezes for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

1.5 SUBMITTALS

A. Product Data: For each type of pipe hanger, channel support system component, and thermal-hanger shield insert indicated.

B. Shop Drawings: Signed and sealed by a qualified professional engineer for multiple piping supports and trapeze hangers. Include design calculations and indicate size and characteristics of components and fabrication details.

1.6 QUALITY ASSURANCE

A. Engineering Responsibility: Design and preparation of Shop Drawings and calculations for each multiple pipe support and trapeze by a qualified professional engineer.

1. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of hangers and supports that are similar to those indicated for this Project in material, design, and extent.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Pipe Hangers:

a. Globe Pipe Hanger Products, Inc.
b. Grinnell Corp.
c. Michigan Hanger Co., Inc.

2.2 MANUFACTURED UNITS

A. Pipe Hangers, Supports, and Components: MSS SP-58, factory-fabricated components. Refer to "Hanger and Support Applications" Article in Part 3 for where to use specific hanger and support types.

1. Galvanized, Metallic Coatings: For piping and equipment that will not have field-applied finish.
2. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.

B. Channel Support Systems: MFMA-2, factory-fabricated components for field assembly.

1. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.
Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.

2.3 MISCELLANEOUS MATERIALS

A. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.

B. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger requirements are specified in Sections specifying equipment and systems.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Specification Sections.

C. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Adjustable Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.
2. Adjustable Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2.
3. Extension Hinged Clamps (MSS Type 12): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 3.

D. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.

E. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
3. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
4. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

F. Building Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
2. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
3. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
4. C-Clamps (MSS Type 23): For structural shapes.
5. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
6. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
7. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching tobottom of steel I-beams for heavy loads, with link extensions.
8. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.

G. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended by manufacturer to prevent crushing insulation.

H. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).

3.2 HANGER AND SUPPORT INSTALLATION

A. Pipe Hanger and Support Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Channel Support System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled channel systems.

1. Field assemble and install according to manufacturer's written instructions.

C. Heavy-Duty Steel Trapeze Installation: Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated, heavy-duty trapezes.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.

D. Install building attachments within concrete slabs or attach to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, and expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

E. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

F. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

G. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

H. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9, "Building Services Piping," is not exceeded.

I. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.

a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
c. Do not exceed pipe stress limits according to ASME B31.9.

2. Shield Dimensions for Pipe: Not less than the following:

a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.

b. NPS 4: 12 inches long and 0.06 inch thick.
c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood inserts.

6. Insert Material: Length at least as long as protective shield.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure above or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

3.4 ADJUSTING

A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

END OF SECTION

SECTION 15070
SUPPORTS AND ANCHORS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Pipe, and equipment hangers, supports and associated anchors.

B. Sleeves and seals.

C. Flashing and sealing equipment and pipe stacks.

1.02 RELATED WORK

A. Section 15083 - Piping Insulation.

B. Section 15330 – Wet Pipe Fire Protection Sprinkler System.

C. Section 15410 - Plumbing Piping and Valves.

D. Section 15530 – Refrigerant Piping

1.03 REFERENCES

A. ANSI/ASME B31.1 - Power Piping.

B. NFPA 13 - Standard for the Installation of Sprinkler Systems.

1.04 QUALITY ASSURANCE

A. Supports for Sprinkler Piping: In conformance with NFPA 13.

1.05 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division One.

B. Indicate hanger and support framing and attachment methods.

PART 2 - PRODUCTS

2.01 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch Malleable iron, adjustable swivel, split ring.

B. Hangers for Pipe Sizes 2 to 4 Inches Carbon steel, adjustable, clevis.

C. Hangers for Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron roll, double hanger.

D. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods; cast iron roll and stand for pipe sizes 6 inches and over.

E. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

F. Wall Support for Pipe Sizes 4 Inches and over: adjustable steel yoke and cast iron roll.

G. Vertical Support: Steel riser clamp.

H. Floor Support for Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, locknut nipple, floor flange, and concrete pier or steel support.

I. Floor Support for Pipe Sizes 6 Inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.

J. Roof Pipe Supports and Hangers: Galvanized Steel Channel System as manufactured by Portable Pipe Hangers, Inc. or approved equal.

For pipes 2-1/2" and smaller – Type PP10 with roller
For pipes 3" through 8" – Type PS
For multiple pipes – Type PSE - Custom

K. Copper Pipe Support and Hangers: Electro-galvanized with thermoplastic elastomer cushions; Unistrut "Cush-A-Clamp" or equal. Hangers: Plastic coated; Unistrut or equal.

L. For installation of protective shields refer to specification section 15140-3.03.

M. Shields for Vertical Copper Pipe Risers: Sheet lead.

N. Pipe Rough-In Supports in Walls/Chases: Provide preformed plastic pipe supports, Sioux Chief "Pipe Titan", Holdrite or equal.

2.02 HANGER RODS

A. Galvanized Hanger Rods: Threaded both ends, threaded one end, or continuous threaded.

2.03 INSERTS

A. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.04 FLASHING

A. Metal Flashing: 20 gage galvanized steel.

B. Lead Flashing: 4 lb. /sq. ft. sheet lead for waterproofing; 1 lb. /sq. ft. sheet lead for soundproofing.

C. Caps: Steel, 20 gage minimum; 16 gage at fire resistant elements.

D. Coordinate with roofing contractor/architect for type of flashing on metal roofs.

2.05 SLEEVES

A. Sleeves for Pipes through Non-fire Rated Floors: Form with 18 gage galvanized steel, tack welded

to form a uniform sleeve.

B. Sleeves for Pipes through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Form with steel pipe, schedule 40.

C. Sleeves for Pipes through Fire Rated and Fire Resistive Floors and Walls, and Fireproofing: Prefabricated fire rated steel sleeves including seals, UL listed.

D. Sleeves for Round Ductwork: Form with galvanized steel.

E. Sleeves for Rectangular Ductwork: Form with galvanized steel.

F. Fire Stopping Insulation: Glass fiber type, non-combustible, U.L. listed.

G. Caulk: Paintable 25-year acrylic sealant.

H. Pipe Alignment Guides: Factory fabricated, of cast semi-steel or heavy fabricated steel, consisting of bolted, two-section outer cylinder and base with two-section guiding spider that bolts tightly to pipe. Length of guides shall be as recommended by manufacturer to allow indicated travel.

2.06 FABRICATION

A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

B. Design hangers without disengagement of supported pipe.

C. Design roof supports without roof penetrations, flashing or damage to the roofing material.

2.07 FINISH

A. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

PART 3 - EXECUTION

3.01 INSERTS

A. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams. Coordinate with structural engineer for placement of inserts.

B. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

C. Where concrete slabs form finished ceiling, provide inserts to be flush with slab surface.

D. Where inserts are omitted, drill through concrete slab from below and provide thru-bolt with recessed square steel plate and nut recessed into and grouted flush with slab. Verify with structural engineer prior to start of work.

3.02 PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as follows:

PIPE SIZE	MAX. HANGER SPACING	HANGER DIAMETER

(Steel Pipe)		
1/2 to 1-1/4 inch	7’-0”	3/8"
1-1/2 to 3 inch	10'-0"	3/8"
4 to 6 inch	10'-0"	1/2"
8 to 10 inch	10'-0"	5/8"
12 to 14 inch	10'-0"	3/4"
15 inch and over	10'-0"	7/8"
(Copper Pipe)		
1/2 to 1-1/4 inch	5'-0"	3/8"
1-1/2 to 2-1/2 inch	8'-0"	3/8"
3 to 4 inch	10'-0"	3/8"
6 to 8 inch	10'-0"	1/2"
(Cast Iron)		
2 to 3 inch	5'-0"	3/8"
4 to 6 inch	10'-0"	1/2"
8 to 10 inch	10'-0"	5/8"
12 to 14 inch	10'-0"	3/4"
15 inch and over	10'-0"	7/8"
(PVC Pipe)		
1-1/2 to 4 inch	4'-0"	3/8"
6 to 8 inch	4'-0"	1/2"
10 and over	4'-0"	5/8"

B. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

C. Place a hanger within 12 inches of each horizontal elbow and at the vertical horizontal transition.

D. Use hangers with 1-1/2 inch minimum vertical adjustment.

E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.

F. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.

G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

H. Support riser piping independently of connected horizontal piping.

I. Install hangers with nut at base and above hanger; tighten upper nut to hanger after final installation adjustments.

J. Portable pipe hanger systems shall be installed per manufacturers' instructions.

K. Distances between supports are maximum distance. Supports shall be provided to carry the pipe/equipment load.

3.03 Insulated Piping: Comply with the following installation requirements.

A. Clamps: Attach galvanized clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ASME B31.9.

B. Saddles: Install galvanized protection saddles MSS Type 39 where insulation without vapor barrier is indicated. Fill interior voids with segments of insulation that match adjoining pipe insulation.

C. Shields: Install protective shields MSS Type 40 on cold and chilled water piping that has vapor barrier. Shields shall span an arc of 180 degrees and shall have dimensions in inches not less than the following:

NPS	LENGTH	THICKNESS
1/4 THROUGH 3-1/2	12	0.048
4	12	0.060
5 & 6	18	0.060
8 THROUGH 14	24	0.075
16 THROUGH 24	24	0.105

D. Piping 2" and larger provide galvanized sheet metal shields with calcium silicate at hangers/supports.

E. Insert material shall be at least as long as the protective shield.

F. Thermal Hanger Shields: Install where indicated, with insulation of same thickness as piping.

3.04 EQUIPMENT BASES AND SUPPORTS

A. Provide equipment bases of concrete.

B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

C. Construct support of steel members. Brace and fasten with flanges bolted to structure.
D. Provide rigid anchors for pipes after vibration isolation components are installed.

3.05 FLASHING

A. Provide flexible flashing and metal counter flashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

B. Flash vent and soil pipes projecting 8 inches minimum above finished roof surface with lead worked one inch minimum into hub, 8 inches minimum clear on sides with 24 x 24 inches sheet size. For pipes through outside walls, turn flanges back into wall and caulk, metal counter flash and seal.

C. Flash floor drains in floors with topping over finished areas with lead, 10 inches clear on sides with minimum 36 x 36 inch sheet size. Fasten flashing to drain clamp device.

D. Seal floor shower mop sink and all other drains watertight to adjacent materials.

E. Provide curbs for mechanical roof installations 8 inches minimum high above roofing surface. Contact architect for all flashing details and roof construction. Seal penetrations watertight.

3.06 SLEEVES

A. Set sleeves in position in formwork. Provide reinforcing around sleeves.

B. Extend sleeves through floors minimum one inch above finished floor level. Caulk sleeves full depth with fire rated thermfiber and 3M caulking and provide floor plate.

C. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with U.L. listed fire stopping insulation and caulk seal air tight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

D. Fire protection sleeves may be flush with floor of stairways.

END OF SECTION

SECTION 15075
MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following mechanical identification materials and their installation:

1. Equipment nameplates.
2. Equipment markers.
3. Access panel and door markers.
4. Pipe markers.
5. Duct markers.
6. Valve tags.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with location of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT IDENTIFICATION DEVICES

A. Equipment Nameplates: Metal, with data engraved or stamped, for permanent attachment on equipment.

1. Data:

   a. Manufacturer, product name, model number, and serial number.
   b. Capacity, operating and power characteristics, and essential data.
   c. Labels of tested compliances.

2. Location: Accessible and visible.

3. Fasteners: As required to mount on equipment.

B. Equipment Markers: Engraved, color-coded laminated plastic. Include contact-type, permanent adhesive.

1. Terminology: Match schedules as closely as possible.
2. Data:

a. Name and plan number.
b. Equipment service.
c. Design capacity.
d. Other design parameters such as pressure drop, entering and leaving conditions, and speed.

3. Size: 2-1/2 by 4 inches (64 by 100 mm) for control devices, dampers, and valves; 4-1/2 by 6 inches (115 by 150 mm) for equipment.

4. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.

2.2 PIPING IDENTIFICATION DEVICES

A. Manufactured Pipe Markers, General: Preprinted, color-coded, with lettering indicating service, and showing direction of flow.

1. Colors: Comply with ASME A13.1, unless otherwise indicated.
2. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.
3. Pipes with OD, Including Insulation, Less Than 6 Inches (150 mm): Full-band pipe markers extending 360 degrees around pipe at each location.
4. Pipes with OD, Including Insulation, 6 Inches (150 mm) and Larger: Either full-band or strip-type pipe markers at least three times letter height and of length required for label.
5. Arrows: Integral with piping system service lettering to accommodate both directions; or as separate unit on each pipe marker to indicate direction of flow.

B. Pretensioned Pipe Markers: Precoiled semirigid plastic formed to cover full circumference of pipe and to attach to pipe without adhesive.

C. Shaped Pipe Markers: Preformed semirigid plastic formed to partially cover circumference of pipe and to attach to pipe with mechanical fasteners that do not penetrate insulation vapor barrier.

D. Self-Adhesive Pipe Markers: Plastic with pressure-sensitive, permanent-type, self-adhesive back.

E. Plastic Tape: Continuously printed, vinyl tape at least 3 mils (0.08 mm) thick with pressure-sensitive, permanent-type, self-adhesive back.

1. Width for Markers on Pipes with OD, Including Insulation, Less Than 6 Inches (150 mm): 3/4 inch (19 mm) minimum.
2. Width for Markers on Pipes with OD, Including Insulation, 6 Inches (150 mm) or Larger: 1-1/2 inches (38 mm) minimum.

2.3 DUCT IDENTIFICATION DEVICES

A. Duct Markers: Engraved, color-coded laminated plastic. Include direction and quantity of airflow and duct service (such as supply, return, and exhaust). Include contact-type, permanent adhesive.

2.4 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch (6.4-mm) letters for piping system abbreviation and 1/2-inch (13-mm) numbers, with numbering scheme [approved by Architect] <Insert other>. Provide 5/32-inch (4-mm) hole for fastener.
   1. Material: 3/32-inch- (2.4-mm-) thick laminated plastic with 2 black surfaces and white inner layer.
   2. Valve-Tag Fasteners: Brass wire-link or beaded chain; or S-hook.

PART 3 - EXECUTION

3.1 APPLICATIONS, GENERAL

A. Products specified are for applications referenced in other Division 15 Sections. If more than single-type material, device, or label is specified for listed applications, selection is Installer's option.

3.2 EQUIPMENT IDENTIFICATION

A. Install and permanently fasten equipment nameplates on each major item of mechanical equipment that does not have nameplate or has nameplate that is damaged or located where not easily visible. Locate nameplates where accessible and visible. Include nameplates for the following general categories of equipment:
   1. Pumps, compressors, chillers, condensers, and similar motor-driven units.
   2. Heat exchangers, coils, evaporators, and similar equipment.
   3. Fans, blowers, primary balancing dampers, and mixing boxes.
   4. Packaged HVAC central-station and zone-type units.

B. Install equipment markers with permanent adhesive on or near each major item of mechanical equipment. Data required for markers may be included on signs, and markers may be omitted if both are indicated.

   1. Letter Size: Minimum 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
   2. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.
   3. Locate markers where accessible and visible. Include markers for the following general categories of equipment:

      a. Main control and operating valves, including safety devices and hazardous units such as gas outlets.
      b. Fire department hose valves and hose stations.
      c. Meters, gages, thermometers, and similar units.
      d. Pumps, compressors, chillers, condensers, and similar motor-driven units.
      e. Heat exchangers, coils, evaporators, and similar equipment.
      f. Fans, blowers, primary balancing dampers, and mixing boxes.
      g. Packaged HVAC central-station and zone-type units.
      h. Strainers, filters, humidifiers, water-treatment systems, and similar equipment.

C. Install equipment signs with screws or permanent adhesive on or near each major item of mechanical equipment. Locate signs where accessible and visible.

1. Identify mechanical equipment with equipment markers in the following color codes:

    a. Green: For cooling equipment and components.
    b. Yellow: For heating equipment and components.
    c. Orange: For combination cooling and heating equipment and components.

2. Letter Size: Minimum 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
3. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.
4. Include signs for the following general categories of equipment:

    a. Main control and operating valves, including safety devices.
    b. Pumps, compressors, chillers, condensers, and similar motor-driven units.
    c. Heat exchangers, coils, evaporators, and similar equipment.
    d. Fans, blowers, primary balancing dampers, and mixing boxes.
    e. Packaged HVAC central-station and zone-type units.
    f. Tanks and pressure vessels.
    g. Strainers, filters, humidifiers, water-treatment systems, and similar equipment.

D. Install access panel markers with screws on equipment access panels.

3.3 PIPING IDENTIFICATION

A. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.

1. Pipes with OD, Including Insulation, Less Than 6 Inches (150 mm): Pretensioned pipe markers. Use size to ensure a tight fit.
2. Pipes with OD, Including Insulation, 6 Inches (150 mm) and Larger: Self-adhesive pipe markers. Use color-coded, self-adhesive plastic tape, at least 1-1/2 inches (38 mm) wide, lapped at least 3 inches (75 mm) at both ends of pipe marker, and covering full circumference of pipe.

B. Locate pipe markers and color bands where piping is exposed in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior nonconcealed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and nonaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet (15 m) along each run. Reduce intervals to 25 feet (7.6 m) in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced markers.

3.4 DUCT IDENTIFICATION

A. Install duct markers with permanent adhesive on air ducts in the following color codes:

1. Green: For cold-air supply ducts.
2. Blue: For exhaust-, outside-, relief-, return-, and mixed-air ducts.
3. ASME A13.1 Colors and Designs: For hazardous material exhaust.
4. Letter Size: Minimum 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

B. Locate markers near points where ducts enter into concealed spaces and at maximum intervals of 50 feet (15 m) in each space where ducts are exposed or concealed by removable ceiling system.

3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; plumbing fixture supply stops; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following:

1. Valve-Tag Size and Shape:

   a. Cold Water: 1-1/2 inches (38 mm), round.
   b. Hot Water: 1-1/2 inches (38 mm), round.
   c. Fire Protection: 2 inches (50 mm), round.

2. Valve-Tag Color:

   a. Cold Water: Green.
   b. Hot Water: Yellow.
   c. Fire Protection: Red.

3. Letter Color:

   a. Cold Water: White.
   b. Hot Water: White.
   c. Fire Protection: White.

3.6 VALVE-SCHEDULE INSTALLATION

A. Mount valve schedule on wall in accessible location in each major equipment room.

3.7 ADJUSTING

A. Relocate mechanical identification materials and devices that have become visually blocked by other work.

CLEANING

B. Clean faces of mechanical identification devices and glass frames of valve schedules.

END OF SECTION

SECTION 15081
DUCT INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes semirigid and flexible duct, plenum, and breeching insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.

B. Related Sections include the following:

1. Division 7 Sections for firestopping materials and requirements for penetrations through fire and smoke barriers.
2. Division 15 Section "Pipe Insulation" for insulation for piping systems.
3. Division 15 Section "Metal Ducts" for duct liner.

1.3 SUBMITTALS

A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.
2. Insulation Installed Outdoors: Flame-spread rating of 75 or less, and smoke-developed rating of 150 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.

B. Deliver and store all insulation with protective material until installation. Any material left exposed to moisture and/or particulates shall be removed and replaced.

C. Any installed insulation left temporarily incomplete shall be covered with protective material until final connections can be installed.

1.6 COORDINATION

A. Coordinate clearance requirements with duct Installer for insulation application.

1.7 SCHEDULING

A. Schedule insulation application after testing duct systems. Insulation application may begin on segments of ducts that have satisfactory test results.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Mineral-Fiber Insulation:

   a. CertainTeed Manson.
   b. Knauf FiberGlass GmbH.
   c. Owens-Corning Fiberglas Corp.
   d. Schuller International,Inc.

2.2 INSULATION MATERIALS

A. Mineral-Fiber Blanket Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II, with all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film

2.3 Field Applied Jacket

A. Foil and paper Jacket: Laminated, glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.

2.4 ACCESSORIES AND ATTACHMENTS

A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz./sq. yd. (270 g/sq. m).

1. Tape Width: 4 inches (100 mm).

B. Adhesive-Attached Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct and plenum with adhesive. Pin length sufficient for insulation thickness indicated.

1. Adhesive: Recommended by the anchor pin manufacturer as appropriate for surface temperatures of ducts, plenums, and breechings; and to achieve a holding capacity of 100 lb (45 kg) for direct pull perpendicular to the adhered surface.

2.5 VAPOR RETARDERS

A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL APPLICATION REQUIREMENTS

A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; and free of voids throughout the length of ducts and fittings.

B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each duct system.

C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Apply multiple layers of insulation with longitudinal and end seams staggered.

E. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.

F. Keep insulation materials dry during application and finishing.

G. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.

H. Apply insulation with the least number of joints practical.

I. Apply insulation over fittings and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated.

J. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic. Apply insulation continuously through hangers and around anchor attachments.

K. Insulation Terminations: For insulation application where vapor retarders are indicated, seal ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

L. Apply insulation with integral jackets as follows:

1. Pull jacket tight and smooth.
2. Joints and Seams: Cover with tape and vapor retarder as recommended by insulation material manufacturer to maintain vapor seal.
3. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to duct flanges and fittings.

M. Cut insulation according to manufacturer's written instructions to prevent compressing insulation to less than 75 percent of its nominal thickness.

N. Install vapor-retarder mastic on ducts and plenums scheduled to receive vapor retarders.

1. Ducts with Vapor Retarders: Overlap insulation facing at seams and seal with vapor-retarder mastic and pressure-sensitive tape having same facing as insulation. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-retarder seal.
2. Ducts without Vapor Retarders: Overlap insulation facing at seams and secure with outward clinching staples and pressure-sensitive tape having same facing as insulation.

O. Roof Penetrations: Apply insulation for interior applications to a point even with top of roof flashing.

1. Seal penetrations with vapor-retarder mastic.
2. Apply insulation for exterior applications tightly joined to interior insulation ends.
3. Seal insulation to roof flashing with vapor-retarder mastic.

P. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions.

Q. Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire/smoke damper sleeves for fire-rated wall and partition penetrations.

R. Floor Penetrations: Terminate insulation at underside of floor assembly and at floor support at top of floor.

1. For insulation indicated to have vapor retarders, taper termination and seal insulation ends with vapor-retarder mastic.

3.4 MINERAL-FIBER INSULATION APPLICATION

A. Blanket Applications for Ducts and Plenums: Secure blanket insulation with adhesive and anchor pins and speed washers.

1. Apply adhesives according to manufacturer's recommended coverage rates per square foot, for 100 percent coverage of duct and plenum surfaces.
2. Install anchor pins and speed washers on sides and bottom of horizontal ducts and all sides of vertical ducts as follows:

a. On duct sides with dimensions 18 inches (450 mm) and smaller, along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
b. On duct sides with dimensions larger than 18 inches (450 mm). Space 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Apply additional pins and clips to hold insulation tightly against surface at cross bracing.
c. Anchor pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
d. Do not overcompress insulation during installation.

3. Impale insulation over anchors and attach speed washers.
4. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
5. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation segment with 1/2-inch (13-mm) staples, 1 inch (25 mm) o.c., and cover with pressure-sensitive tape having same facing as insulation.
6. Overlap unfaced blankets a minimum of 2 inches (50 mm) on longitudinal seams and end joints. Secure with steel band at end joints and spaced a maximum of 18 inches (450 mm) o.c.
7. Apply insulation on rectangular duct elbows and transitions with a full insulation segment for each surface. Apply insulation on round duct elbows with individually mitered gores cut to fit the elbow.
8. Insulate duct stiffeners, hangers, and flanges that protrude beyond the insulation surface with 6-inch- (150-mm-) wide strips of the same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with anchor pins spaced 6 inches (150 mm) o.c.
9. Apply vapor-retarder mastic to open joints, breaks, and punctures for insulation indicated to receive vapor retarder.

3.5 DUCT SYSTEM APPLICATIONS

A. Insulation materials and thicknesses are specified in schedules at the end of this Section.

B. Materials and thicknesses for systems listed below are specified in schedules at the end of this Section.

C. Insulate the following plenums and duct systems:

1. Indoor concealed supply-, return-, and outside-air ductwork.
2. Indoor exposed supply-, return-, and outside-air ductwork.
3. Indoor concealed range-hood exhaust ductwork.
4. Indoor concealed dishwasher ductwork.

D. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:
1. Factory-insulated flexible ducts.
2. Factory-insulated plenums, casings, terminal boxes, and filter boxes and sections.
3. Flexible connectors.
4. Vibration-control devices.
5. Testing agency labels and stamps.
6. Nameplates and data plates.
7. Access panels and doors in air-distribution systems.

3.6 INDOOR DUCT AND PLENUM APPLICATION SCHEDULE

A. Service: Round and rectangular, supply-air ducts, concealed.

1. Material: Mineral-fiber blanket.
2. Thickness: 3 inches (R-8 or greater)
3. Number of Layers: One.
4. Field-Applied Jacket: Foil and paper.
5. Vapor Retarder Required: Yes.

B. Service: Round and rectangular, return-air ducts, outside air duct, concealed or exposed.

1. Material: Mineral-fiber blanket.
2. Thickness: 2 inches (50 mm).
3. Number of Layers: One.
4. Field-Applied Jacket: Foil and Paper
5. Vapor Retarder Required: Yes.

C. Service: Round and rectangular, supply and return-air ducts, exposed and in mechanical rooms.

1. Material: 2" liner insulation
2. Thickness: 2 inches (50 mm).
3. Number of Layers: One.
4. Field-Applied Jacket: None.
5. Vapor Retarder Required: No

D. Service: Round and rectangular, exhaust air ducts, concealed & exposed and in mechanical rooms.

1. Material: 1" Interior liner
2. Thickness: 1 inches
3. Number of Layers: One.
4. Field-Applied Jacket: None.
5. Vapor Retarder Required: No
6.

END OF SECTION

SECTION 15083
PIPE INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes preformed, rigid and flexible pipe insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.

B. Related Sections include the following:
1. Division 2 for loose-fill pipe insulation in underground piping outside the building.
2. Division 7 for firestopping materials and requirements for penetrations through fire and smoke barriers.
3. Division 15 Section "Duct Insulation" for insulation for ducts and plenums.
4. Division 15 Section "Equipment Insulation" for insulation materials and application for pumps, tanks, hydronic specialties, and other equipment.
5. Division 15 Section "Hangers and Supports" for pipe insulation shields and protection saddles.

1.3 SUBMITTALS

A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.
2. Insulation Installed Outdoors: Flame-spread rating of 75 or less, and smoke-developed rating of 150 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 15 Section "Hangers and Supports."

B. Coordinate clearance requirements with piping Installer for insulation application.

C. Coordinate installation and testing of steam or electric heat tracing.

1.7 SCHEDULING

A. Schedule insulation application after testing piping systems and, where required, after installing and testing heat-trace tape. Insulation application may begin on segments of piping that have satisfactory test results.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Mineral-Fiber Insulation:
   a. CertainTeed Manson.
   b. Knauf FiberGlass GmbH.
   c. Owens-Corning Fiberglas Corp.
   d. Schuller International, Inc.

2. Cellular-Glass Insulation:
   a. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

3. Flexible Elastomeric Thermal Insulation:
   a. Armstrong World Industries, Inc.
   b. Rubatex Corp.

2.2 INSULATION MATERIALS

A. Mineral-Fiber Insulation: Glass fibers bonded with a thermosetting resin complying with the following:

1. Preformed Pipe Insulation: Comply with ASTM C 547, Type 1, with factory-applied, all-purpose, vapor-retarder jacket.
2. Fire-Resistant Adhesive: Comply with MIL-A-3316C in the following classes and grades:

   a. Class 1, Grade A for bonding glass cloth and tape to unfaced glass-fiber insulation, for sealing edges of glass-fiber insulation, and for bonding lagging cloth to unfaced glass-fiber insulation.

   b. Class 2, Grade A for bonding glass-fiber insulation to metal surfaces.

3. Vapor-Retarder Mastics: Fire- and water-resistant, vapor-retarder mastic for indoor applications. Comply with MIL-C-19565C, Type II.
4. Mineral-Fiber Insulating Cements: Comply with ASTM C 195.
5. Expanded or Exfoliated Vermiculite Insulating Cements: Comply with ASTM C 196.

6. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.

B. Cellular-Glass Insulation: Inorganic, foamed or cellulated glass, annealed, rigid, hermetically sealed cells, incombustible.

1. Preformed Pipe Insulation, without Jacket: Comply with ASTM C 552, Type II, Class 1.
2. Preformed Pipe Insulation, with Jacket: Comply with ASTM C 552, Type II, Class 2.

C. Closed-Cell Phenolic-Foam Insulation: Preformed pipe insulation of rigid, expanded, closed-cell structure. Comply with ASTM C 1126, Type III, Grade 1.

D. Flexible Elastomeric Thermal Insulation used on Refrigerant Piping: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

1. Adhesive: As recommended by insulation material manufacturer.
2. Ultraviolet-Protective Coating: As recommended by insulation manufacturer.

E. Prefabricated Thermal Insulating Fitting Covers: Comply with ASTM C 450 for dimensions used in preforming insulation to cover valves, elbows, tees, and flanges.

2.3 FIELD-APPLIED JACKETS

A. General: ASTM C 921, Type 1, unless otherwise indicated.

B. Foil and Paper Jacket: Laminated, glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.

C. Standard PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 20-mil- (0.5-mm-) thick, high-impact, ultraviolet-resistant PVC.

1. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories for the disabled.
2. Adhesive: As recommended by insulation material manufacturer.

D. Aluminum Jacket: Factory cut and rolled to indicated sizes. Comply with ASTM B 209 (ASTM B 209M), 3003 alloy, H-14 temper.

1. Finish and Thickness: Smooth finish, 0.010 inch (0.25 mm) thick.
2. Moisture Barrier: 1-mil- (0.025-mm-) thick, heat-bonded polyethylene and kraft paper.
3. Elbows: Preformed, 45- and 90-degree, short- and long-radius elbows; same material, finish, and thickness as jacket.

E. Underground Direct-Buried Jacket: 125-mil-thick vapor barrier and waterproofing membrane consisting of a rubberized bituminous resin reinforced with a woven-glass fiber or polyester scrim and laminated aluminum foil.
1. Products:
   a. Pittsburgh Corning Corporation; Pittwrap.
   b. Polyguard; Insulrap No Torch 125.

2.4 ACCESSORIES AND ATTACHMENTS

A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz./sq. yd. (270 g/sq. m).

1. Tape Width: 4 inches (100 mm).

B. Bands: 3/4 inch (19 mm) wide, in one of the following materials compatible with jacket:

1. Aluminum: 0.007 inch (0.18 mm) thick.

2.5 VAPOR RETARDERS

A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry pipe and fitting surfaces. Remove materials that will adversely affect insulation application.

3.3 GENERAL APPLICATION REQUIREMENTS

A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.

B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each piping system.

C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Apply insulation with longitudinal seams at top and bottom of horizontal pipe runs.

E. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

F. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.

G. Keep insulation materials dry during application and finishing.

H. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.

I. Apply insulation with the least number of joints practical.

J. Apply insulation over fittings, valves, and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated. Refer to special instructions for applying insulation over fittings, valves, and specialties.

K. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic.

1. Apply insulation continuously through hangers and around anchor attachments. Insulation around hanger or pipe clamp will not be acceptable.
2. For insulation application where vapor retarders are indicated, extend insulation on anchor legs at least 12 inches (300 mm) from point of attachment to pipe and taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.
3. Install insert materials and apply insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by the insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect the jacket from tear or puncture by the hanger, support, and shield.

L. Insulation Terminations: For insulation application where vapor retarders are indicated, taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

M. Apply adhesives and mastics at the manufacturer's recommended coverage rate.

N. Apply insulation with integral jackets as follows:

1. Pull jacket tight and smooth.
2. Circumferential Joints: Cover with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip and spaced 4 inches (100 mm) o.c.
3. Longitudinal Seams: Overlap jacket seams at least 1-1/2 inches (40 mm). Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches (100 mm) o.c.

   a. Exception: Do not staple longitudinal laps on insulation having a vapor retarder.

4. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to flanges, unions, valves, and fittings.
5. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor-retarder mastic.

O. Roof Penetrations: Apply insulation for interior applications to a point even with top of roof flashing.

1. Seal penetrations with vapor-retarder mastic.
2. Apply insulation for exterior applications tightly joined to interior insulation ends.
3. Extend metal jacket of exterior insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
4. Seal metal jacket to roof flashing with vapor-retarder mastic.

P. Exterior Wall Penetrations: For penetrations of below-grade exterior walls, terminate insulation flush with mechanical sleeve seal. Seal terminations with vapor-retarder mastic.

Q. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and floors.

R. Fire-Rated Wall and Partition Penetrations: Apply insulation continuously through penetrations of fire-rated walls and partitions.

1. Firestopping and fire-resistive joint sealers are specified in Division 7 Section "Firestopping."

3.4 MINERAL-FIBER INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Secure each layer of preformed pipe insulation to pipe with wire, tape, or bands without deforming insulation materials.
2. Where vapor retarders are indicated, seal longitudinal seams and end joints with vapor-retarder mastic. Apply vapor retarder to ends of insulation at intervals of 15 to 20 feet (4.5 to 6 m) to form a vapor retarder between pipe insulation segments.
3. For insulation with factory-applied jackets, secure laps with outward clinched staples at 6 inches (150 mm) o.c.
4. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.

B. Apply insulation to flanges as follows:

1. Apply preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch (25 mm), and seal joints with vapor-retarder mastic.

C. Apply insulation to fittings and elbows as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When premolded insulation elbows and fittings are not available, apply mitered sections of pipe insulation, or glass-fiber blanket insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire, tape, or bands.
3. Cover fittings with standard PVC fitting covers.

D. Apply insulation to valves and specialties as follows:

1. Apply premolded segments of cellular-glass insulation or glass-fiber blanket insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, arrange insulation for access to strainer basket without disturbing insulation.
2. Apply insulation to flanges as specified for flange insulation application.
3. Use preformed standard PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
4. For larger sizes where PVC fitting covers are not available, seal insulation with canvas jacket and sealing compound recommended by the insulation material manufacturer.

3.5 CELLULAR-GLASS INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Secure each layer of insulation to pipe with wire, tape, or bands without deforming insulation materials.
2. Where vapor retarders are indicated, seal longitudinal seams and end joints with vapor-retarder mastic.
3. For insulation with factory-applied jackets, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.

B. Apply insulation to flanges as follows:

1. Apply preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of the same thickness as pipe insulation.
4. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch (25 mm), and seal joints with vapor-retarder mastic.

C. Apply insulation to fittings and elbows as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturers written instructions.
2. When premolded sections of insulation are not available, apply mitered sections of cellular-glass insulation. Secure insulation materials with wire, tape, or bands.
3. Cover fittings with heavy PVC fitting covers. Overlap PVC covers on pipe insulation jackets at least 1 inch (25 mm) at each end. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.

D. Apply insulation to valves and specialties as follows:
1. Apply premolded segments of cellular-glass insulation or glass-fiber blanket insulation to valve body. Arrange insulation to permit access to packing and to allow vale operation without disturbing insulation. For check valves, arrange insulation for access to stainer basket without disturbing insulation.
2. Apply insulation to flanges as specified for flange insulation application.
3. Use preformed heavy PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
4. For larger sizes where PVC fitting covers are not available, seal insulation with canvas jacket and sealing compound recommended by the insulation material manufacturer.

3.6 CLOSED-CELL PHENOLIC-FOAM INSUALTION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Secure each layer of insulation to pipe with wire, tape, or bands without deforming insulation materials.
2. Where vapor retarders are indicated, seal longitudinal seams and end joints with vapor-retarder mastic.
3. For insulation with factory-applied jackets, secure laps with outward clinched staples at 6 inches o.c.

4. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.

B. Apply insulation to flanges as follows:

1. Apply preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of block insulation of the same thickness as pipe insulation.
4. Apply canvas jacket material with manufacturer’s recommended adhesive, overlapping seams at least 1 inch (25 mm), and seal joints with vapor-retarder mastic.

C. Apply insulation to fittings and elbows as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturers written instructions.
2. When premolded sections of insulation are not available, apply mitered sections of phenolic-foam insulation. Secure insulation materials with wire, tape, or bands.
3. Cover fittings with heavy PVC fitting covers. Overlap PVC covers on pipe insulation jackets at least 1 inch (25 mm) at each end. Secure fitting covers with manufacturer’s attachments and accessories. Seal seams with tape and vapor-retarder mastic.

D. Apply insulation to valves and specialties as follows:
1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer’s written instructions.
2. When premolded sections of insulation are not available, apply mitered sections of phenolic-foam insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, arrange insulation for access to stainer basket without distributing insulation.
3. Apply insulation to flanges as specified for flange insulation application.
4. Use preformed heavy PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer’s attachments and accessories. Seal seams with tape and vapor-retarder mastic.
5. For larger sizes where PVC fitting covers are not available, seal insulation with canvas jacket and sealing compound recommended by the insulation material manufacturer.

3.7 FLEXIBLE ELASTOMERIC THERMAL INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Follow manufacturer's written instructions for applying insulation.
2. Seal longitudinal seams and end joints with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

B. Apply insulation to flanges as follows:

1. Apply pipe insulation to outer diameter of pipe flange.
2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of the same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

C. Apply insulation to fittings and elbows as follows:

1. Apply mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

D. Apply insulation to valves and specialties as follows:

1. Apply preformed valve covers manufactured of the same material as pipe insulation and attached according to the manufacturer's written instructions.
2. Apply cut segments of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, fabricate removable sections of insulation arranged to allow access to stainer basket.
3. Apply insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

3.8 FIELD-APPLIED JACKET APPLICATION

A. Apply glass-cloth jacket, where indicated, directly over bare insulation or insulation with factory-applied jackets.

1. Apply jacket smooth and tight to surface with 2-inch (50-mm) overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch- (1.6-mm-) thick coats of jacket manufacturer's recommended adhesive.
3. Completely encapsulate insulation with jacket, leaving no exposed raw insulation.

B. Foil and Paper Jackets: Apply foil and paper jackets where indicated.

1. Draw jacket material smooth and tight.
2. Apply lap or joint strips with the same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Apply jackets with 1-1/2-inch (40-mm) laps at longitudinal seams and 3-inch- (75-mm-) wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-retarder mastic.

C. Apply metal jacket where indicated, with 2-inch (50-mm) overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches (300 mm) o.c. and at end joints.

3.9 PIPING SYSTEM APPLICATIONS

A. Insulation materials and thicknesses are specified in schedules at the end of this Section.

B. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:

1. Flexible connectors.
2. Fire-suppression piping.
3. Drainage piping located in crawl spaces, unless otherwise indicated.
4. Below-grade piping, unless otherwise indicated.
5. Chrome-plated pipes and fittings, unless potential for personnel injury.
6. Air chambers, unions, strainers, check valves, plug valves, and flow regulators.

3.10 INTERIOR INSULATION APPLICATION SCHEDULE

A. Service: Domestic hot and recirculated hot water.

1. Operating Temperature: 60 to 140 deg F (15 to 60 deg C).
2. Insulation Material: Mineral fiber
3. Insulation Thickness: 1” thick
4. Field-Applied Jacket: Foil and Paper(ASJ)
5. Vapor Retarder Required: No
6. Finish: None.

B. Service: Condensate and equipment drain piping.

1. Operating Temperature: 40 to 60 deg F
2. Insulation Material: Flexible elastomeric, only on first ten feet of pipe from trap.
3. Insulation Thickness: 3/4”
4. Field-Applied Jacket: None.
5. Vapor Retarder Required: No.
6. Finish: Two coats of the insulation manufacturer’s recommended protective coating.

C. Service: Refrigerant suction and hot-gas piping.

1. Operating Temperature: 35 to 50 deg F
2. Insulation Material: Flexible elastomeric.
3. Insulation Thickness: 1” thick.
4. Field-Applied Jacket: Aluminum Jacket on building exterior application only.
5. Vapor Retarder Required: Yes.
6. Finish: None.

D. Service: Domestic cold water piping.

1. Operating Temperature: 60 to 80 deg F
2. Insulation Material: Mineral Fiber
3. Insulation Thickness: 1” thick.
4. Field-Applied Jacket: Foil and Paper(ASJ)
5. Vapor Retarder Required: Yes.
6. Finish: None.

E. Service: For obtaining fire/smoke rating in return air plenum (calbes, PE, PB, PP, ABS, PVC, CPVC, etc).

1. Operating Temperature: 35 to 90 deg F
2. Insulation Material: 3M Fire Barrier Plenum Wrap 5 A or equal.
3. Insulation Thickness: larger of 1” or mfr’s recommendations.

4. Field-Applied Jacket: scrim reinforced foil
5. Vapor Retarder Required: None.
6. Finish: None.

3.11 EXTERIOR INSULATION APPLICATION SCHEDULE

A. Service: Domestic water.

1. Operating Temperature: 60 to 140 deg F (15 to 60 deg C).
2. Insulation Material: Mineral fiber.
3. Insulation Thickness: Apply the following insulation thicknesses: 1”
4. Field-Applied Jacket: Aluminum.
5. Vapor Retarder Required: Yes.
6. Finish: None.

B. Service: Refrigerant suction.

1. Operating Temperature: 35 to 50 deg F (2 to 10 deg C).
2. Insulation Material: Flexible elastomeric.
3. Insulation Thickness: Apply the following insulation thicknesses: ½”
4. Field-Applied Jacket: Aluminum
5. Vapor Retarder Required: Yes.
6. Finish: None.

END OF SECTION

SECTION 15110
VALVES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following general-duty valves:
   1. Copper-alloy ball valves.
   2. Bronze check valves.
   3. Bronze gate valves.
   4. Cast-iron gate valves.

B. Related Sections include the following:

   1. Division 2 piping Sections for general-duty and specialty valves for site construction piping.
   2. Division 13 fire-suppression piping and fire pump Sections for fire-protection valves.
   3. Division 15 Section "Mechanical Identification" for valve tags and charts.
   4. Division 15 piping Sections for specialty valves applicable to those Sections only.

1.3 DEFINITIONS

A. The following are standard abbreviations for valves:

   1. CWP: Cold working pressure.
   2. EPDM: Ethylene-propylene-diene terpolymer rubber.
   3. NBR: Acrylonitrile-butadiene rubber.
   4. PTFE: Polytetrafluoroethylene plastic.
   5. SWP: Steam working pressure.
   6. TFE: Tetrafluoroethylene plastic.

1.4 SUBMITTALS

A. Product Data: For each type of valve indicated. Include body, seating, and trim materials; valve design; pressure and temperature classifications; end connections; arrangement; dimensions; and required clearances. Include list indicating valve and its application. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.

1.5 QUALITY ASSURANCE

A. ASME Compliance: ASME B31.9 for building services piping valves.

   1. Exceptions: , sanitary waste, and storm drainage piping valves unless referenced.

B. ASME Compliance for Ferrous Valves: ASME B16.10 and ASME B16.34 for dimension and design criteria.

C. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set angle, gate, and globe valves closed to prevent rattling.
4. Set ball and plug valves open to minimize exposure of functional surfaces.
5. Set butterfly valves closed or slightly open.
6. Block check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Grinnell Corporation.
   c. Hammond Valve.
   d. Milwaukee Valve Company.
   e. NIBCO INC.
   f. Red-White Valve Corp.
   g. Watts Industries, Inc.; Water Products Div.

2.2 VALVES, GENERAL

A. Refer to Part 3 "Valve Applications" Article for applications of valves.

B. Bronze Valves: NPS 2 (DN 50) and smaller with threaded ends, unless otherwise indicated.

C. Ferrous Valves: NPS 2-1/2 (DN 65) and larger with flanged ends, unless otherwise indicated.

D. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

E. Valve Sizes: Same as upstream pipe, unless otherwise indicated.

F. Valve Actuators:
   1. Handwheel: For valves other than quarter-turn types.
   2. Lever Handle: For quarter-turn valves NPS 6 (DN 150) and smaller, except plug valves.

G. Extended Valve Stems: On insulated valves.

H. Valve Flanges: ASME B16.1 for cast-iron valves, ASME B16.5 for steel valves, and ASME B16.24 for bronze valves.

I. Valve Grooved Ends: AWWA C606.

   1. Solder Joint: With sockets according to ASME B16.18.

      a. Caution: Use solder with melting point below 840 deg F (454 deg C) for angle, check, gate, and globe valves; below 421 deg F (216 deg C) for ball valves.

   2. Threaded: With threads according to ASME B1.20.1.

J. Valve Bypass and Drain Connections: MSS SP-45.

2.3 COPPER-ALLOY BALL VALVES

A. Copper-Alloy Ball Valves, General: MSS SP-110.

B. One-Piece, Copper-Alloy Ball Valves: Brass or bronze body with chrome-plated bronze ball, PTFE or TFE seats, and 400-psig (2760-kPa) minimum] [600-psig (4140-kPa)] CWP rating.

C. Two-Piece, Copper-Alloy Ball Valves: Brass or bronze body with full-port, chrome-plated bronze ball; PTFE seats; and 600-psig (4140-kPa) minimum CWP rating and blowout-proof stem.

2.4 BRONZE CHECK VALVES

A. Bronze Check Valves, General: MSS SP-80.

B. Type 1, Class 150, Bronze, Horizontal Lift Check Valves: Bronze body with bronze disc and seat.

C. Type 1, Class 150, Bronze, Vertical Lift Check Valves: Bronze body with bronze disc and seat.

2.5 BRONZE GATE VALVES

A. Bronze Gate Valves, General: MSS SP-80, with ferrous-alloy handwheel.

B. Type 1, Class 125, Bronze Gate Valves: Bronze body with nonrising stem and bronze solid wedge and union-ring bonnet.

2.6 CAST-IRON GATE VALVES

A. Cast-Iron Gate Valves, General: MSS SP-70, Type I.

B. Class 125, NRS, Bronze-Mounted, Cast-Iron Gate Valves: Cast-iron body with bronze trim, nonrising stem, and solid-wedge disc.

C. Class 125, OS&Y, Bronze-Mounted, Cast-Iron Gate Valves: Cast-iron body with bronze trim, rising stem, and solid-wedge disc.

2.7 CAST-IRON PLUG VALVES

A. Cast-Iron Plug Valves, General: MSS SP-78.

B. Class 125 or 150, lubricated-type, cast-iron plug valves.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine piping system for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

C. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

D. Examine threads on valve and mating pipe for form and cleanliness.

E. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

F. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE APPLICATIONS

A. Refer to piping Sections for specific valve applications. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball, butterfly, gate, or plug valves.
2. Throttling Service: Ball, butterfly, or globe valves.
3. Pump Discharge: Swing check, lift-disc check valves.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.

C. Domestic Water Piping: Use the following types of valves:

1. Ball Valves, NPS 2 (DN 50) and Smaller: Two-piece, [400-psig (2760-kPa)]CWP rating, copper alloy.
2. Ball Valves, NPS 2-1/2 (DN 65) and Larger: Class 150, ferrous alloy.
3. Swing Check Valves, NPS 2 (DN 50) and Smaller: Type 4, Class [125] [150], bronze.
4. Swing Check Valves, NPS 2-1/2 (DN 65) and Larger: Type II, Class 125, gray iron.
5. Gate Valves, NPS 2 (DN 50) and Smaller: Type [1] [2], Class 150] , bronze.
6. Gate Valves, NPS 2-1/2 (DN 65) and Larger: Type I, Class 125, bronze-mounted cast iron.

3.3 VALVE INSTALLATION

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

C. Locate valves for easy access and provide separate support where necessary.

D. Install valves in horizontal piping with stem at or above center of pipe.

E. Install valves in position to allow full stem movement.

3.4 JOINT CONSTRUCTION

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.

B. Grooved Joints: Assemble joints with keyed coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

C. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

END OF SECTION

SECTION 15140
DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes domestic water piping from locations indicated to fixtures and equipment inside the building.

B. Related Sections include the following:

1. Division 15 Section "Plumbing Specialties" for water distribution piping specialties.

1.3 PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing domestic water piping systems with the following minimum working-pressure ratings, unless otherwise indicated:

1. Domestic Water Distribution Piping: 125 psig (860 kPa).

1.4 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

B. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.5 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic, potable domestic water piping and components.

C. Comply with NSF 61, "Drinking Water System Components-Health Effects; Sections 1 through 9," for potable domestic water piping and components.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

B. Transition Couplings for Aboveground Pressure Piping: Coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

C. Transition Couplings for Underground Pressure Piping: AWWA C219, metal, sleeve-type coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

2.2 COPPER TUBING

A. Hard Copper Tube: ASTM B 88, Types K and L, water tube, drawn tempered.

1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.

2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.

3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.

4. Copper, Grooved-End Fittings: ASTM B 75 (ASTM B 75M) copper tube or ASTM B 584 bronze castings.

a. Copper-Tubing, Keyed Couplings: Copper-tube dimensions and design similar to AWWA C606. Include ferrous housing sections, gasket suitable for hot water, and bolts and nuts.

2.4 VALVES

A. Refer to Division 15 Section "Valves" for bronze and cast-iron, general-duty valves.

B. Refer to Division 15 Section "Plumbing Specialties" for balancing and drain valves.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Refer to Division 2 for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.

B. Flanges may be used on aboveground piping, unless otherwise indicated.

C. Grooved joints may be used on aboveground grooved-end piping.

D. Fitting Option: Mechanically formed tee-branch outlets and brazed joints may be used on aboveground copper tubing.

E. Aboveground Domestic Water Piping: Use the following piping materials for each size range:

1. NPS 4” and Smaller: Hard copper tube, Type L; copper pressure fittings; and soldered joints.

F. Underground Domestic Water Piping NPS 4” and Smaller: Schedule 80 CPVC.

3.3 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use bronze ball or gate valves for piping NPS 2 (DN 50) and smaller. Use cast-iron butterfly or gate valves with flanged ends for piping NPS 2-1/2 (DN 65) and larger.

2. Throttling Duty: Use bronze ball or globe valves for piping NPS 2 (DN 50) and smaller. Use cast-iron butterfly valves with flanged ends for piping NPS 2-1/2 (DN 65) and larger.

3. Hot-Water-Piping, Balancing Duty: Calibrated balancing valves.

4. Drain Duty: Hose-end drain valves.

B. Cast-iron, grooved-end valves may be used with grooved-end piping.

3.4 PIPING INSTALLATION

A. Refer to Division 2 for site water distribution and service piping.

B. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation.

C. Extend domestic water service piping to exterior water distribution piping in sizes and locations indicated.

D. Install underground copper tubing according to CDA's "Copper Tube Handbook."

E. Install underground PVC piping according to ASTM D 2774 and ASTM F 645. Install buried piping inside building between wall and floor penetrations and connection to water service piping outside building with restrained joints. Anchor pipe to wall or floor. Install thrust-block supports at vertical and horizontal offsets.

F. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for sleeves and mechanical sleeve seals.

G. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for wall penetration systems.

H. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside building at each domestic water service. Refer to Division 15 Section "Meters and Gages" for pressure gages, and to Division 15 Section "Plumbing Specialties" for drain valves and strainers.

I. Install water-pressure regulators downstream from shutoff valves. Refer to Division 15 Section "Plumbing Specialties" for water-pressure regulators.

J. Fill water piping. Check components to determine that they are not air bound and that piping is full of water.

K. Perform the following steps before operation:

1. Close drain valves, hydrants, and hose bibbs.

2. Open shutoff valves to fully open position.

3. Open throttling valves to proper setting.

4. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.

L. Check plumbing equipment and verify proper settings, adjustments, and operation. Do not operate water heaters before filling with water.

3.5 JOINT CONSTRUCTION

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.

B. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

C. Grooved Joints: Assemble joints with keyed-coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

D. Mechanically Formed Outlets: Form tee in copper tube according to equipment manufacturer's written instructions. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

3.6 VALVE INSTALLATION

A. Install shutoff valve on each water supply to equipment and on each water supply to plumbing fixtures without supply stops. Use ball or gate valves for piping NPS 2 (DN 50) and smaller. Use butterfly or gate valves for piping NPS 2-1/2 (DN 65) and larger.

B. Install calibrated balancing valves in each hot-water circulation return branch and discharge side of each pump and circulator. Set calibrated balancing valves partly open to restrict but not stop flow. Refer to Division 15 Section "Plumbing Specialties" for calibrated balancing valves.

3.7 HANGER AND SUPPORT INSTALLATION

A. Refer to Division 15 Section "Hangers and Supports" for pipe hanger and support devices. Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Individual, Straight, Horizontal Piping Runs: According to the following:
   a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
   b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
   c. Longer Than 100 Feet (30 m), if Indicated: MSS Type 49, spring cushion rolls.
3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Install supports according to Division 15 Section "Hangers and Supports."

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced 1 size for double-rod hangers, to a minimum of 3/8 inch (10 mm).

E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 (DN 20) and Smaller: 60 inches (1500 mm) with 3/8-inch (10-mm) rod
2. NPS 1 and NPS-1-1/4 (DN 25 and DN 32): 72 inches (1800 mm) with 3/8-inch (10mm) Rod.
3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches (2400 mm) with 3/8-inch (10mm) rod.
4. NPS 2-1/2 (DN 65): 108 inches (2700 mm) with 1/2-inch (13 mm) rod.
5. NPS 3 to NPS 5 (DN 80 to DN 125): 10 feet (3 m) with 1/2-inch (13 mm) rod.
6. NPS 6 (DN 150): 10 feet (3 m) with 5/8-inch (16-mm) rod.
7. NPS 8 (DN 200): 10 feet (3 m) with 3/4-inch (19-mm) rod.

G. Install supports for vertical copper tubing every 10 feet (3m).

3.8 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow service and maintenance.

C. Connect domestic water piping to exterior water service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to service piping with shutoff valve, and extend and connect to the following:

1. Water Heaters: Cold-water supply and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
2. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Fixtures."
3. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 (DN 65) and larger.

3.9 FIELD QUALITY CONTROL

A. Inspect domestic water piping as follows:

1. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.

b. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

B. Test domestic water piping as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed new, altered, extended, or replaced domestic water piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.

3. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.

4. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.

5. Prepare reports for tests and required corrective action.

3.10 ADJUSTING

A. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

1. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.

2. Adjust calibrated balancing valves to flows indicated.

3.11 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing domestic water piping that have been altered, extended, or repaired before using.

2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction or, if methods are not prescribed, procedures described in either AWWA C651 or AWWA C652 or as described below:

a. Flush piping system with clean, potable water until dirty water does not appear at outlets.

b. Fill and isolate system according to either of the following:

1) Fill system or part thereof with water/chlorine solution with at least 50 ppm (50 mg/L) of chlorine. Isolate with valves and allow to stand for 24 hours.

2) Fill system or part thereof with water/chlorine solution with at least 200 ppm (200 mg/L) of chlorine. Isolate and allow to stand for three hours.

c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.

d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

B. Prepare and submit reports of purging and disinfecting activities.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

END OF SECTION

SECTION 15150
SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes soil and waste, sanitary drainage and vent piping inside the building and to locations indicated.

B. Related Sections include the following:
   1. Division 15 Section "Plumbing Specialties" for soil, waste, and vent piping systems specialties.

1.3 DEFINITIONS

A. The following are industry abbreviations for plastic piping materials:
   1. PVC: Polyvinyl chloride plastic.

1.4 PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:

   1. Soil, Waste, and Vent Piping: 10-foot head of water (30 kPa).

1.5 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

B. Shop Drawings: For sovent drainage system, include plans, elevations, sections, and details.

C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.6 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

B. Flexible Transition Couplings for Underground Nonpressure Piping: ASTM C 1173 with elastomeric sleeve. Include ends of same sizes as piping to be joined and include corrosion-resistant metal band on each end.

2.2 PVC PIPING

A. PVC Pipe: ASTM D 2665, solid-wall drain, waste, and vent.

1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns.

B. PVC Special Fittings: ASTM F 409, drainage-pattern tube and tubular fittings with ends as required for application.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

A. Transition and special fittings with pressure ratings at least equal to piping pressure ratings may be used in applications below, unless otherwise indicated.

B. Flanges may be used on aboveground pressure piping, unless otherwise indicated.

C. Aboveground and Underground, Soil, Waste, and Vent Piping: Use the following piping materials for each size range:

1. 1-1/4” and 1-1/2” : Schedule 40 Solid Core PVC pipe, PVC socket fittings, and solvent-cemented joints.
2. 2” to 4”: Schedule 40 Solid Core PVC pipe, PVC socket fittings, and solvent-cemented joints.

3.3 PIPING INSTALLATION

A. Refer to Division 2 Section "Sanitary Sewerage" for Project-site sanitary sewer piping.

B. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation.

C. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.

D. Install cleanout fitting with closure plug inside the building in sanitary force-main piping.

1. Encase piping with PE film according to ASTM A 674 or AWWA C105.

E. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for sleeves and mechanical sleeve seals.

F. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep ¼ bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8- bend fittings if 2 fixture are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

G. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

H. Re-verify building drainage piping slope before covering pipe in trench if left uncovered over a 24 hour period of subjected to exterior water. If slope of piping has changed, provide new shoring material to maintain original slope after trench has been covered.

I. Install soil and waste drainage and vent piping at the code required minimum slopes, unless otherwise indicated:

J. Install engineered soil and waste drainage and vent piping systems in locations indicated and as follows:

1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
2. Cast-Iron, Sovent, Single Stack: Comply with ASSE 1043 and sovent fitting manufacturer's written installation instructions.
3. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.

K. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

L. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.

M. Install underground PVC soil and waste drainage piping according to ASTM D 2321.

N. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.4 JOINT CONSTRUCTION

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.

B. PVC Nonpressure Piping Joints: Join piping according to ASTM D 2665.

3.5 HANGER AND SUPPORT INSTALLATION

A. Refer to Division 15 Section "Hangers and Supports" for pipe hanger and support devices. Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Individual, Straight, Horizontal Piping Runs: According to the following:

    a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet (30 m), if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Install supports according to Division 15 Section "Hangers and Supports."

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.

J. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 48 inches (1200 mm) with 3/8-inch (10-mm) rod.
2. NPS 3 (DN 80): 48 inches (1200 mm) with ½-inch (13-mm) rod.
3. NPS 4 and NPS 5 (DN 100 and DN 125): 48 inches (1200 mm) with 5/8-inch (16-mm) rod.
4. NPS 6 (DN 150): 48 inches (1200 mm) with ¾-inch (19-mm) rod.
5. NPS 8 to NPS 12 (DN 200 to DN 300): (1200 mm) with 7/8-inch (22-mm) rod.

K. Install supports for vertical PVC piping every 48 inches (1200 mm).

L. Support piping and tubing not listed above according to MSS SP-69 and manufacturer’s written instructions.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Fixtures."
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Specialties."
4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 (DN 65) and larger.

3.7 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water (30 kPa). From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg (250 Pa). Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.8 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION

SECTION 15190

SYSTEM IDENTIFICATION AND PIPE MARKING

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General Conditions and Supplementary Conditions apply to all work herein.

B. The Basic Materials and Methods, Section 15050, are included as a part of this Section as though written in full in this document.

1.02 SCOPE

Scope of the Work shall include the furnishing and complete installation of the equipment covered by this Section, with all auxiliaries, ready for owner's use.

1.03 Refer to Architectural Sections for additional requirements.

PART 2 - PRODUCTS

2.01 VALVE AND PIPE IDENTIFICATION

A. Valves:

1. All valves shall be identified with a 1-1/2" diameter brass disc wired onto the handle. The disc shall be stamped with 1/2" high depressed black filled identifying numbers. These numbers shall be numerically sequenced for all valves on the job.

2. The number and description indicating make, size, model number and service of each valve shall be listed in proper operational sequence, properly typewritten. Three copies to be turned over to Owner at completion.

3. Tags shall be fastened with approved meter seal and 4 ply 0.018 smooth copper wire. Tags and fastenings shall be manufactured by the Seton Name Plate Company or approved equal.

4. All valves shall be numbered serially with all valves of any one system and/or trade grouped together.

B. Pipe Marking:

1. All interior visible piping located in accessible spaces such as above accessible ceilings, equipment rooms, attic space, under floor spaces, etc., shall be identified with all temperature pipe markers as manufactured by W.H. Brady Company, 431 West Rock Ave., New Haven, Connecticut, or approved equal.

2. All exterior visible piping shall be identified with UV and acid resistant outdoor grade acrylic plastic markers as manufactured by Set Mark distributed by Seton nameplate company. Factory location 20 Thompson Road, Branford, Connecticut, or approved equal.

3. Generally, markers shall be located on each side of each partition, on each side of each

tee, on each side of each valve and/or valve group, on each side of each piece of equipment, and, for straight runs, at equally spaced intervals not to exceed 75 feet. In congested area, marks shall be placed on each pipe at the points where it enters and leaves the area and at the point of connection of each piece of equipment and automatic control valve. All markers shall have directional arrows.

4. Markers shall be installed after final painting of all piping and equipment and in such a manner that they are visible from the normal maintenance position. Manufacturer's installation instructions shall be closely followed.

5. Markers shall be colored as indicated below per ANSI/OSHA Standards:

SYSTEM	COLOR	LEGEND
Chilled Water	Green	Chilled Water Supply Chilled Water Return
Sanitary Sewer	Green	Vent Sanitary Sewer
Storm Drain	Green	Storm Drain
Domestic Water	Green	Domestic Water
Domestic Hot Water Supply	Yellow	Domestic Hot Water Supply
Domestic Hot Water Recirculating	Yellow	Domestic Hot Water Return
Fire Protection	Red	Fire Protection
Automatic Sprinkler	Red	Fire Sprinkler
Gas	Yellow	Natural Gas
Condenser Water	Green	Condenser Water Supply Condenser Water Return
Compressed Air	Blue	Compressed Air
Pneumatic Control	Yellow	Pneumatic Controls
Oxygen	Yellow	Oxygen
Nitrogen	Green	Nitrogen
Deionized Water	Green	Deionized Water
Steam	Yellow	Steam Supply Steam Return

C. Pipe Painting:

1. All piping exposed to view shall be painted as indicated or as directed by the Architect in

the field. Confirm all color selections with Architect prior to installation.

2. The entire fire protection piping system shall be painted red.

3. All piping located in mechanical rooms and exterior piping shall be painted as indicated below:

System	Color
Storm Sewer	White
Sanitary Sewer Waste and Vent	Light Gray
Domestic Cold Water	Dark Blue
Domestic Hot Water Supply and Return	Orange
Condenser Water Supply and Return	Light Green
Gas	Yellow
Chilled Water Supply and Return	Light Blue
Heating Hot Water Supply and Return	Reddish Orange

PART 3 - EXECUTION

3.01 All labeling equipment shall be installed as per manufacturers printed installation instructions.

3.02 All items required for a complete and proper installation are not necessarily indicated on the plans or in the specifications. Contractors price shall include all items required as per manufacturers' requirements.

3.03 All piping shall be cleaned of rust, dirt, oil and all other contaminants prior to painting. Install primer and a quality latex paint over all surfaces of pipe.

END OF SECTION

SECTON 15330
WET TYPE FIRE SPRINKLER SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies wet-pipe sprinkler systems for buildings and structures. It is designed to be a performance specification. Sprinkler Contractor will design according to NFPA 13.

B. Products specified in this Section with installation not in Contract include sprinkler cabinets with spare sprinklers and sprinkler wrenches. Deliver to the Owner's maintenance personnel.

C. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 16 Section "Fire Alarm Systems" for alarm devices not specified in this Section.

D. New fire sprinkler system shall be extended to existing gym and classroom building.

1.3 DEFINITIONS

A. Pipe sizes used in this Section are nominal pipe size (NPS) specified in inches. Tube sizes are standard tube size specified in inches.

B. Working plans as used in this Section refer to documents (including drawings and calculations) prepared pursuant to requirements in NFPA 13 for obtaining approval of authority having jurisdiction.

C. Other definitions for fire protection systems are included in referenced NFPA standards.

1.4 SYSTEM DESCRIPTION

A. Wet-Pipe Sprinkler System: System with automatic sprinklers attached to piping system containing water and connected to water supply so that water discharges immediately from sprinklers when they are opened by fire.

B. The sprinkler system shall be a closed-head wet pipe AFFF foam water sprinkler system designed to provide adequately proportioned foam water solution at listed water flows past proportioning device. System shall be installed in accordance with NFPA 16 & NFPA 406, Standard for the Installation of Closed Head Foam-Water Sprinkler Systems, NFPA 11, Standard for Low Expansion Foam, NFPA 13, Standard for Installation of Sprinkler Systems and all other applicable codes or requirements.
   a. This system shall be part of alternate bid. See bid sheet.

1.5 SYSTEM PERFORMANCE REQUIREMENTS

A. Design and obtain approval from authority having jurisdiction for fire protection systems specified and from Architect and Engineer, prior to commencement of work.

B. Minimum Pipe Sizes: Not smaller than sizes indicated for connection to water supply piping, standpipes, and branches from standpipes to sprinklers.

C. Conduct fire hydrant flow tests as required to obtain hydraulic data needed to prepare design for hydraulically calculated systems.

D. Hydraulically design sprinkler systems according to NPFA13.:

E. Components and Installation: Capable of producing piping systems with the following minimum working pressure ratings except where indicated otherwise.

1. Sprinkler Systems: 200 psig.

1.6 SUBMITTALS

A. Product data for fire protection system components. Include the following:

1. Backflow preventers.
2. Valves.
3. Specialty valves, accessories, and devices.
4. Alarm devices. Include electrical data.
5. Fire department connections. Include type of fire department connection; number, size, type, and arrangement of inlets; size and direction of outlet; and finish.
6. Sprinklers, escutcheons, and guards. Include sprinkler flow characteristics, mounting, finish, and other data.

B. Sprinkler system drawings, identified as "working plans" and prepared according to NFPA 13, that have **been approved by authority having jurisdiction**. Include system hydraulic calculations where applicable.

C. Test reports and certificates as described in NFPA 13. Include "Contractor's Material & Test Certificate for Aboveground Piping" and "Contractor's Material & Test Certificate for Underground Piping."

D. Maintenance data for each type of fire protection specialty specified, for inclusion in "Operating and Maintenance Manual" specified in Division 1 Section "Project Closeout."

E. 2 copies of NFPA 25 "Standard for Inspection, Testing and Maintenance of Water Based Fire Protection Systems." Deliver to Owner's maintenance personnel and Engineer.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firms whose equipment, specialties, and accessories are listed by product name and manufacturer in UL Fire Protection Equipment Directory and FM Approval Guide and that conform to other requirements indicated.

B. Listing/Approval Stamp, Label, or Other Marking: On equipment, specialties, and accessories made to specified standards.

C. Listing and Labeling: Equipment, specialties, and accessories that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in "National Electrical Code," Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

D. Comply with requirements of authority having jurisdiction for submittals, approvals, materials, hose threads, installation, inspections, and testing.

E. Comply with requirements of Owner's insurance underwriter for submittals, approvals, materials, installation, inspections, and testing.

F. Certified Welders Certificates per NFPA 13 and AWS-B2.1- Specification for Qualification of Welding Procedures and Welders for Piping and Tubing.

G. Installer's Qualifications: Firms qualified by Texas State Fire Marshal to install and alter fire protection piping, equipment, specialties, and accessories, and repair and service equipment. A qualified firm is one that is experienced (minimum of 5 previous projects similar in size and scope to this Project) in such work, familiar with precautions required, and in compliance with the requirements of the authority having jurisdiction. Submit evidence of qualifications to the Architect upon request. Refer to Division 1 Section "Reference Standards and Definitions" for definition of "Installer."

H. NFPA Standards: Equipment, specialties, accessories, installation, and testing complying with the following:

1. NFPA 13 "Standard for the Installation of Sprinkler Systems."
2. NFPA 26 "Recommended Practice for the Supervision of Valves Controlling Water Supplies for Fire Protection."
3. NFPA 70 "National Electrical Code."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. Specialty Valves and Water Motor Alarm Devices:

   a. Gem Sprinkler Co. Div., Grinnell Corp.
   b. Reliable Automatic Sprinkler Co., Inc.
   c. Star Sprinkler Corp.
   d. Viking Corp.

2. Detector Check Valves:

   a. Ames Co., Inc.
   b. Cla-Val Co.
   c. Hersey Products, Inc., Grinnell Corp.
   d. Viking Corp.
   e. Watts Regulator Co.

3. Water Meters:

   a. Badger Meter, Inc.
   b. Hersey Products, Inc., Grinnell Corp.
   c. Kent Meters, Inc.
   d. Neptune Water Div., Schlumberger Industries, Inc.
   e. Sensus Technologies, Inc., BTR Co.

4. Backflow Preventers:

a. Ames Co., Inc.
b. Cla-Val Co.
c. Conbraco Industries, Inc.
d. Febco.
e. Hersey Products, Inc., Grinnell Corp.
f. Watts Regulator Co.
g. Wilkins Regulator Div., Zurn Industries, Inc.

5. Waterflow Indicators and Supervisory Switches:

a. Gamewell Co.
b. Gem Sprinkler Co. Div., Grinnell Corp.
c. Potter Electric Signal Co.
d. Reliable Automatic Sprinkler Co., Inc.
e. System Sensor Div., Pittway Corp.
f. Victaulic Company of America.
g. Watts Regulator Co.

6. Fire Department Connections:

a. Badger-Powhatan, Figgie International Co.
b. Croker Div., Fire-End and Croker Corp.
c. Elkhart Brass Mfg. Co., Inc.
d. Firematic Sprinkler Devices, Inc.
e. Gem Sprinkler Co. Div., Grinnell Corp.
f. Guardian Fire Equipment, Inc.
g. Potter-Roemer Div., Smith Industries, Inc.
h. Reliable Automatic Sprinkler Co., Inc.
i. Sierra Fire Equipment Co.

7. Sprinklers:

a. Tyco
b. Central Sprinkler Corp.
c. Firematic Sprinkler Devices, Inc.
d. Gem Sprinkler Co. Div., Grinnell Corp.
e. Globe Fire Sprinkler Corp.
f. Reliable Automatic Sprinkler Co., Inc.
g. Star Sprinkler Corp.
h. Viking Corp.

8. Indicator Posts and Indicator Post Gate Valves:

a. Clow Valve Co. Div., McWane, Inc.
b. Gem Sprinkler Co. Div., Grinnell Corp.
c. Kennedy Valve Div., McWane, Inc.
d. Nibco, Inc.
e. Stockham Valves and Fittings, Inc.
f. Waterous Co.

9. Indicator Valves:

a. Gem Sprinkler Co. Div., Grinnell Corp.
b. Grinnell Supply Sales Co., Grinnell Corp.
c. Kennedy Valve Div., McWane, Inc.
d. Milwaukee Valve Co., Inc.

e. Nibco, Inc.
f. Sprink-Line by Sprink, Inc.
g. Victaulic Company of America.

10. Fire Protection Service Gate and Check Valves:

a. Gem Sprinkler Co. Div., Grinnell Corp.
b. Kennedy Valve Div., McWane, Inc.
c. Nibco, Inc.
d. Stockham Valves and Fittings, Inc.
e. Victaulic Company of America.

11. Grooved Couplings for Steel Piping:

a. Grinnell Supply Sales Co., Grinnell Corp.
b. Gustin-Bacon Div., Tyler Pipe Subsid., Tyler Corp.
c. Sprink-Line by Sprink, Inc.
d. Stockham Valves and Fittings, Inc.
e. Victaulic Company of America.

2.2 PIPES, TUBES, FITTINGS, AND VALVES

A. Shall be in compliance with NFPA 13, UL & FM approved as applicable, and as indicated in Part 3 of this specification.
B. Refer to acceptable pipe in section 15331.

2.3 WATER METERS

A. Coordinate with utility requirements.

2.4 BACKFLOW PREVENTERS

A. General: ASSE standard backflow preventers, of size indicated for maximum flow rate indicated and maximum pressure loss indicated.

1. Working Pressure: 150 psig (1035 kPa) minimum except where indicated otherwise.
2. Bronze, cast-iron, steel, or stainless-steel body with flanged ends.
3. Interior Lining: FDA-approved epoxy coating, for backflow preventers having cast-iron or steel body.
4. Interior Components: Corrosion-resistant materials.

B. Reduced-Pressure-Principle Backflow Preventer: ASSE 1013, consisting of OS&Y gate valves on inlet and outlet. Include test cocks and pressure-differential relief valve with ASME A112.1.2 air-gap fitting located between 2 positive-seating check valves for continuous pressure application.

1. Pressure Loss: 12 psig (83 kPa) maximum, through middle third of flow range.

C. Double-Check Backflow Prevention Assemblies: ASSE 1015, consisting of shutoff valves on inlet and outlet. Include test cocks with 2 positive-seating check valves for continuous pressure application.

1. Pressure Loss: 5 psig (35 kPa) maximum, through middle third of flow range.

D. Reduced-Pressure Detector Assembly Backflow Preventers: UL 312 and ASSE 1047, consisting of OS&Y gate valves on inlet and outlet. Include pressure-differential relief valve having

ASME A112.1.2 air-gap fitting located between 2 positive-seating check valves, test cocks, and bypass with displacement-type water meter, valves, and reduced-pressure backflow preventer, for continuous pressure application.

1. Pressure Loss: 12 psig (83 kPa) maximum, through middle third of flow range.

E. Double-Check Detector Assembly Backflow Preventers: UL 312 and ASSE 1048, consisting of OS&Y gate valves on inlet and outlet. Include 2 positive-seating check valves and test cocks, and bypass with displacement-type water meter, valves, and double-check backflow preventer, for continuous pressure application.

1. Pressure Loss: 5 psig (35 kPa) maximum, through middle third of flow range.

2.5 SPRINKLERS

A. Automatic Sprinklers: With heat-responsive element conforming to:

1. UL 199, for applications except residential.
2. UL 1767, for early-suppression, fast-response applications.

B. Sprinkler types and categories are as indicated and as required by application. Furnish automatic sprinklers with nominal 1/2-inch (12.7 mm) orifice for "Ordinary" temperature classification rating except where otherwise indicated and required by application.

C. Sprinkler type (All other options need to be pre-approved prior to bid):

1. Upright sprinklers
2. Pendent sprinklers
3. Sidewalls
4. Concealed ceiling sprinklers, including cover plate.

D. Sprinkler Finishes: Chrome-plated.

E. Special Coatings: Wax, lead, and corrosion-resistant paint.

F. Sprinkler Escutcheons: Escutcheons for recessed-type sprinklers are specified with sprinklers.
G. Provide chrome plated covers to conceal recessed sprinkler heads.

H. Sprinkler Cabinets: Finished steel cabinet and hinged cover, with space for minimum of 6 spare sprinklers plus sprinkler wrench, suitable for wall mounting. Include number of sprinklers required by NFPA 13 and 1 wrench for sprinklers. Include separate cabinet with sprinklers and wrench for each style sprinkler on Project.

2.6 SPECIALTY SPRINKLER FITTINGS

A. Specialty Fittings: UL-listed and FM-approved, made of steel, ductile iron, or other materials compatible with system materials and applications where used.

B. Mechanical-"T" Fittings: UL 213, ductile-iron housing with pressure-responsive gasket, bolts, and threaded or locking-lug outlet.

C. Mechanical-Cross Fittings: UL 213, ductile-iron housing with pressure-responsive gaskets, bolts, and threaded or locking-lug outlets.

D. Sprinkler Alarm Test Fittings: Ductile-iron housing, integral test valves, combination orifice and sight glass, and threaded ends.

2.7 FIRE DEPARTMENT CONNECTIONS

A. Exposed, Remote mounted Fire Department Connections: UL 405, cast-brass body; NH-standard thread inlets according to NFPA 1963 and matching local fire department threads; and threaded NPS outlet. Include lugged cap, gasket, and chain; lugged swivel connection and drop clappers for each hose connection inlet; and round wall escutcheon plate with marking "AUTO SPKR."

1. Coordinate with Jurisdiction Having Authority for Location and Type of Fire Department Connection.
2. Connections: Two 2-1/2-inch (65 mm) inlets and 4-inch (100 mm) outlet.
3. Direction of Outlet: Back, angle.
4. Finish: Polished brass.

2.8 ALARM DEVICES

A. Alarm Devices: Types and sizes that will match piping and equipment connections.

B. Waterflow Indicators: UL 346, electrical-supervision type, vane-type waterflow detector, rated to 250 psig (1725 kPa), and designed for horizontal or vertical installation. Include 2 SPDT (single-pole, double-throw) circuit switches to provide isolated alarm and auxiliary contacts, 7 ampere, 125 volts a.c. (7 A, 125 V a.c.) and 0.25 ampere, 24 volts d.c. (0.25 A, 24 V d.c.); complete with factory-set, field-adjustable retard element to prevent false signals, and tamper-proof cover that sends a signal when cover is removed. Wiring to be installed by Fire Alarm contractor.

2.9 PRESSURE GAGES

A. Pressure Gages: UL 393, 3-1/2 to 4-1/2 inches (90 to 115 mm) diameter dial, with dial range of 0-250 psig (0-1600 kPa).

PART 3 - EXECUTION

3.1 SPRINKLER SYSTEM PIPING APPLICATIONS

A. Refer to Part 2 of this Section for detailed specifications on pipe and fittings products listed below. Use pipe, tube, fittings, and joining methods according to the following applications. Piping may be joined with flanges instead of indicated joints. Use grooved-end fittings with grooved couplings that are made by the same manufacturer and that comply with listing when used together for grooved-coupling joints.

B. Pipe Between Fire Department Connections and Check Valves: Use galvanized-steel pipe instead of black-steel pipe when steel pipe is specified for applications below. Do not use welded joints.

3.2 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use gate, ball, or butterfly valves.
2. Throttling Duty: Use globe, ball, or butterfly valves.

3.3 JOINT CONSTRUCTION

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.

B. Grooved-End Pipe and Grooved-End Fitting Joints: Use grooved-end fittings and grooved couplings that are made by the same manufacturer and that are listed for use together. Groove pipe and assemble joints with grooved coupling, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

3.4 SERVICE ENTRANCE PIPING

A. Connect fire protection piping to water service piping of size and in location to be determined for service entrance to building.
B. Include tapping fees, shut-off valve, and all other fees required by City.
C. Coordinate location of Backflow preventer with water purveyor.

D. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to fire service piping.
E. Stainless steel in building riser will be installed a minimum of Five (5) from building to riser penetration up to 12 inches a.f.f.
F. PVC Pipe – AWWA C-900 is allowed when approved by Jurisdiction Having Authority.

3.5 PIPING INSTALLATIONS

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation.

B. Locations and Arrangements: Coordinate with architect and engineer the general location and arrangement of piping.

1. Deviations from approved "working plans" for sprinkler piping require written approval from authority with jurisdiction.

C. Use approved fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

D. Install "Inspector's Test Connections" in sprinkler piping, complete with shutoff valve, sized and located according to NFPA 13.

E. Install sprinkler piping with drains for complete system drainage.

F. Install ball drip valves to drain piping between fire department connections and check valves, and where indicated. Drain to floor drain or outside building.

G. Install alarm devices in piping systems.

H. Hangers and Supports: Comply with NFPA 13.

1. Install hanger and support spacing and locations for steel piping joined with grooved mechanical couplings according to manufacturer's written instructions for rigid systems.
2. Earthquake Protection: Install piping according to NFPA 13 to protect from earthquake damage.

I. Install pressure gages on riser. Include pressure gages with connection not less than 1/4 inch (7 mm) and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.

3.6 SPECIALTY SPRINKLER FITTING INSTALLATIONS

A. Install specialty sprinkler fittings according to manufacturer's written instructions.

3.7 VALVE INSTALLATIONS

A. Refer to Division 15 Section "Valves" for installation of general-duty valves. Install fire-protection specialty valves, trim, fittings, controls, and specialties according to NFPA 13, manufacturer's written instructions, and the authority having jurisdiction.

B. Gate Valves: Install fire-protection service valves supervised-open, located to control sources of water supply except from fire department connections. Where there is more than 1 control valve, provide permanently marked identification signs indicating portion of system controlled by each valve.

C. Install check valve in each water supply connection. Install backflow preventers instead of check valves in potable water supply sources.

D. Detector Check Valves: Install for proper direction of flow, located to detect system leakage and unauthorized use of water and to prevent backflow into public water mains. Install bypass with water meter, with gate valves on each side of meter, and check valve downstream from meter.

3.8 WATER METER INSTALLATION

A. Install water meter according to utility company's written installation instructions and requirements.

B. Size meter and arrange piping and specialties to comply with utility company's requirements.

3.9 ROUGHING-IN FOR WATER METER

A. Install roughing-in piping and specialties for water meter installation according to utility company's instructions and requirements.

3.10 BACKFLOW PREVENTER INSTALLATION

A. Install backflow preventers of type, size, and capacity indicated. Comply with plumbing code and authority with jurisdiction. Install air-gap fitting on units with atmospheric vent connection and pipe relief outlet drain to nearest floor drain. Do not install bypass around backflow preventer.

3.11 SPRINKLER APPLICATIONS

A. Spaces Subject to Freezing: Upright, dry-type sprinklers.
B. Special Applications: Use extended-coverage and quick-response sprinklers where indicated.

C. Sprinkler Finishes: Use sprinklers with following finishes:

1. Chrome pendent ceiling sprinklers, including cover plate on all areas.
2. Provide upright sprinkler with head guards in all exposed areas.

3.12 SPRINKLER INSTALLATIONS

A. Install sprinklers in suspended ceilings in center of acoustical panels and tiles.

B. Do not install wet-type sprinklers in areas subject to freezing. Use dry-type sprinklers supplied from heated space.

3.13 FIRE DEPARTMENT CONNECTION INSTALLATIONS

A. Install fire department connections of types and features indicated in locations approved by Jurisdiction Having Authority.

B. Install ball drip valves at each check valve for fire department connection to mains and where indicated. Drain to floor drain or outside building.

3.14 CONNECTIONS

A. Connect to specialty valves, specialties, fire department connections, and accessories.

B. Connect water supplies to sprinkler systems. Include backflow preventers.

C. Electrical Connections: Provide Power wiring as specified in Division 16.

D. Coordinate connection of alarm devices to fire alarm system as specified by Division 16.

3.15 FIELD QUALITY CONTROL

A. Perform field acceptance tests of each fire protection system.

1. Flush, test, and inspect sprinkler piping systems according to NFPA 13 Chapter "System Acceptance."

B. Replace piping system components that do not pass test procedures specified, then retest to demonstrate compliance. Repeat procedure until satisfactory results are obtained.

1. Report test results promptly and in writing to Architect.
2. Report test results promptly and in writing to authority having jurisdiction when required.

3**.16** CLEANING

A. Clean dirt and debris from sprinklers. Replace sprinklers having paint other than factory finish with new sprinklers. Cleaning and reuse of painted sprinklers is prohibited.

3.17 COMMISSIONING

A. Starting Procedures: Follow manufacturer's written procedures. If no procedures are prescribed by manufacturer, proceed as follows:

1. Verify that specialty valves, trim, fittings, controls, and accessories have been installed correctly and operate correctly.
2. Verify that specified tests of piping are complete.
3. Check that damaged sprinklers and sprinklers with paint or coating not specified have been replaced with new, correct type of sprinklers.
4. Check that sprinklers are correct type, have correct finish and temperature ratings, and have guards where required for applications.
5. Check that potable water supplies have correct type of backflow preventer.
6. Check that fire department connections have threads compatible with local fire department equipment and have correct pressure rating.
7. Fill wet-pipe sprinkler systems with water.
8. Energize circuits to electrical equipment and devices.
9. Adjust operating controls and pressure settings.

B. Coordinate with fire alarm system tests. Operate systems as required.

3.18 DEMONSTRATION

A. Demonstrate equipment, specialties, and accessories. Review operating and maintenance information.

B. Schedule demonstration with at least 7 days' advance notice.

END OF SECTION 15330

SECTION 15331
FIRE PROTECTION PIPING

PART 1. GENERAL

1.1 SECTION INCLUDES

1. Pipe, fittings, valves, and connections for sprinkler systems.

1.2 SUBMITTALS

1. Submit under provisions of Section 15330.

2. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, elevation, weights, mounting and support details, piping, connections, anchors and thrust blocks.

3. Product Data: Provide manufacturers catalog information. Indicate valve data and ratings

4. Maintenance Instructions: Include installation instructions, spare parts lists, procedures, and treatment programs.

1.3 QUALITY ASSURANCE

1. Installation shall comply with all requirements of the Local Code and the authority having jurisdiction.

2.
3. Sprinkler Systems: Perform work in accordance with NFPA 13. Latest Edition.

4. Private Fire Main Systems: Perform work in accordance with NFPA 24.

5. Welding Materials and Procedures: Perform to ASME Code.

6. Refer to Section 15330 for general materials and methods.

7. Valves: Bear UL label or marking. Provide manufacturer's name and pressure rating marked on valve body. Refer to Section 15100.

8. Whenever the specification requirements are more stringent than the Code provisions, comply with the specifications.

1.4 DELIVERY, STORAGE, AND HANDLING

1. Deliver, store, protect, and handle products under provisions of Section 15330.

2. Deliver and store valves in shipping containers, with labeling in place.

3. Provide temporary protective coating on cast iron and steel valves.

4. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

PART 2 PRODUCTS

2.1 BURIED PIPING

1. Stainless steel in building riser.

2. C-900, DR-18
    a. All gaskets and method of connection shall be appoved by Factory Mutual.

2.2 ABOVE GROUND PIPING

1. Schedule 40 Black Steel for 2 inch and smaller
2. Schedule 10 Black Steel for all 2.5 and greater.
3. Steel Pipe: ANSI/ASTM A53, standard weight; with minimum_mil factory applied polyethylene jacket.
    1. Welding Fittings: ANSI/ASTM A234 Seamless Black Steel; standard weight.
    2. Threaded Fittings: ANSI/ASTM B16.3, black class 150 malleable.
    3. Flanges: ANSI B16.5, class 150 black steel with 1/16-inch raised face.
    4. Companion Flanges: ANSI B16.1, class 150 black cast iron, flat faced, threaded.
    5. Grooved Fittings: ASTM A47 malleable iron, black, enamel coated.
    6. Grooved Couplings: ASTM A47 malleable iron black, enamel coated split coupling with EPDM gasket.

4. Support in accordance with NFPA 13
    1. Provide electro galvanized hanger rods with cadmium plated nuts and washers.

PART 3 EXECUTION

3.1 PREPARATION

1. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe before welding.

2. Remove scale and foreign material from inside and outside, before assembly.

3. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

1. Install piping to be schedule 40 black steel for all above ground piping and in accordance with NFPA 13 for sprinkler systems and NFPA 24 for service mains and provisions of these specifications whichever is more stringent.

2. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

3. Install piping to conserve building space, and not interfere with use of space and other work.

4. Group piping whenever practical at common elevations.

5. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

6. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

7. Prepare pipe, fittings, supports, and accessories for finish painting.

8. Do not penetrate building structural members unless indicated.

9. Provide sleeves. Seal pipe and sleeve penetrations to achieve fire resistance equivalent to fire separation required. Refer to Section 15140.

10. Die cut screw joints with full cut standard taper pipe threads with red lead and linseed oil or other non-toxic joint compound applied to male threads only.

11. Install valves with stems upright or horizontal, not inverted. Remove protective coatings after installation.

12. Provide drain valves at main shut-off valves and low points of piping and apparatus.

13. Provide reaction blocking or anchorage at all dead ends, tees, crosses and bends in underground piping. Locate behind the fitting and symmetrical with the axis of the resultant thrust. Minimum 1500 psi; concrete. Place blocking so that joints remain accessible.

3.2 TESTS

1. Upon completion and prior to acceptance of the installation, the Contractor shall subject the system to the tests required by NFPA 13 and the requirements of the local authority having jurisdiction.

END OF SECTION

SECTION 15410
PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes plumbing fixtures and related components.

B. Related Sections include the following:
   1. Division 15 Section "Drinking Fountains and Water Coolers."
   2. Division 15 Section "Plumbing Specialties" for backflow preventers and specialty fixtures not in this Section.

1.3 DEFINITIONS

A. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.

B. Fitting: Device that controls flow of water into or out of plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.

1.4 SUBMITTALS

A. Product Data: Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports and indicate materials and finishes, dimensions, construction details, and flow-control rates for each type of fixture indicated.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.

   1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.

B. Regulatory Requirements: Comply with requirements in U.S. Architectural & Transportation Barriers Compliance Board's "Uniform Federal Accessibility Standards (UFAS), 1985-494-187" about plumbing fixtures for people with disabilities.

C. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

D. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

E. TAS: Texas Accessibility Standards.

1.6 COORDINATION

A. Coordinate roughing-in and final plumbing fixture locations, and verify that fixtures can be installed to comply with original design and referenced standards.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. For fixture descriptions in other Part 2 articles where the subparagraph titles "Products," and "Manufacturers" introduce a list of manufacturers and their products or manufacturers only, the following requirements apply for product selection:

1. Products: Subject to compliance with requirements, provide one of the products specified in other Part 2 articles.

2.2 LAVATORY FAUCETS

A. Lavatory Faucet: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes and outlet with spout and fixture receptor.
1. Products:

a. American Standard.
b. Eljer.
c. Kohler.

2.3 SHOWER FAUCETS

A. Shower Faucet: Include hot- and cold-water indicators; tub spout; and shower head, arm, and flange. Coordinate faucet inlets with supplies and outlet with diverter valve.
1. Manufacturers:

a. American Standard.
b. Eljber.
c. Kohler.

2.4 SINK FAUCETS

A. Sink Faucet: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes and outlet with spout and fixture receptor.
1. Manufacturers:

a. American Standard.
b. Eljer

c. Kohler.

2.5 TOILET SEATS

A. Toilet Seat: Solid plastic.
1. Manufacturers:

a. Bemis.
b. Beneke.
c. Centoco.
d. Church.

2.6 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Guard, Manufactured, plastic enclosure for covering for hot- and cold-water supplies and trap and drain piping and complying with ADA requirements.
1. Manufacturers:

a. Engineered Brass Co.
b. Plumerex
c. Truebro.

2.7 FIXTURE SUPPORTS

A. Water-Closet Support: Water-closet combination carrier designed for accessible and standard mounting heights. Include single or double, vertical or horizontal, hub-and-spigot or hubless waste fitting as required for piping arrangement; faceplates; couplings with gaskets; feet; and fixture bolts and hardware matching fixture. Include additional extension coupling, faceplate, and feet for installation in wide pipe space.
1. Manufacturers:
a. Mifab
b. Josam.
c. Wade.
d. Zurn

B. Urinal Support: Type I, urinal carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture. Include steel uprights with feet.
1. Manufacturers:

a. Josam.
b. J.R. Smith
c. Zurn.

2. Accessible Fixture Support: Include rectangular steel uprights.

C. Lavatory Support: Type II, lavatory carrier with concealed arms and tie rod. Include steel uprights with feet.
1. Manufacturers:

a. Josam.
b. J.R. Smith

c. Zurn.

2. Accessible Fixture Support: Include rectangular steel uprights.

D. Sink Support: Type II, sink carrier with hanger plate, bearing studs, and tie rod. Include steel uprights with feet.
1. Manufacturers:

a. Josam.
b. J.R. Smith
c. Zurn.

2.8 WATER CLOSETS

A. Water Closets: Accessible, wall-hanging, back-outlet, vitreous-china fixture designed for flushometer valve operation.
1. Products:

a. American Standard, Inc.
b. Kohler Co.
c. TOTO USA, Inc.

B. Water Closets: Accessible, floor mounting, floor-outlet, vitreous-china fixture designed for flushometer valve operation.
1. Products:

a. American Standard, Inc.
b. Kohler Co.
c. TOTO USA, Inc.

2.9 URINALS

A. Urinals,: Accessible, wall-hanging, back-outlet, vitreous-china fixture designed for flushometer valve operation.
1. Products:

a. American Standard, Inc.
b. Kohler Co.
c. TOTO USA, Inc.

2.10 LAVATORIES, SINKS

A. Lavatories,: Accessible, wall hanging, vitreous-china fixture.
1. Products:

a. American Standard, Inc.
b. Kohler Co.
c. Toto

2.11 KITCHEN SINKS

A. Kitchen Sinks: Commercial, counter-mounting, stainless-steel fixture.
   1. Products:

      a. Elkay Manufacturing Co.
      b. Just Manufacturing Co.

2.12 SERVICE SINKS

A. Service Sinks: Floor-mounting, enameled, sink with front apron, raised back, and coated, wire rim guard.
   1. Products:

      a. Commercial Enameling Co.
      b. Kohler Co.
      c. Fiat

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water soil and for waste piping systems and supports to verify actual locations and sizes of piping connections and that locations and types of supports match those indicated, before plumbing fixture installation. Use manufacturer's roughing-in data if roughing-in data are not indicated.

B. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FIXTURE INSTALLATION

A. Assemble fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. For wall-hanging fixtures, install off-floor supports affixed to building substrate.

   1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
   2. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.

C. Install back-outlet, wall-hanging fixtures onto waste fitting seals and attach to supports.

D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.

E. Install wall-hanging fixtures with tubular waste piping attached to supports.

F. Install floor-mounting, back-outlet water closets attached to building floor substrate and wall bracket and onto waste fitting seals.

G. Install counter-mounting fixtures in and attached to casework.

H. Install fixtures level and plumb according to manufacturers' written instructions and roughing-in drawings.

I. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

1. Exception: Use ball, gate, or globe valve if stops are not specified with fixture. Refer to Division 15 Section "Valves" for general-duty valves.

J. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

K. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

L. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

M. Install toilet seats on water closets.

N. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

O. Install water-supply, flow-control fittings with specified flow rates in fixture supplies at stop valves.

P. Install faucet, flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

Q. Install traps on fixture outlets.

R. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for escutcheons.

S. Seal joints between fixtures and walls, floors, and counters using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Refer to Division 7 Section "Joint Sealants" for sealant and installation requirements.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect water supplies from water distribution piping to fixtures.

C. Connect drain piping from fixtures to drainage piping.

D. Supply and Waste Connections to Plumbing Fixtures: Connect fixtures with water supplies, stops, risers, traps, and waste piping. Use size fittings required to match fixtures. Connect to plumbing piping.

E. Supply and Waste Connections to Fixtures and Equipment Specified in Other Sections: Connect fixtures and equipment with water supplies, stops, risers, traps, and waste piping specified. Use size fittings required to match fixtures and equipment. Connect to plumbing piping.

F. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Verify that installed fixtures are categories and types specified for locations where installed.

B. Check that fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

3.5 ADJUSTING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Adjust water pressure at faucets, shower valves, and flushometer valves to produce proper flow and stream.

C. Replace washers and seals of leaking and dripping faucets and stops.

3.6 CLEANING

A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:

1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
2. Remove sediment and debris from drains.

3.7 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 15415
DRINKING FOUNTAINS AND WATER COOLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Drinking fountains.
2. Self-contained water coolers.
3. Fixture supports.

1.3 DEFINITIONS

A. Accessible Drinking Fountain and Water Cooler: Fixture that can be approached and used by people with disabilities.

B. Drinking Fountain: Fixture with nozzle for delivering stream of water for drinking.

C. Fitting: Device that controls flow of water into or out of fixture.

D. Fixture: Drinking fountain or water cooler, unless one is specifically indicated.

E. Water Cooler: Electrically powered fixture for generating and delivering cooled drinking water.

1.4 SUBMITTALS

A. Product Data: Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories for each type of fixture indicated.

B. Shop Drawings: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.

C. Maintenance Data: For fixtures to include in maintenance manuals specified in Division 1.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities" about fixtures for people with disabilities.

C. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

D. ARI Standard: Comply with ARI 1010, "Self-Contained, Mechanically Refrigerated Drinking-Water Coolers," for water coolers and with ARI's "Directory of Certified Drinking Water Coolers" for type and style classifications.

E. TAS: Texas Accessibility Standards.

1.6 COORDINATION

A. Coordinate roughing-in and final fixture locations, and verify that fixtures can be installed to comply with original design and referenced standards.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified below.

1. Elkay.
2. Halsey Taylor.
3. Haws Corporation.

2.2 DRINKING FOUNTAINS

A. Drinking Fountains,: Accessible, Style W, wall-hanging fixture made of stainless steel.

1. Receptor Shape: Rectangular.
2. Back Panel: Stainless-steel wall plate behind drinking fountain.
3. Bubblers: Two, with automatic stream regulator, located on deck.
4. Control: Push button.
5. Supply: NPS 3/8 (DN 10) with ball, gate, or globe valve.
6. Drain: Grid with NPS 1-1/4 (DN 32) minimum horizontal waste and trap complying with ASME Standards.
7. Support: Type I, water-cooler carrier. Refer to "Fixture Supports" Article.

2.3 SELF-CONTAINED WATER COOLERS

A. Water Coolers: Accessible, ARI 1010, Type PB, pressure with bubbler, Style W, wall-hanging fixture.

1. Cabinet: Bilevel with two attached cabinets, enameled steel with stainless-steel top.
2. Bubbler: One, with automatic stream regulator, located on each cabinet deck.
3. Control: Push button.
4. Supply: NPS 3/8 (DN 10) with ball, gate, or globe valve and filter.

5. Drain: Grid with NPS 1-1/4 (DN 32) minimum horizontal waste and trap complying with ASME Standards.
6. Cooling System: Electric, with hermetically sealed compressor, cooling coil, air-cooled condensing unit, corrosion-resistant tubing, refrigerant, corrosion-resistant-metal storage tank, and adjustable thermostat.

    a. Capacity: 8 gph (0.0084 L/s) of 50 deg F (10 deg C) cooled water from 80 deg F (27 deg C) inlet water and 90 deg F (32 deg C) ambient air temperature.
    b. Electrical Characteristics: 1/5 hp; 120-V ac; single phase; 60 Hz.

7. Support: Type II, water-cooler carrier. Refer to "Fixture Supports" Article.

2.4 FIXTURE SUPPORTS

A. Off-Floor, Plumbing Fixture Supports: ASME A112.6.1M, water-cooler carriers. Include vertical, steel uprights with feet and tie rods and bearing plates with mounting studs matching fixture to be supported.

1. Available Manufacturers:
2. Manufacturers:

    a. Josam Co.
    b. Smith, Jay R. Mfg. Co.
    c. Tyler Pipe; Wade Div.
    d. Zurn Specifications Drainage Operation.

3. Type I: Hanger-type carrier with two vertical uprights.
4. Type II: Bilevel, hanger-type carrier with three vertical uprights.
5. Supports for Accessible Fixtures: Include rectangular, vertical, steel uprights instead of steel pipe uprights.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water and waste piping systems to verify actual locations of piping connections before fixture installation. Verify that sizes and locations of piping and types of supports match those indicated.

B. Examine walls and floors for suitable conditions where fixtures are to be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Use carrier off-floor supports for wall-hanging fixtures, unless otherwise indicated.

B. Use chrome-plated brass or copper tube, fittings, and valves in locations exposed to view. Plain copper tube, fittings, and valves may be used in concealed locations.

3.3 INSTALLATION

A. Install off-floor supports affixed to building substrate and attach wall-hanging fixtures, unless otherwise indicated.

B. Install mounting frames affixed to building construction and attach recessed water coolers to mounting frames, unless otherwise indicated.

C. Install fixtures level and plumb.

D. Install water-supply piping with shutoff valve on supply to each fixture to be connected to water distribution piping. Use ball, gate, or globe valve. Install valves in locations where they can be easily reached for operation. Refer to Division 15 Section "Valves" for general-duty valves.

E. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.

F. Install pipe escutcheons at wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding pipe fittings. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for escutcheons.

G. Seal joints between fixtures and walls and floors using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Refer to Division 7 for sealant and installation requirements.

3.4 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect water supplies from water distribution piping to fixtures.

C. Connect drain piping from fixtures to drainage piping.

D. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

END OF SECTION

SECTION 15430
PLUMBING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following plumbing specialties:
1. Balancing valves.
2. Washer-supply outlets.
3. Key-operation hydrants.
4. Trap seal primer valves.
5. Drain valves.
6. Miscellaneous piping specialties.
7. Sleeve penetration systems.
8. Flashing materials.
9. Cleanouts.
10. Floor drains.
11. Roof drains.
12. Grease interceptors.

1.3 DEFINITIONS

A. The following are industry abbreviations for plastic piping materials:

1. ABS: Acrylonitrile-butadiene-styrene plastic.
2. PVC: Polyvinyl chloride plastic.

1.4 PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with following minimum working-pressure ratings, unless otherwise indicated:

1. Domestic Water Piping: 125 psig (860 kPa).
2. Sanitary Waste and Vent Piping: 10-foot head of water (30 kPa).
3. Storm Drainage Piping: 10-foot head of water (30 kPa).

1.5 SUBMITTALS

A. Product Data: Include rated capacities and shipping, installed, and operating weights. Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections for the following:
1. Balancing valves.

2. Water hammer arresters, and trap seal primer valves and systems.
3. Hose bibbs, hydrants.
4. Washer-supply outlets.
5. Cleanouts, floor drains, and roof drains.
6. Roof flashing assemblies.
7. Grease interceptors.
8. Sleeve penetration systems.

B. Shop Drawings: Diagram power, signal, and control wiring.

1.6 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of plumbing specialties and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

B. Plumbing specialties shall bear label, stamp, or other markings of specified testing agency.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for piping materials and installation.

E. NSF Compliance:

1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components. Include marking "NSF-pw" on plastic potable-water piping and "NSF-dwv" on plastic drain, waste, and vent piping.
2. Comply with NSF 61, "Drinking Water System Components--Health Effects, Sections 1 through 9," for potable domestic water plumbing specialties.

PART 2 - PRODUCTS

2.1 BALANCING VALVES

A. Calibrated Balancing Valves: Adjustable, with two readout ports and memory setting indicator. Include manufacturer's standard hoses, fittings, valves, differential pressure meter, and carrying case.
1. Manufacturers:

a. Armstrong Pumps, Inc.
b. Flow Design, Inc.
c. ITT Industries; Bell & Gossett Div.
d. Taco, Inc.
e. Watts Industries, Inc.; Water Products Div.

2. NPS 2 (DN 50) and Smaller: Bronze body with brass ball, adjustment knob, calibrated nameplate, and threaded or solder-joint ends.
3. NPS 2 (DN 50) and Smaller: Bronze, Y-pattern body with adjustment knob and threaded ends.
4. NPS 2-1/2 (DN 65) and Larger: Cast-iron, Y-pattern body with bronze disc and flanged or grooved ends.

B. Memory-Stop Balancing Valves, NPS 2 (DN 50) and smaller: MSS SP-110, ball valve, rated for 400-psig (2760-kPa) mininmum CWP. Include two-piece, copper-alloy body with full-port, chrome-plated brass ball, replaceable seats and seals, threaded or solder-joint ends, and vinyl-covered steel handle with memory-stop device.

1. Manufacturers:

   a. Conbraco Industries, Inc.
   b. Crane Co., Crane Valve Group; Crane Valves.
   c. Grinnell Corporation.
   d. NIBCO INC.
   e. Red-White Valve Corp.

2.2 STRAINERS

A. Strainers: Y-pattern, unless otherwise indicated, and full size of connecting piping. Include ASTM A 666, Type 304, stainless-steel screens with 3/64-inch (1.2-mm) round perforations, unless otherwise indicated.

1. Pressure Rating: 125-psig (860-kPa) minimum steam working pressure, unless otherwise indicated.
2. NPS 2 (DN 50) and Smaller: Bronze body, with female threaded ends.
3. NPS 2-1/2 (DN 65) and Larger: Cast-iron body, with interior AWWA C550 or FDA-approved, epoxy coating and flanged ends.

2.3 OUTLET BOXES

A. Manufacturers:

1. Acorn Engineering Company.
2. Gray, Guy Manufacturing Co., Inc.
3. Symmons Industries, Inc.

B. General: Recessed-mounting outlet boxes with supply fittings complying with ASME A112.18.1M. Include box with faceplate, services indicated for equipment connections, and wood-blocking reinforcement.

C. Clothes Washer Outlet Boxes: With hot- and cold-water hose connections, drain, and the following:

1. Box and Faceplate: [Stainless steel] [Enameled or epoxy-painted steel].
2. Shutoff Fitting: Two hose bibbs.
3. Supply Fittings: Two NPS 1/2 (DN 15) gate, globe, or ball valves and NPS 1/2 (DN 15) copper, water tubing.
4. Drain: NPS 2 (DN 50) standpipe, P-trap, and direct waste connection to drainage piping.
5. Inlet Hoses: Two ASTM D 3571, 60-inch- (1500-mm-) long, rubber household clothes washer inlet hoses with female hose-thread couplings.
6. Drain Hose: One 48-inch- (1200-mm-) long, rubber household clothes washer drain hose with hooked end.

D. Icemaker Outlet Boxes: With hose connection and the following:

1. Box and Faceplate: Stainless steel.
2. Shutoff Fitting: Hose bibb.

3. Supply Fitting: NPS 1/2 (DN 15) gate, globe, or ball valve and NPS 1/2 (DN 15) copper, water tubing.

2.4 KEY-OPERATION HYDRANTS

A. Manufacturers:

1. Josam Co.
2. Smith, Jay R. Mfg. Co.
3. Woodford Manufacturing Co.

B. General: ASME A112.21.3M, key-operation hydrant with pressure rating of 125 psig (860 kPa).

1. Inlet: NPS 3/4 or NPS 1 (DN 20 or DN 25) threaded or solder joint.
2. Outlet: ASME B1.20.7, garden-hose threads.
3. Operating Keys: One with each key-operation hydrant.

C. Moderate-Climate, Concealed-Outlet Wall Hydrants: ASSE 1019, self-drainable with flush-mounting box with cover, integral nonremovable hose-connection vacuum breaker, and concealed outlet.

1. Classification: Type A, for automatic draining with hose removed or Type B, for automatic draining with hose removed or with hose attached and nozzle closed.

D. Hot and Cold, Nonfreeze Concealed-Outlet Wall Hydrants: With deep flush-mounting box with cover; hot- and cold-water casings and operating rods to match wall thickness; concealed outlet; wall clamps; and factory- or field-installed, nonremovable and manual drain-type, hose-connection vacuum breaker complying with ASSE 1011.

2.5 TRAP SEAL PRIMER VALVES

A. Supply-Type Trap Seal Primer Valves: ASSE 1018, water-supply-fed type, with the following characteristics:
1. Manufacturers:

a. Josam Co.
b. MIFAB Manufacturing, Inc.
c. Precision Plumbing Products, Inc.
d. Smith, Jay R. Mfg. Co.

2. 125-psig (860-kPa) minimum working pressure.
3. Bronze body with atmospheric-vented drain chamber.
4. Inlet and Outlet Connections: NPS 1/2 (DN 15) threaded, union, or solder joint.
5. Gravity Drain Outlet Connection: NPS 1/2 (DN 15) threaded or solder joint.
6. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

2.6 MISCELLANEOUS PIPING SPECIALTIES

A. Water Hammer Arresters: ASSE 1010 or PDI-WH 201, metal-bellows type with pressurized metal cushioning chamber. Sizes indicated are based on ASSE 1010 or PDI-WH 201, Sizes A through F.
1. Manufacturers:

a. Josam Co.
b. Smith, Jay R. Mfg. Co.
c. Tyler Pipe; Wade Div.
d. Zurn Industries, Inc.; Specification Drainage Operation.

B. Hose Bibbs: Bronze body with replaceable seat disc complying with ASME A112.18.1M for compression-type faucets. Include NPS 1/2 or NPS 3/4 (DN 15 or DN 20) threaded or solder-joint inlet, of design suitable for pressure of at least 125 psig (860 kPa); integral [or field-installed,] nonremovable, drainable hose-connection vacuum breaker; and garden-hose threads complying with ASME B1.20.7 on outlet.

C. Roof Flashing Assemblies: Manufactured assembly made of [4-lb/sq. ft. (20-kg/sq. m), 0.0625-inch- (1.6-mm-)] [6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch- (2.4-mm-)] thick, lead flashing collar and skirt extending at least [6 inches (150 mm)] [8 inches (200 mm)] [10 inches (250 mm)] from pipe with galvanized steel boot reinforcement, and counterflashing fitting.

D. Floor-Drain Inlet Fittings: Cast iron, with threaded inlet and threaded or spigot outlet, and trap seal primer valve connection.

E. Fixed Air-Gap Fittings: Manufactured cast-iron or bronze drainage fitting with semiopen top with threads or device to secure drainage inlet piping in top and bottom spigot or threaded outlet larger than top inlet. Include design complying with ASME A112.1.2 that will provide fixed air gap between installed inlet and outlet piping.

F. Stack Flashing Fittings: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.

G. Vent Caps: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and set-screws to secure to vent pipe.

H. Vent Terminals: Commercially manufactured, shop- or field-fabricated, frost-proof assembly constructed of galvanized steel, copper, or lead-coated copper. Size to provide 1-inch (25-mm) enclosed air space between outside of pipe and inside of flashing collar extension, with counterflashing.

I. Expansion Joints: ASME A112.21.2M, assembly with cast-iron body with bronze sleeve, packing gland, and packing; of size and end types corresponding to connected piping.

2.7 SLEEVE PENETRATION SYSTEMS

A. Manufacturers:

1. ProSet Systems, Inc.

B. Description: UL 1479, through-penetration firestop assembly consisting of sleeve and stack fitting with firestopping plug.

1. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
2. Stack Fitting: ASTM A 48 (ASTM A 48M), gray-iron, hubless-pattern, wye-branch stack fitting with neoprene O-ring at base and gray-iron plug in thermal-release harness in branch. Include PVC protective cap for plug.

a. Special Coating: Include corrosion-resistant interior coating on fittings for plastic chemical waste and vent stacks.

2.8 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness.
2. Vent Pipe Flashing: 3-lb/sq. ft. (15-kg/sq. m), 0.0469-inch (1.2-mm) thickness.
3. Burning: 6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness.

B. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil (1.01-mm) minimum thickness.

C. Fasteners: Metal compatible with material and substrate being fastened.

D. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

E. Solder: ASTM B 32, lead-free alloy.

F. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

2.9 CLEANOUTS

A. Cleanouts: Comply with [ASME A112.36.2M] [ASME A112.3.1] <Insert other>.

1. Application: [Floor cleanout] [Wall cleanout] [For installation in exposed piping].
2. Products:
   a. Josam Co.
   b. Mifab
   c. Smith, Jay R. Mfg. Co.
   d. Tyler Pipe, Wade Div.
   e. Zurn Industries, Inc., Specification Drainage Operation.

2.10 FLOOR DRAINS

A. Floor Drains.
1. Products:

   a. Josam Co.
   b. Mifab
   c. Smith, Jay R. Mfg. Co.
   d. Tyler Pipe, Wade Div.
   e. Zurn Industries, Inc.

2.11 ROOF DRAINS

A. Roof Drains: Comply with [ASME A112.21.2M] [ASME A112.3.1].

1. Application: Roof drain.
2. Products:

   a. Josam Co.

b. Mifab
c. Smith, Jay R. Mfg. Co.
d. Tyler Pipe, Wade Div.
e. Watts Industries, Inc., Drainage Products Div.
f. Zurn Industries, Inc.

2.12 GREASE INTERCEPTORS

A. Grease Interceptors: Comply with PDI-G101.
1. Products:

a. American Industrial Precast Products, Inc.
b. Brooks Products
c. Park Equipment Co.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for piping joining materials, joint construction, and basic installation requirements.

B. Install pressure regulators with inlet and outlet shutoff valves and balance valve bypass. Install pressure gages on inlet and outlet.

C. Install strainers on supply side of each control valve, pressure regulator, and solenoid valve.

D. Install trap seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

E. Install backwater valves in building drain piping. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.

F. Install expansion joints on vertical risers, stacks, and conductors if indicated.

G. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4 (DN 100). Use NPS 4 (DN 100) for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet (15 m) for piping NPS 4 (DN 100) and smaller and 100 feet (30 m) for larger piping.
4. Locate at base of each vertical soil and waste stack.

H. Install cleanout deck plates with top flush with finished floor, for floor cleanouts for piping below floors.

I. Install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall, for cleanouts located in concealed piping.

J. Install flashing flange and clamping device with each stack and cleanout passing through floors with waterproof membrane.

K. Install vent flashing sleeves on stacks passing through roof. Secure over stack flashing according to manufacturer's written instructions.

L. Install frost-proof vent caps on each vent pipe passing through roof. Maintain 1-inch (25-mm) clearance between vent pipe and roof substrate.

M. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:

    a. Radius, 30 Inches (750 mm) or Less: Equivalent to 1 percent slope, but not less than 1/4-inch (6.35-mm) total depression.
    b. Radius, 30 to 60 Inches (750 to 1500 mm): Equivalent to 1 percent slope.
    c. Radius, 60 Inches (1500 mm) or Larger: Equivalent to 1 percent slope, but not greater than 1-inch (25-mm) total depression.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

N. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions.

1. Install roof-drain flashing collar or flange so no leakage occurs between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
2. Position roof drains for easy access and maintenance.

O. Install interceptors, including trapping, venting, and flow-control fitting, according to authorities having jurisdiction and with clear space for servicing.

1. Flush with In-Ground Installation: Set unit and extension, if required, with cover flush with finished grade.
2. Install cleanout immediately downstream from interceptors not having integral cleanout on outlet.

P. Fasten wall-hanging plumbing specialties securely to supports attached to building substrate if supports are specified and to building wall construction if no support is indicated.

Q. Fasten recessed-type plumbing specialties to reinforcement built into walls.

R. Install wood-blocking reinforcement for wall-mounting and recessed-type plumbing specialties.

S. Install individual shutoff valve in each water supply to plumbing specialties. Use ball, gate, or globe valve if specific valve is not indicated. Install shutoff valves in accessible locations. Refer to Division 15 Section "Valves" for general-duty ball, butterfly, check, gate, and globe valves.

T. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Connect plumbing specialties to piping specified in other Division 15 Sections.

D. Ground equipment.

E. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

F. Connect plumbing specialties and devices that require power according to Division 16 Sections.

G. Interceptor Connections: Connect piping, flow-control fittings, and accessories.

1. Grease Interceptors: Connect inlet and outlet to unit, and flow-control fitting and vent to unit inlet piping.

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of lead sheets 6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness or thicker. Solder joints of lead sheets 4-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness or thinner.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches (250 mm), and skirt or flange extending at least 8 inches (200 mm) around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Division 7 Section "Sheet Metal Flashing and Trim."

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled trap seal primer systems and their installation, including piping and electrical connections. Report results in writing.

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.5 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

SECTION 15485
ELECTRIC, DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following for domestic water systems:

1. Tankless, electric water heaters.
2. Commercial, electric water heaters.
3. Compression tanks.
4. Accessories.

1.3 SUBMITTALS

A. Product Data: For each type and size of water heater. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.

B. Shop Drawings: Detail water heater assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.

C. Product Certificates: Signed by manufacturers of water heaters certifying that products furnished comply with requirements.

D. Maintenance Data: For water heaters to include in maintenance manuals specified in Division 1.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain same type of water heaters through one source from a single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of water heaters and are based on specific units indicated. Other manufacturers' products complying with requirements may be considered. Refer to Division 1 Section "Substitutions."

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. ASME Compliance: Fabricate and label water heater, hot-water storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," Division 1.

E. ASHRAE Standards: Comply with performance efficiencies prescribed for the following:

1. ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings," for commercial water heaters.
2. ASHRAE 90.2, "Energy Efficient Design of New Low-Rise Residential Buildings," for household water heaters.

1.5 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Point-of-Use, Tankless, Electric Water Heaters:

   a. Chronomite Laboratories, Inc.
   b. Eemax

2. Commercial, Point-of-Use, Storage, Electric Water Heaters:

   a. Rheem
   b. State Industries.

3. Commercial, Storage, Electric Water Heaters:

   a. Lochinvar Corp.
   b. PVI Industries, Inc.
   c. State Industries.

4. Water Heater Stand and Drain Pan Units:

   a. Safety: W. H. Safety Products, Inc.

5. Compression Tanks:
   a. Bell & Gossett
   b. Taco, Inc.
   c. Zurn Industries, Inc.; Wilkins Div.

2.2 POINT-OF-USE, TANKLESS, ELECTRIC WATER HEATERS

A. Description: Comply with UL 499.

B. Construction: Without hot-water storage.

1. Working-Pressure Rating: 150 psig (1035 kPa).

2. Tappings: ASME B1.20.1, pipe thread.
3. Interior Finish: Materials complying with NSF 61, barrier materials for potable-water tank linings.
4. Jacket: Aluminum or steel, with enameled finish, or plastic.

C. Heating System: Electric-resistance type.

1. Temperature Control: Adjustable thermostat.
2. Safety Control: Automatic, high-temperature-limit cutoff device or system.

D. Mounting: Bracket or device for wall mounting.

2.3 COMMERCIAL, POINT-OF-USE, STORAGE, ELECTRIC WATER HEATERS (6 TO 40 GALLON)

A. Compliance: 2012 International Energy Code

B. Description: Comply with UL 174 or UL 1453, and listed by manufacturer for commercial applications.

C. Storage Tank Construction: Non-ASME-code steel with 150-psig (1035-kPa) working-pressure rating.

1. Tappings: Factory fabricated of materials compatible with tank for piping connections, relief valve, drain, anode rod, and controls as required. Attach tappings to tank before testing and labeling. Include ASME B1.20.1, pipe thread.
2. Interior Finish: Materials and thicknesses complying with NSF 61, barrier materials for potable-water tank linings. Extend finish into and through tank fittings and outlets.
3. Insulation: Comply with ASHRAE 90.1. Surround entire storage tank except connections and controls.
4. Jacket: Steel, with enameled finish.

D. Heating Elements: Two, unless otherwise indicated; electric, screw-in, immersion type.

1. Temperature Control: Adjustable thermostat.

E. Anode Rod: Factory installed, magnesium.

F. Drain Valve: ASSE 1005, corrosion-resistant metal, factory installed.

G. Special Requirement: NSF 5 construction.

2.4 COMMERCIAL, STORAGE, ELECTRIC WATER HEATERS (OVER 40 GALLONS)

A. Compliance: 2012 International Energy Code

B. Description: Comply with UL 1453.

C. Storage Tank Construction: ASME-code steel with 150-psig (1035-kPa) working-pressure rating.

1. Tappings: Factory fabricated of materials compatible with tank for piping connections, relief valve, pressure gage, thermometer, drain, anode rods, and controls as required. Attach tappings to tank shell before testing and labeling.

a. NPS 2 (DN50) and Smaller: Threaded ends according to ASME B1.20.1, pipe threads.

2. Interior Finish: Materials and thicknesses complying with NSF 61, barrier materials for potable-water tank linings. Extend finish into and through tank fittings and outlets.
3. Insulation: Comply with ASHRAE 90.1. Surround entire storage tank except connections and controls.
4. Jacket: Steel, with enameled finish.

D. Heating Elements: Electric, screw-in or bolt-on, immersion type arranged in multiples of three.

1. Exception: Water heaters up to 9-kW input may have 2 or 3 elements.
2. Staging: Input not exceeding 18 kW per step.
3. Temperature Control: Adjustable surface-mounted thermostat.
4. Safety Controls: Automatic, high-temperature-limit and low-water cutoff devices or systems.

E. Drain Valve: ASSE 1005, corrosion-resistant metal, factory installed.

F. Anode Rods: Factory installed, magnesium.

G. Dip Tube: Factory installed. Not required if cold-water inlet is near bottom of storage tank.

H. Special Requirement: NSF 5 construction.

2.5 COMPRESSION TANKS

A. Description: Steel, pressure-rated tank constructed with welded joints and factory-installed, butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.

B. Construction: 150-psig (1035-kPa) working-pressure rating.

C. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1, pipe thread.

D. Tank Interior Finish: Materials and thicknesses complying with NSF 61, barrier materials for potable-water tank linings. Extend finish into and through tank fittings and outlets.

E. Tank Exterior Finish: Manufacturer's standard, unless finish is indicated.

F. Air-Charging Valve: Factory installed.

2.6 WATER HEATER ACCESSORIES

A. Combination Temperature and Pressure Relief Valves: ASME rated and stamped and complying with ASME PTC 25.3. Include relieving capacity at least as great as heat input and include pressure setting less than water heater working-pressure rating. Select relief valve with sensing element that extends into tank.

B. Vacuum Relief Valves: Comply with ASME PTC 25.3. Furnish for installation in piping.

1. Exception: Omit if water heater has integral vacuum-relieving device.

C. Shock Absorbers: ASSE 1010 or PDI WH 201, Size A water hammer arrester.

D. Water Heater Stands: Water heater manufacturer's factory-fabricated, steel stand for floor mounting and capable of supporting water heater and water. Include dimension that will support bottom of water heater a minimum of 18 inches (457 mm) above the floor.

E. Water Heater Mounting Brackets: Water heater manufacturer's factory-fabricated, steel bracket for wall mounting and capable of supporting water heater and water.

F. Drain Pans: Corrosion-resistant metal with raised edge. Include dimensions not less than base of water heater and include drain outlet not less than NPS 3/4 (DN20).

PART 3 - EXECUTION

3.1 CONCRETE BASES

A. Install concrete bases of dimensions indicated. Refer to Division 3 and Division 15 Section "Basic Mechanical Materials and Methods."

3.2 WATER HEATER INSTALLATION

A. Install commercial water heaters on concrete bases.

1. Exception: Omit concrete bases for commercial water heaters if installation on stand, bracket, suspended platform, or direct on floor is indicated.

B. Install water heaters, level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

C. Install temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend relief valve outlet with water piping in continuous downward pitch and discharge onto closest floor drain.

D. Install vacuum relief valves in cold-water-inlet piping.

E. Install water heater drain piping as indirect waste to spill into open drains or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains. Refer to Division 15 Section "Plumbing Specialties" for drain valves.

F. Install thermometers on water heater inlet and outlet piping

1. Exception: Omit thermometers for the following:

a. Commercial, point-of-use, water heater inlet piping.
b. Water heater with thermometer outlet piping.

G. Fill water heaters with water.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to machine to allow service and maintenance.

C. Connect hot- and cold-water piping with shutoff valves and unions. Connect hot-water-circulating piping with shutoff valve, check valve, and union.

D. Make connections with dielectric fittings where piping is made of dissimilar metal.

E. Electrical Connections: Power wiring and disconnect switches are specified in Division 16 Sections. Arrange wiring to allow unit service.

F. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL Standards.

3.4 FIELD QUALITY CONTROL

A. In addition to manufacturer's written installation and startup checks, perform the following:

1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
2. Verify that piping system tests are complete.
3. Check for piping connection leaks.
4. Check for clear relief valve inlets, outlets, and drain piping.
5. Check operation of circulators.
6. Test operation of safety controls, relief valves, and devices.
7. Energize electric circuits.
8. Adjust operating controls.
9. Adjust hot-water-outlet temperature settings. Do not set above 140 deg F (60 deg C) unless piping system application requires higher temperature.
10. Balance water flow through manifolds of multiple-unit installations.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain water heaters.

1. Train Owner's maintenance personnel on procedures for starting and stopping, troubleshooting, servicing, and maintaining equipment.
2. Review data in maintenance manuals. Refer to Division 1.
3. Schedule training with Owner, through Architect, with at least seven days' advance notice.

END OF SECTION

SECTION 15815

METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes rectangular, round, and flat-oval metal ducts and plenums for heating, ventilating, and air-conditioning systems in pressure classes from minus 2- to plus 10-inch wg

B. Related Sections include the following:

1. Division 15 Section "Duct Accessories" for dampers, sound-control devices, duct-mounted access doors and panels, turning vanes, and flexible ducts.
2. Division 15 Section "Diffusers, Registers, and Grilles."
3. Division 15 Section "Testing, Adjusting, and Balancing" for air balancing and final adjusting of manual-volume dampers.

1.3 DEFINITIONS

A. Thermal Conductivity and Apparent Thermal Conductivity (k-Value): As defined in ASTM C 168. In this Section, these values are the result of the formula Btu x in./h x sq. ft. x deg F or W/m x K at the temperature differences specified. Values are expressed as Btu or W.

1.4 SYSTEM DESCRIPTION

A. Duct system design, as indicated, has been used to select and size air-moving and -distribution equipment and other components of air system. Changes to layout or configuration of duct system must be specifically approved in writing by Architect.

1.5 SUBMITTALS

A. Product Data: For duct liner and sealing materials.

B. Shop Drawings: Show details of the following:

1. Duct layout indicating pressure classifications and sizes on plans.

2. Fittings.

3. Penetrations through fire-rated and other partitions.

4. Coordination with other trades and including but not limited to: structural members, electrical lights and conduits, plumbing lines, & fire sprinkler lines.

C. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:

1. Ceiling- and wall-mounted access doors and panels required to provide access to dampers and other operating devices.
2. Coordination with ceiling-mounted items, including lighting fixtures, diffusers, grilles, speakers, sprinkler heads, access panels, and special moldings.

D. Duct Construction Standards: Provide a copy of the duct construction standards to be used for each pressure classification in this project. Duct Construction Standards must comply with the latest edition of SMACNA “HVAC Duct Construction Standards – Metal and Flexible.”

E. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

F. Record Drawings: Indicate actual routing, fitting details, reinforcement, support, and installed accessories and devices.

1.6 QUALITY ASSURANCE

A. Welding Standards: Qualify welding procedures and welding personnel to perform welding processes for this Project according to AWS D1.1, "Structural Welding Code--Steel," for hangers and supports; AWS D1.2, "Structural Welding Code--Aluminum," for aluminum supporting members; and AWS D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," unless otherwise indicated.

C. Comply with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems," unless otherwise indicated.

D. Comply with NFPA 96, "Ventilation Control and Fire Protection of Commercial Cooking Operations," Chapter 3, "Duct System," for range hood ducts, unless otherwise indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver sealant and firestopping materials to site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle sealant and firestopping materials according to manufacturer's written recommendations.

C. Deliver and store stainless-steel sheets with mill-applied adhesive protective paper maintained through fabrication and installation

D. Deliver and store all ductwork with protective material until installation. Any material left exposed to moisture and/or particulates shall be removed and replaced.

E. Any installed ductwork or piping system left temporarily incomplete shall be covered with protective material until final connections can be installed.

F. All ductwork and/or liner insulation to be wrapped with protective material until installation. Any ductwork or insulation left exposed to the environment or contaminating particulate matter shall be replaced at the contractor’s expense.

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

A. Galvanized, Sheet Steel: Lock-forming quality; ASTM A 653/A 653M, G90 (Z275) coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.

B. Carbon-Steel Sheets: ASTM A 366/A 366M, cold-rolled sheets; commercial quality; with oiled, exposed matte finish.

C. Stainless Steel: ASTM A 480/A 480M, Type 316, sheet form with No. 4 finish for surfaces of ducts exposed to view; and Type 304, sheet form with No. 1 finish for concealed ducts.

D. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

E. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for 36-inch (900-mm) length or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.2 SEALANT MATERIALS

A. Joint and Seam Sealants, General: The term "sealant" is not limited to materials of adhesive or mastic nature but includes tapes and combinations of open-weave fabric strips and mastics.

1. Joint and Seam Sealant: One-part, nonsag, solvent-release-curing, polymerized butyl sealant, formulated with a minimum of 75 percent solids.

2. Flanged Joint Mastics: One-part, acid-curing, silicone, elastomeric joint sealants, complying with ASTM C 920, Type S, Grade NS, Class 25, Use O.

2.3 HANGERS AND SUPPORTS

A. Hanger Materials: Galvanized, sheet steel or round, threaded steel rod.

1. Hangers Installed in Corrosive Atmospheres: Electrogalvanized, all-thread rod or galvanized rods with threads painted after installation.

2. Straps and Rod Sizes: Comply with latest edition of SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for sheet steel width and thickness and for steel rod diameters.

B. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

C. Trapeze and Riser Supports: Steel shapes complying with ASTM A 36/A 36M.

1. Supports for Galvanized-Steel Ducts: Galvanized steel shapes and plates.

2. Supports for Stainless-Steel Ducts: Stainless-steel support materials.

3. Supports for Aluminum Ducts: Aluminum support materials, unless materials are electrolytically separated from ductwork.

2.4 RECTANGULAR DUCT FABRICATION

A. General: Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction with galvanized, sheet steel, according to the latest edition of SMACNA's "HVAC Duct Construction Standards--Metal and Flexible." Comply with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.

1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure classification.

2. Materials: Free from visual imperfections such as pitting, seam marks, roller marks, stains, and discolorations.

B. Fabricate range hood exhaust ducts with 0.0598-inch- thick, galvanized sheet for concealed ducts and 0.0500-inch- thick stainless steel for exposed ducts. Weld and flange seams and joints. Comply with NFPA 96.

C. Fabricate dishwasher hood exhaust ducts with 0.0500-inch- thick stainless steel. Weld and flange seams and joints.

D. Static-Pressure Classifications: Unless otherwise indicated, construct ducts to the following:

1. Supply Ducts between AHU and Air Terminal Units: 3-inch wg.

2. Supply Ducts after air terminal units and on constant volume supply equipment: 1-inch wg (250 Pa), positive pressure

3. Return Ducts: 1-inch wg ,negative pressure.

4. Exhaust Ducts: 1-inch wg negative pressure.

E. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches and larger and 0.0359 inch thick or less, with more than 10 sq. ft. of unbraced panel area, unless ducts are lined.

2.5 ROUND FABRICATION

A. Round Ducts: Fabricate spiral seam supply and return ducts of galvanized steel according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible." Snap Lock Longitudinal seam ductwork will not be allowed. Adjustable elbows will not be allowed.

B. Spiral seam round or oval duct may be substituted for rectangular duct at the contractors option. Spiral seam ductwork sizing must result in the same or less pressure drop than the rectangular duct indicated on the plans.

2.6 DUCT STORGE

A. All duct must have end capped with plastic covers on both ends from end of fabrication to duct installation.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION, GENERAL

A. Duct installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of ducts, fittings, and accessories.

B. Construct and install each duct system for the specific duct pressure classification indicated.

C. Install round ducts in lengths not less than 10 feet (3 m), unless interrupted by fittings.

D. Install ducts with fewest possible joints.

E. Install fabricated fittings for changes in directions, changes in size and shape, and connections.

F. Install couplings tight to duct wall surface with a minimum of projections into duct.

G. Install ducts, unless otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs.

H. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

I. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.

J. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions, unless specifically indicated.

K. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.

L. Electrical Equipment Spaces: Route ductwork to avoid passing through transformer vaults and electrical equipment spaces and enclosures.

M. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same metal thickness as duct. Overlap opening on four sides by at least 1-1/2 inches (38 mm).

N. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire damper, sleeve, and firestopping sealant. Fire and smoke dampers are specified in Division 15 Section "Duct Accessories." Firestopping materials and installation methods are specified in Division 7 Sections.

3.2 SEAM AND JOINT SEALING

A. General: Seal duct seams and joints according to the duct pressure class indicated and as described in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible." All duct to be sealed to SMACNA seal class A which requires sealing all transverse joints, longitudinal seams and duct wall penetrations regardless of pressure classification.

B. Seal externally insulated ducts before insulation installation.

C. All ducts shall be inspected after sealing is complete and prior to insulation installation. Provide the engineer with a minimum 7 days notice prior to beginning duct insulation.

3.3 RANGE HOOD EXHAUST DUCT INSTALLATIONS

A. Install ducts to allow for thermal expansion of ductwork through 2000 deg F temperature range.

B. Install ducts without dips or traps that may collect residues, unless traps have continuous or automatic residue removal.

C. Install access openings at each change in direction and at 15-foot intervals; locate on sides of duct a minimum of 1-1/2 inches from bottom; and fit with grease-tight covers of same material as duct.

D. Do not penetrate fire-rated assemblies.

3.4 HANGING AND SUPPORTING

A. Install rigid round and rectangular metal duct with support systems indicated in the latest edition of SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

B. Support horizontal ducts within 24 inches of each elbow and within 48 inches of each branch intersection.

C. Support vertical ducts at a maximum interval of 16 feet and at each floor.

D. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.

3.5 CONNECTIONS

A. Connect equipment with flexible connectors according to Division 15 Section "Duct Accessories."

B. For branch, outlet and inlet, and terminal unit connections, comply with the latest edition of SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

3.6 DUCT APPLICATION

A. Service: Round and rectangular, supply/return/outside -air ducts, concealed.

1. Sheet-metal with wrap insulation

B. Service: Round and rectangular, supply/return/outside -air ducts, exposed and in mechanical rooms.

1. Sheet-metal double wall with lined insulation in-between.
2. Inner sheet-metal duct shall be perforated in areas with acoustical requirements, ref. plans.

C.

3.7 FIELD QUALITY CONTROL

A. Disassemble, reassemble, and seal segments of systems as required to accommodate leakage testing and as required for compliance with test requirements.

B. Leakage Test: Perform tests according to SMACNA's "HVAC Air Duct Leakage Test Manual."

C. Maximum Allowable Leakage: Comply with requirements for Leakage Classification 3 for round, Leakage Classification 12 for rectangular ducts in pressure classifications less than and equal to 2-inch wg (both positive and negative pressures), and Leakage Classification 6 for pressure classifications from 2- to 10-inch wg.

D. Remake leaking joints and retest until leakage is less than maximum allowable.

3.8 CLEANING

A. After completing system installation, including outlet fittings and devices, inspect the system. Vacuum ducts before final acceptance to remove dust and debris.

END OF SECTION

SECTION 15820
DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Backdraft dampers.
2. Manual-volume dampers.
3. Fire dampers.
4. Turning vanes.
5. Duct-mounted access doors and panels.
6. Flexible ducts.
7. Flexible connectors.
8. Duct accessory hardware.

B. Related Sections include the following:

1. Division 8 Sections for wall- and ceiling-mounted access doors and panels.
2. Division 10 Sections for intake and relief louvers and vents connected to ducts and installed in exterior walls.
3. Division 15 Section "Diffusers, Registers, and Grilles."
4. Division 16 Sections for duct-mounted fire and smoke detectors.

1.3 SUBMITTALS

A. Product Data: For the following:

1. Backdraft dampers.
2. Manual-volume dampers.
3. Fire dampers.
4. Duct-mounted access doors and panels.
5. Flexible ducts.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loadings, required clearances, method of field assembly, components, location, and size of each field connection. Detail the following:

1. Special fittings and manual- and automatic-volume-damper installations.
2. Fire-damper installations, including sleeves and duct-mounted access doors and panels.

C. Product Certificates: Submit certified test data on dynamic insertion loss; self-noise power levels; and airflow performance data, static-pressure loss, dimensions, and weights.

1.4 QUALITY ASSURANCE

A. NFPA Compliance: Comply with the following NFPA standards:

1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."
2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

1.5 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

1. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

A. Galvanized, Sheet Steel: Lock-forming quality; ASTM A 653/A 653M, G90 (Z275) coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.

B. Carbon-Steel Sheets: ASTM A 366/A 366M, cold-rolled sheets, commercial quality, with oiled, exposed matte finish.

C. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

D. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for 36-inch (900-mm) length or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.2 BACKDRAFT DAMPERS

A. Description: Suitable for horizontal or vertical installations.

B. Frame: 0.052-inch- (1.3-mm-) thick, galvanized, sheet steel, with welded corners and mounting flange.

C. Blades: 0.025-inch- (0.6-mm-) thick, roll-formed aluminum.

D. Blade Seals: Vinyl.

E. Blade Axles: Galvanized steel.

F. Tie Bars and Brackets: Galvanized steel.

G. Return Spring: Adjustable tension.

2.3 MANUAL-VOLUME DAMPERS

A. General: Factory fabricated with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.

B. Standard Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, standard leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.

1. Steel Frames: Hat-shaped, galvanized, sheet steel channels, minimum of 0.064 inch (1.62 mm) thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls; and flangeless frames where indicated for installing in ducts.
2. Roll-Formed Steel Blades: 0.064-inch- (1.62-mm-) thick, galvanized, sheet steel.
3. Blade Axles: Galvanized steel.
4. Tie Bars and Brackets: Galvanized steel.

C. Jackshaft: 1-inch- (25-mm-) diameter, galvanized steel pipe rotating within a pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.

1. Length and Number of Mountings: Appropriate to connect linkage of each damper of a multiple-damper assembly.

D. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch- (2.4-mm-) thick zinc-plated steel, and a 3/4-inch (19-mm) hexagon locking nut. Include center hole to suit damper operating-rod size. Include elevated platform for insulated duct mounting.

2.4 FIRE DAMPERS

A. General: Labeled to UL 555.

B. Fire Rating: One and one-half hours.

C. Fire Rating: One and one-half hours.

D. Frame: SMACNA Type B with blades out of airstream; fabricated with roll-formed, 0.034-inch- (0.85-mm-) thick galvanized steel; with mitered and interlocking corners.

E. Mounting Sleeve: Factory- or field-installed galvanized, sheet steel.

1. Minimum Thickness: 0.052 inch (1.3 mm) or 0.138 inch (3.5 mm) thick as indicated, and length to suit application.
2. Exceptions: Omit sleeve where damper frame width permits direct attachment of perimeter mounting angles on each side of wall or floor, and thickness of damper frame complies with sleeve requirements.

F. Mounting Orientation: Vertical or horizontal as indicated.

G. Blades: Roll-formed, interlocking, 0.034-inch- (0.85-mm-) thick, galvanized, sheet steel. In place of interlocking blades, use full-length, 0.034-inch- (0.85-mm-) thick, galvanized steel blade connectors.

H. Horizontal Dampers: Include a blade lock and stainless-steel negator closure spring.

I. Fusible Link: Replaceable, 165 deg F (74 deg C) rated as indicated.

2.5 TURNING VANES

A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

B. Acoustic Turning Vanes: Fabricate of airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

2.6 DUCT-MOUNTED ACCESS DOORS AND PANELS

A. General: Fabricate doors and panels airtight and suitable for duct pressure class.

B. Frame: Galvanized, sheet steel, with bend-over tabs and foam gaskets.

C. Door: Double-wall, galvanized, sheet metal construction with insulation fill and thickness, and number of hinges and locks as indicated for duct pressure class. Include vision panel where indicated. Include 1-by-1-inch (25-by-25-mm) butt or piano hinge and cam latches.

D. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.

E. Insulation: 1-inch- (25-mm-) thick, fibrous-glass or polystyrene-foam board.

2.7 FLEXIBLE CONNECTORS

A. General: Flame-retarded or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.

B. Standard Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-1/2 inches (89 mm) wide attached to two strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized, sheet steel or 0.032-inch (0.8-mm) aluminum sheets. Select metal compatible with connected ducts.

C. Extra-Wide Metal-Edged Connectors: Factory fabricated with a strip of fabric 5-3/4 inches (146 mm) wide attached to two strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized, sheet steel or 0.032-inch (0.8-mm) aluminum sheets. Select metal compatible with connected ducts.

D. Transverse Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-1/2 inches (89 mm) wide attached to two strips of 4-3/8-inch- (111-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized, sheet steel or 0.032-inch (0.8-mm) aluminum sheets. Select metal compatible with connected ducts.

E. Conventional, Indoor System Flexible Connector Fabric: Glass fabric double coated with polychloroprene.

1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).
2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp, and 360 lbf/inch (63 N/mm) in the filling.

F. Conventional, Outdoor System Flexible Connector Fabric: Glass fabric double coated with a synthetic-rubber, weatherproof coating resistant to the sun's ultraviolet rays and ozone environment.

1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).
2. Tensile Strength: 530 lbf/inch (93 N/mm) in the warp, and 440 lbf/inch (77 N/mm) in the filling.

2.8 FLEXIBLE DUCTS

A. General: Comply with UL 181, Class 1.

B. Flexible Ducts, Insulated: Factory-fabricated, insulated, round duct, with an outer jacket enclosing 1-1/2-inch- (38-mm-) thick, glass-fiber insulation around a continuous inner liner.

1. Reinforcement: Steel-wire helix encapsulated in inner liner.
2. Outer Jacket: Polyethylene film.
3. Inner Liner: Polyethylene film.

C. Pressure Rating: 6-inch wg (1500 Pa) positive, 1/2-inch wg (125 Pa) negative.

2.9 ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments, and length to suit duct insulation thickness.

B. Splitter Damper Accessories: Zinc-plated damper blade bracket; 1/4-inch (6-mm), zinc-plated operating rod; and a duct-mounted, ball-joint bracket with flat rubber gasket and square-head set screw.

C. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes 3 to 18 inches (75 to 450 mm) to suit duct size.

D. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details shown in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts and NAIMA's "Fibrous Glass Duct Construction Standards" for fibrous-glass ducts.

B. Install volume dampers in lined duct; avoid damage to and erosion of duct liner.

C. Provide test holes at fan inlet and outlet and elsewhere as indicated.

D. Install fire and smoke dampers according to manufacturer's UL-approved written instructions.

1. Install fusible links in fire dampers.

E. Install duct access panels for access to both sides of duct coils. Install duct access panels downstream from volume dampers, fire dampers, turning vanes, and equipment.

1. Install duct access panels to allow access to interior of ducts for cleaning, inspecting, adjusting, and maintaining accessories and terminal units.
2. Install access panels on side of duct where adequate clearance is available.

F. Label access doors according to Division 15 Section "Mechanical Identification."

3.2 ADJUSTING

A. Adjust duct accessories for proper settings.

B. Adjust fire dampers for proper action.

C. Final positioning of manual-volume dampers is specified in Division 15 Section "Testing, Adjusting, and Balancing."

END OF SECTION

SECTION 15837
CENTRIFUGAL FANS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes centrifugal fans and vent sets.

1.3 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base air ratings on actual site elevations.

B. Operating Limits: Classify according to AMCA standards.

1.4 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each unit scheduled and include the following:

1. Certified fan performance curves with system operating conditions indicated.
2. Certified fan sound-power ratings.
3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
4. Material gages and finishes, including color charts.
5. Dampers, including housings, linkages, and operators.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.

C. Maintenance Data: For centrifugal fans to include in maintenance manuals specified in Division 1.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.

C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver fans as factory-assembled units, to the extent allowable by shipping limitations, with protective crating and covering.

B. Disassemble and reassemble units, as required for moving to the final location, according to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

1.7 COORDINATION

A. Coordinate size and location of structural support members and/or shaft locations.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 7.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Belts: One set for each belt-driven unit.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cook, Loren Company.
2. Greenheck.

2.2 HOUSINGS

A. Roof Mounted Centrifugal Exhaust Fan.
1. The fan shall be of bolted and welded construction utilizing corrosion resistant fasteners. The spun aluminum structural components shall be constructed of minimum 16 gauge marine alloy aluminum, bolted to a rigid aluminum support structure. The aluminum base shall have continuously welded curb cap corners for maximum leak protection. The discharge baffle shall have a rolled bead for added strength. An integral conduit chase shall be provided through the curb cap and into the motor compartment to facilitate wiring connections. Bearings and drives shall be mounted on a minimum 14 gauge steel power assembly, isolated from the unit structure with rubber vibration isolators. These components shall be enclosed in a weather-tight compartment, separated from the exhaust airstream. Unit shall bear an engraved aluminum nameplate and shall be shipped in ISTA certified transit tested packaging.

2.3 WHEELS

A. Roof Mounted Centrifugal Exhaust Fan
   1. Wheel shall be centrifugal backward inclined, constructed of 100% aluminum, including a precision machined cast aluminum hub. Wheel inlet shall overlap an aerodynamic aluminum inlet cone to provide maximum performance and efficiency. Wheel shall be balanced in accordance with AMCA Standard 204-96, Balance Quality and Vibration Levels for Fans.

2.4 SHAFTS

A. Statically and dynamically balanced and selected for continuous operation at maximum rated fan speed and motor horsepower, with final alignment and belt adjustment made after installation.

B. Turned, ground, and polished hot-rolled steel with keyway. Ship with a protective coating of lubricating oil.

C. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.

2.5 BEARINGS

A. Prelubricated and Sealed Shaft Bearings: Self-aligning, pillow-block-type ball bearings.

   1. Ball-Bearing Rating Life: ABMA 9, L_{50} of 200,000 hours.
   2. Roller-Bearing Rating Life: ABMA 11, L_{50} of 200,000 hours.

2.6 BELT DRIVES

A. Description: Factory mounted, with final alignment and belt adjustment made after installation.

   1. Service Factor Based on Fan Motor: 1.5.

B. Fan Pulleys: Cast iron or cast steel with split, tapered bushing; dynamically balanced at factory.

C. Motor Pulleys: Adjustable pitch for use with motors through 5 hp; fixed pitch for use with motors larger than 5 hp. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.

D. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.

E. Motor Mount: Adjustable for belt tensioning.

2.7 ACCESSORIES

A. Scroll Access Doors: Shaped to conform to scroll, with quick-opening latches and gaskets.

B. Companion Flanges: Galvanized steel, for duct connections.

C. Scroll Drain Connection: NPS 1 (DN 25) steel pipe coupling welded to low point of fan scroll.

D. Shaft Cooler: Metal disk between bearings and fan wheel, designed to dissipate heat from shaft.

E. Spark-Resistant Construction: AMCA 99 (where required).

F. Shaft Seals: Airtight seals installed around shaft on drive side of single-width fans.

G. Weather Cover: Enameled-steel sheet with ventilation slots, bolted to housing.

2.8 MOTORS

A. Refer to Division 15 Section "Motors" for general requirements for factory-installed motors.

B. Motor Construction: NEMA MG 1, general purpose, continuous duty, high efficiency, Design B.

C. Enclosure Type: [Open dripproof] [Totally enclosed, fan cooled].

2.9 SOURCE QUALITY CONTROL

A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install centrifugal fans level and plumb.

B. Install units with clearances for service and maintenance.

C. Label fans according to requirements specified in Division 15 Section "Mechanical Identification."

3.2 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 15 Section "Duct Accessories."

B. Install ducts adjacent to fans to allow service and maintenance.

C. Ground equipment.

D. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

A. Equipment Startup Checks:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Verify lubrication for bearings and other moving parts.

B. Starting Procedures:

1. Energize motor and adjust fan to indicated rpm.
2. Measure and record motor voltage and amperage.

C. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.

D. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Shut unit down and reconnect automatic temperature-control operators.

F. Refer to Division 15 Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing procedures.

G. Replace fan and motor pulleys as required to achieve design airflow.

H. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Lubricate bearings.

3.5 CLEANING

A. On completion of installation, internally clean fans according to manufacturer's written instructions. Remove foreign material and construction debris. Vacuum fan wheel and cabinet.

B. After completing system installation, including outlet fitting and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain centrifugal fans.

1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.

2. Review data in maintenance manuals. Refer to Division 1 Section "Closeout Procedures."
3. Schedule training with Owner, through Architect, with at least seven days' advance notice.

END OF SECTION

SECTION 15855
DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes ceiling- and wall-mounted diffusers, registers, and grilles.

B. Related Sections include the following:

1. Division 10 Sections for fixed and adjustable louvers and wall vents, whether or not they are connected to ducts.
2. Division 15 Section "Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.
3. Division 15 Section "Testing, Adjusting, and Balancing" for balancing diffusers, registers, and grilles.

1.3 DEFINITIONS

A. Diffuser: Circular, square, or rectangular air distribution outlet, generally located in the ceiling and comprised of deflecting members discharging supply air in various directions and planes and arranged to promote mixing of primary air with secondary room air.

B. Grille: A louvered or perforated covering for an opening in an air passage, which can be located in a sidewall, ceiling, or floor.

C. Register: A combination grille and damper assembly over an air opening.

1.4 SUBMITTALS

A. Product Data: For each model indicated, include the following:

1. Data Sheet: For each type of air outlet and inlet, and accessory furnished; indicate construction, finish, and mounting details.
2. Performance Data: Include throw and drop, static-pressure drop, and noise ratings for each type of air outlet and inlet.
3. Schedule of diffusers, registers, and grilles indicating drawing designation, room location, quantity, model number, size, and accessories furnished.
4. Assembly Drawing: For each type of air outlet and inlet; indicate materials and methods of assembly of components.

B. Coordination Drawings: Reflected ceiling plans and wall elevations drawn to scale to show locations and coordination of diffusers, registers, and grilles with other items installed in ceilings and walls.

1.5 QUALITY ASSURANCE

A. NFPA Compliance: Install diffusers, registers, and grilles according to NFPA 90A, "Standard for the Installation of Air-Conditioning and Ventilating Systems."

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Diffusers, registers, and grilles are scheduled on Drawings.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Titus.
2. Price

2.2 SOURCE QUALITY CONTROL

A. Testing: Test performance according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb, according to manufacturer's written instructions, Coordination Drawings, original design, and referenced standards.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. . Coordinate device locations with ceiling grid, sprinklers, and lights. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connection to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

3.4 CLEANING

A. After installation of diffusers, registers, and grilles, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace diffusers, registers, and grilles that have damaged finishes.

END OF SECTION

SECTION 15990

TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes testing, adjusting, and balancing HVAC systems to produce design objectives, including the following:

1. Balancing airflow within distribution systems, including submains, branches, and terminals, to indicated quantities according to specified tolerances.
2. Adjusting total HVAC systems to provide indicated quantities.
3. Measuring electrical performance of HVAC equipment.
4. Setting quantitative performance of HVAC equipment.
5. Verifying that automatic control devices are functioning properly.
6. Reporting results of the activities and procedures specified in this Section.

B. Related Sections include the following:

1. Testing and adjusting requirements unique to particular systems and equipment are included in the Sections that specify those systems and equipment.
2. Field quality-control testing to verify that workmanship quality for system and equipment installation is specified in system and equipment Sections.

1.3 DEFINITIONS

A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.

B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to design quantities.

C. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.

D. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.

E. Report Forms: Test data sheets for recording test data in logical order.

F. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.

G. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.

H. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

I. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.

J. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.

K. Test: A procedure to determine quantitative performance of a system or equipment.

L. Testing, Adjusting, and Balancing Agent: The entity responsible for performing and reporting the testing, adjusting, and balancing procedures.

M. AABC: Associated Air Balance Council.

N. CTI: Cooling Tower Institute.

O. NEBB: National Environmental Balancing Bureau.

P. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

1.4 SUBMITTALS

A. Quality-Assurance Submittals: Within 30 days from the Contractor's Notice to Proceed, submit 2 copies of evidence that the testing, adjusting, and balancing Agent and this Project's testing, adjusting, and balancing team members meet the qualifications specified in the "Quality Assurance" Article below.

B. Certified Testing, Adjusting, and Balancing Reports: Submit 2 copies of reports prepared, as specified in this Section, on approved forms certified by the testing, adjusting, and balancing Agent.

C. Warranty: Submit 2 copies of special warranty specified in the "Warranty" Article below.

1.5 QUALITY ASSURANCE

A. Agent Qualifications for larger projects: Engage a testing, adjusting, and balancing agent certified by AABC.

B. Agent Qualifications for smaller projects: Engage a testing, adjusting, and balancing agent certified by NEBB.

C. Certification of Testing, Adjusting, and Balancing Reports: Certify the testing, adjusting, and balancing field data reports. This certification includes the following:

1. Review field data reports to validate accuracy of data and to prepare certified testing, adjusting, and balancing reports.
2. Certify that the testing, adjusting, and balancing team complied with the approved testing, adjusting, and balancing plan and the procedures specified and referenced in this Specification.

D. Testing, Adjusting, and Balancing Reports: Use standard forms from AABC's "National Standards for Testing, Adjusting, and Balancing."

E. Testing, Adjusting, and Balancing Reports: Use standard forms from NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."

F. Instrumentation Type, Quantity, and Accuracy: As described in AABC national standards.

G. Instrumentation Type, Quantity, and Accuracy: As described in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."

H. Instrumentation Calibration: Calibrate instruments at least every 6 months or more frequently if required by the instrument manufacturer.

1.6 PROJECT CONDITIONS

A. Partial Owner Occupancy: The Owner may occupy completed areas of the building before Substantial Completion. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations.

1.7 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist testing, adjusting, and balancing activities.

B. Notice: Provide 7 days' advance notice for each test. Include scheduled test dates and times.

C. Perform testing, adjusting, and balancing after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

1.8 WARRANTY

A. General Warranty: The national project performance guarantee specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Contract Documents to become familiar with project requirements and to discover conditions in systems' designs that may preclude proper testing, adjusting, and balancing of systems and equipment.

1. Contract Documents are defined in the General and Supplementary Conditions of the Contract.
2. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract

Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

B. Examine approved submittal data of HVAC systems and equipment.

C. Examine project record documents described in Division 1.

D. Examine Architect's and Engineer's design data, including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine equipment performance data, including fan and pump curves. Relate performance data to project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce the performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.

F. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Specification Sections have been performed.

G. Examine system and equipment test reports.

H. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

I. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

J. Examine air-handling equipment to ensure clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

K. Examine terminal units, such as variable-air-volume boxes and mixing boxes, to verify that they are accessible and their controls are connected and functioning.

L. Examine equipment for installation and for properly operating safety interlocks and controls.

M. Examine automatic temperature system components to verify the following:

1. Dampers, valves, and other controlled devices operate by the intended controller.
2. Dampers and valves are in the position indicated by the controller.
3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multizone units, mixing boxes, and variable-air-volume terminals.
4. Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.
5. Sensors are located to sense only the intended conditions.
6. Sequence of operation for control modes is according to the Contract Documents.
7. Controller set points are set at design values. Observe and record system reactions to changes in conditions. Record default set points if different from design values.
8. Interlocked systems are operating.
9. Changeover from heating to cooling mode occurs according to design values.

N. Report deficiencies discovered before and during performance of testing, adjusting, and balancing procedures.

3.2 PREPARATION

A. Complete system readiness checks and prepare system readiness reports. Verify the following:

1. Permanent electrical power wiring is complete.
2. Automatic temperature-control systems are operational.
3. Equipment and duct access doors are securely closed.
4. Balance, fire dampers are open.
5. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
6. Windows and doors can be closed so design conditions for system operations can be met.

3.3 GENERAL TESTING AND BALANCING PROCEDURES

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC national standards and this Section.

B. Perform testing and balancing procedures on each system according to the procedures contained in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.

C. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to the insulation Specifications for this Project.

D. Mark equipment settings with paint or other suitable, permanent identification material, including damper-control positions, valve indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

3.4 FUNDAMENTAL AIR SYSTEMS' BALANCING PROCEDURES

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Check the airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check condensate drains for proper connections and functioning.

J. Check for proper sealing of air-handling unit components.

3.5 CONSTANT-VOLUME AIR SYSTEMS' BALANCING PROCEDURES

A. The procedures in this Article apply to constant-volume supply-, return-, and exhaust-air systems.

B. Adjust fans to deliver total design airflows within the maximum allowable rpm listed by the fan manufacturer.

1. Measure fan static pressures to determine actual static pressure as follows:

   a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
   b. Measure static pressure directly at the fan outlet or through the flexible connection.
   c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.

2. Measure static pressure across each air-handling unit component.

   a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.

3. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.
4. Adjust fan speed higher or lower than design with the approval of the Architect. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.
5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure no overload will occur. Measure amperage in full cooling, full heating, and economizer modes to determine the maximum required brake horsepower.

C. Adjust volume dampers for main duct, submain ducts, and major branch ducts to design airflows within specified tolerances.

1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.

   a. Where sufficient space in submains and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submains and branch ducts to design airflows within specified tolerances.

D. Measure terminal outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or the outlet manufacturer's written instructions and calculating factors.

E. Adjust terminal outlets and inlets for each space to design airflows within specified tolerances of design values. Make adjustments using volume dampers rather than extractors and the dampers at the air terminals.

1. Adjust each outlet in the same room or space to within specified tolerances of design quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer, model, and serial numbers.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating if high-efficiency motor.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass for the controller to prove proper operation. Record observations, including controller manufacturer, model and serial numbers, and nameplate data.

3.7 CONDENSING UNITS

A. Verify proper rotation of fans and measure entering- and leaving-air temperatures. Record compressor data.

3.8 HEAT-TRANSFER COILS

A. Electric-Heating Coils: Measure the following data for each coil:

1. Nameplate data.
2. Airflow.
3. Entering- and leaving-air temperatures at full load.
4. Voltage and amperage input of each phase at full load and at each incremental stage.
5. Calculated kW at full load.
6. Fuse or circuit-breaker rating for overload protection.

3.9 TEMPERATURE TESTING

A. During testing, adjusting, and balancing, report need for adjustment in temperature regulation within the automatic temperature-control system.

B. Measure outside-air, wet- and dry-bulb temperatures.

3.10 TEMPERATURE-CONTROL VERIFICATION

A. Verify that controllers are calibrated and commissioned.

B. Check transmitter and controller locations and note conditions that would adversely affect control functions.

C. Record controller settings and note variances between set points and actual measurements.

D. Verify operation of limiting controllers (i.e., high- and low-temperature controllers).

E. Verify free travel and proper operation of control devices such as damper and valve operators.

F. Verify sequence of operation of control devices. Note air pressures and device positions and correlate with airflow and water-flow measurements. Note the speed of response to input changes.

G. Confirm interaction of electrically operated switch transducers.

H. Confirm interaction of interlock and lockout systems.

I. Verify main control supply-air pressure and observe compressor and dryer operations.

J. Record voltages of power supply and controller output. Determine if the system operates on a grounded or nongrounded power supply.

K. Note operation of electric actuators using spring return for proper fail-safe operations.

3.11 TOLERANCES

A. Set HVAC system airflow and water flow rates within the following tolerances:

1. Supply and Exhaust Fans: Plus 5 to plus 10 percent.
2. Air Outlets and Inlets: 0 to minus 10 percent.
3. Cooling-Water Flow Rate: 0 to minus 5 percent.

3.12 FINAL REPORT

A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in 3-ring binder, tabulated and divided into sections by tested and balanced systems.

B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.

1. Include a list of the instruments used for procedures, along with proof of calibration.

C. Final Report Contents: In addition to the certified field report data, include the following:
1. Fan curves.
2. Manufacturers' test data.
3. Field test reports prepared by system and equipment installers.
4. Other information relative to equipment performance, but do not include approved Shop Drawings and Product Data.

D. General Report Data: In addition to the form titles and entries, include the following data in the final report, as applicable:

1. Title page.
2. Name and address of testing, adjusting, and balancing Agent.

3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of testing, adjusting, and balancing Agent who certifies the report.
10. Summary of contents, including the following:

    a. Design versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

11. Nomenclature sheets for each item of equipment.
12. Data for terminal units, including manufacturer, type size, and fittings.
13. Notes to explain why certain final data in the body of reports vary from design values.
14. Test conditions for fans and pump performance forms, including the following:

    a. Settings for outside-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings, including settings and percentage of maximum pitch diameter.
    f. Settings for supply-air, static-pressure controller.
    g. Other system operating conditions that affect performance.

E. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present with single-line diagrams and include the following:

1. Quantities of outside, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.

F. Roof Top Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data: Include the following:

    a. Unit identification.
    b. Location.
    c. Make and type.
    d. Model number and unit size.
    e. Manufacturer's serial number.
    f. Unit arrangement and class.
    g. Discharge arrangement.
    h. Sheave make, size in inches (mm), and bore.
    i. Number of belts, make, and size.
    j. Number of filters, type, and size.

2. Motor Data: Include the following:

    a. Make and frame type and size.
    b. Horsepower and rpm.

c. Volts, phase, and hertz.
d. Full-load amperage and service factor.

3. Test Data: Include design and actual values for the following:

a. Total airflow rate in cfm (L/s).
b. Total system static pressure in inches wg (Pa).
c. Fan rpm.
d. Discharge static pressure in inches wg (Pa).
e. Preheat coil static-pressure differential in inches wg (Pa).
f. Cooling coil static-pressure differential in inches wg (Pa).
g. Heating coil static-pressure differential in inches wg (Pa).
h. Outside airflow in cfm (L/s).
i. Return airflow in cfm (L/s).
j. Outside-air damper position.
k. Return-air damper position.
l. Discharge air temperature

G. Electric-Coil Test Reports: For electric duct coils, and electric coils installed in central-station air-handling units, include the following:

1. Unit Data: Include the following:

a. System identification.
b. Location.
c. Coil identification.
d. Capacity in Btuh (kW).
e. Number of stages.
f. Connected volts, phase, and hertz.
g. Rated amperage.
h. Discharge air temperature

2. Test Data: Include design and actual values for the following:

a. Heat output in Btuh (kW).
b. Airflow rate in cfm (L/s).
c. Air velocity in fpm (m/s).
d. Entering-air temperature in deg F (deg C).
e. Leaving-air temperature in deg F (deg C).
f. Voltage at each connection.
g. Amperage for each phase.

H. Fan Test Reports: For exhaust fans, include the following:

1. Fan Data: Include the following:

a. System identification.
b. Location.
c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.

2. Motor Data: Include the following:

a. Make and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Number of belts, make, and size.

3. Test Data: Include design and actual values for the following:

a. Total airflow rate in cfm (L/s).
b. Total system static pressure in inches wg (Pa).
c. Fan rpm.
d. Discharge static pressure in inches wg (Pa).
e. Suction static pressure in inches wg (Pa).

I. Condenser Reports: For refrigerant side of unitary systems, stand-alone refrigerant compressors, air-cooled condensing units, include the following:

1. Unit Data: Include the following:

a. Unit identification.
b. Location.
c. Unit make and model number.
d. Manufacturer's compressor serial numbers.
e. Compressor make.
f. Compressor model and serial numbers.
g. Refrigerant weight in lb (kg).

2. Test Data: Include design and actual values for the following:
a. Entering-air, dry-bulb temperature in deg F (deg C).
b. Leaving-air, dry-bulb temperature in deg F (deg C).
c. Control settings.
d. Unloader set points.
e. Low-pressure-cutout set point in psig (kPa).
f. High-pressure-cutout set point in psig (kPa).
g. Suction pressure in psig (kPa).
h. Suction temperature in deg F (deg C).
i. Condenser refrigerant pressure in psig (kPa).
j. Condenser refrigerant temperature in deg F (deg C).
k. Oil pressure in psig (kPa).
l. Oil temperature in deg F (deg C).
m. Voltage at each connection.
n. Amperage for each phase.
o. The kW input.
p. Number of fans.

3.13 ADDITIONAL TESTS

A. Within 90 days of completing testing, adjusting, and balancing, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

END OF SECTION

DIVISION 16010
SUMMARY OF ELECTRICAL WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections and other Division 15 Specification Sections, apply to this Section.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. The following Summary of Work is intended as an aid to achieve an understanding of the various elements of work included in the project, as is not intended to be all-inclusive. Detailed descriptions of work and requirements are given in drawings and specifications.

B. General Scope of Work:

1. Providing new panels, feeders, conduits, electrical meter, disconnect, fire alarm, rough-in for telephone and data system and new light fixtures.

1.4 COORDINATION

A. All electrical work shall be done under sub-contract to a General Contractor. Electrical Contractor shall coordinate all work through General Contractor, even in areas where only electrical work is to take place.

B. Work shall take place with minimal disruption to Owner's operations in areas surrounding the new building.

C. Cooperate fully with other contractors so that work under those contracts may be carried out smoothly, without interfering with or delaying work under this Contract.

D. Fully coordinate with mechanical contractor for providing power to mechanical equipment.

1.5 UTILITIES

1. Coordinate with power company and provide conduit, and trenching from transformer to power source. Coordinate with water, telephone, cable and gas utilities to locate all utilities prior to digging in any area.
2. Obtain any approvals required from utilities to relocate utilities.
3. Cost of relocating or bypassing utilities indicated on drawings shall be included in Base Bid.

1.6 CONTRACTOR USE OF PREMISES

A. Use of the Site: Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.

1. Owner Occupancy: Allow for Owner occupancy and use by the public.
2. Driveways and Entrances: Keep driveways and entrances serving the premises, clear and available to the Owner, the Owner's employees, and emergency vehicles at all time. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

B. Site Safety: Take every precaution to ensure the site does not present a threat to the safety of occupants and/or workers. Minimal safety requirements include, but are not limited to the following:

1. Temporary fencing around construction areas.
2. Yellow caution tape and construction barricades along open trenches during the day. Trenches shall be covered at night and warning lights provided on construction barricades.
3. Temporary fencing around equipment while site work is in progress.

1.7 SUBMITTALS

1. To extradite the submittal process more efficiently, do not piece-meal the submittals. Submit entire electrical in a bound enclosure. This will eliminate delays in the submittal process. Unbound submittals shall be returned without review. Submit 10 copies minimum.

END OF SECTION

DIVISION 16020
BASIC ELECTRICAL REQUIREMENTS

PART 1 – GENERAL

1.1 RELATED REQUIREMENTS

A. The General Provisions, Supplemental General Provisions, Special Provisions, Division 1 Specification Sections and all relevant documents shall form a part of this Division of the Specifications, and shall be incorporated in this Section and each Division 16 Section hereinafter as if repeated verbatim herein. All conditions imposed by these documents shall be applicable to all portions of the work under this Division. Certain specific paragraphs of said references may be referred to hereinafter in this Division. These references are intended to point out specific items to the Contractor, but in no way relieve him of the responsibility of reading and complying with all relevant parts of the entire Specification.

B. The Contractor shall examine and coordinate with all Contract Drawings and Specifications, and all Addenda issued. Failure to comply shall not relieve him of responsibility. The omission of details of other portions of the work from this Division shall not be used as a basis for a request for additional compensation.

C. The specific features and details for other portions of the work related to the construction in progress or to the adjacent building shall be determined by examination at the site.

1.2 SCOPE OF WORK

A. The requirements contained in this Section apply to all work performed under Division 16 of these Specifications.

B. The work covered by this Division of the Specifications comprises the furnishing of labor, material, equipment, transportation, tools and services, and performing operations required for, and reasonably incidental to, the installation of the work in accordance with the applicable Contract Documents, and subject to the terms and conditions of the Contract.

C. Refer to other Divisions of the Specifications for related work.

1.3 DEFINITION OF "CONTRACTOR"

A. Where the word "Contractor" is used under any Section of this Division of the Specifications, it shall mean the Contractor engaged to execute the work included under that Section, even though this Contractor may be technically described as a Subcontractor, or an authorized representative.

B. If the Contractor, engaged to execute a portion of the work, employs a Subcontractor to perform some of that work, he shall be completely responsible for the proper execution of this Subcontractor's work, in full conformity with the Contract Documents.

1.4 RESPONSIBILITY OF THE CONTRACTOR

A. The Contractor shall be responsible for all work of every description in connection with this Division of the Specifications. The Contractor shall specifically and distinctly assume, and does so assume, all risk for damage or injury from whatever cause to property or person used or employed on or in connection with this work and of all damages or injury to any person or property wherever located, resulting from an action or operation under the Contract in connection with the work, and undertake the responsibility to defend the Owner against all claims on account of any such damage or injury.

B. The Contractor will be held responsible for the satisfactory execution and completion of the work in accordance with the true intent of the Contract Documents. The Contractor shall provide without extra charge all incidental items required as part of the work, even though it may not be specifically indicated. If the Contractor has reason for objecting to the use of any material, equipment, device or method of construction as indicated, the Contractor shall make report of such objections to the Owner's Representative, obtain proper approval and adjustment to the Contract, and shall proceed with the work.

1.5 TERMINOLOGY

A. Whenever the words "furnish", "provide", "furnish and install", "provide and install", and similar phrases occur, it is the intent that the materials, equipment and devices described be furnished, installed and connected under this Division, complete for operation, unless specifically noted to the contrary.

B. It is also the intent, unless specifically noted to the contrary, that all materials, equipment and

devices described and specified under this Division of the Specifications be similarly furnished, installed and connected under this Division, whether or not a phrase as described in the preceding paragraph has been actually included.

C. Whenever the words "Owner's Representative" occurs, it is intended to refer to the Architect, Engineer and/or specific Owner's Representative responsible for or capable of providing the necessary direction pertaining to the referenced issue.

1.6 ORDINANCES, PERMITS AND CODES

A. It shall be the Contractor's duty to perform the work and provide the materials covered by these specifications in conformance with all ordinances and regulations of all authorities having jurisdiction.

B. All work herein shall conform to all applicable laws, ordinances and regulations of the local utility companies.

C. The Contractor shall obtain and pay for all permit and connection fees as required for the complete installation of the specified systems, equipment, devices and materials.

D. The Contractor shall obtain permits, plan checks, inspections and approvals applicable to the work as required by the regulatory authorities. Fees and costs of any nature whatsoever incidental to these permits, inspections and approvals shall be assumed and paid by the Contractor. The pro-rata costs, if any, for utilities serving this property will be paid for by the Owner and shall not be included as part of this Contract.

E. The work shall be in accordance with, but shall not be limited to, the requirements of:

1 National Fire Protection Association
2 National Electrical Code
3 National Safety Code
4 State of Texas Safety Code
5. Local City Building Codes
6. State of Texas Building Codes

F. Codes and standards referred to are minimum standards. Where the requirements of the Drawings or Specifications exceed those of the codes and regulations, the Drawings and Specifications govern.

1.7 MATERIALS, EQUIPMENT AND DEVICE DESCRIPTION

A. Materials, equipment and devices shall be of the best quality customarily applied in quality commercial practice, and shall be the products of reputable manufacturers. Each major component shall bear a nameplate giving the name and address of the manufacturer, and the catalog number or designation of the component.

B. Materials, equipment and devices furnished under this Division of the Specifications shall be essentially the standard product of the specified manufacturer, or where allowed, an alternate manufacturer. Where two or more units of the same kind or class of a specific item are required, these shall be the products of a single manufacturer; however, the component parts of the item need not be the products of one manufacturer.

C. In describing the various materials, equipment and devices, in general each item will be described singularly, even though there may be a multiplicity of identical items. Also, where the description is only general in nature, exact sizes, duties, space arrangements, horsepower requirements and other data shall be determined by reference to the Contract Documents.

D. Space allocations for materials, equipment and devices have been made on the basis of present and known future requirements and the dimensions of items of equipment or devices of a particular manufacturer whether indicated or not. The Contractor shall verify that all materials, equipment and devices proposed for use on this project are within the constraints of the allocated space.

1.8 QUALITY ASSURANCE

A. Materials, equipment and devices shall be new and of the quality specified, and shall be free from defects at the time of installation. Materials, equipment and devices damaged in shipment or otherwise damaged or found defective prior to acceptance by the Owner shall not be repaired at the job site, but shall be replaced with new materials, equipment or devices identical with those damaged, unless specifically approved otherwise by the Owner's Representative.

B. Wherever a UL standard has been established for a particular type of material, equipment or

device, each item of such material, equipment or device provided on this project shall meet the requirements of the UL standard in every way, and shall be UL listed and labeled.

1.9 REFERENCE STANDARDS

A. Materials, equipment, devices and workmanship shall comply with applicable local, county, state and national codes, laws and ordinances, utility company regulations and industry standards.

B. In case of differences between building codes, state laws, local ordinances, industry standards, utility company regulations and the Contract Documents, the most stringent shall govern. The Contractor shall promptly notify the Owner's Representative in writing of any such difference. Should the Contractor perform any work that does not comply with local codes, laws and ordinances, industry standards or other governing regulations, the work shall be corrected of noncompliance deficiencies with the Contractor bearing all costs.

C. In addition to the aforementioned ordinances, industry standards published by the following organizations shall apply:

AABM - American Association of Battery Manufacturers
ADA - American's with Disabilities Act
AIA - American Institute of Architects
ANSI - American National Standards Institute
ASTM - American Society for Testing and Materials
CBM - Certified Ballast Manufacturers Association
ETL - Electrical Testing Laboratories
FM - Factory Mutual
ICEA - Insulated Cable Engineers Associated
IEEE - Institute of Electrical and Electronic Engineers
IES - Illuminating Engineering Society
IRI - Industrial Risk Insurance
NBS - National Bureau of Standards
NEC - National Electrical Code
NECA - National Electrical Contractors Association
NEMA - National Electrical Manufacturers Association
NESC - National Electrical Safety Code
NETA - National Electrical Testing Association
NFPA - National Fire Protection Association
UL - Underwriters Laboratories

1.10 DRAWINGS AND SPECIFICATIONS

A. The interrelation of the Drawings (including the schedules) and the Specifications are as follows:

1 The Drawings establish quantities, locations, dimensions and details of materials, equipment and devices. The schedules on the Drawings indicate the capacities, characteristics and components.

2 The Specifications provide written requirements for the quality, standard and nature of the materials, equipment, devices and construction systems.

B. The Drawings and Specifications shall be considered as being compatible; therefore, the work called for by one and not by the other shall be furnished and installed as though called for by both. Resolution of conflicts between Drawings and Specifications shall be as follows:

1 If the Drawings and Specifications disagree in themselves, or with each other, the Contractor's pricing shall be based on furnishing and installing the most expensive combination of quality and quantity of work indicated for a complete operable system. Contractor is responsible to notifying the Architect and Engineer. In the event of this type of disagreement, the resolution shall be determined by the Owner's Representative. The contractor shall assume for an operable system at the most expensive combination as per the latest National Electrical Code. The contractor shall review all drawings and specifications prior to bid date.

2 The Contractor shall be responsible for bringing any conflicts in the Drawings and the

Specifications to the attention of the Owner's Representative immediately, prior to bid date.

3 In general, if there is conflict between the Drawings and Specifications, the Drawings shall govern the Specifications.

4 Where the Specifications do not fully agree with schedules on the Drawings, the schedules shall govern. Actual numerical dimensions indicated on the Drawings govern scale measurements and large scale details govern small scale drawings.

5 Materials, equipment and devices called for on the Drawings and not indicated herein, shall be completely provided and installed as though it were fully described herein.

6 Materials, equipment and devices called for herein shall be completely provided and installed, whether or not it is fully detailed, scheduled or indicated on the Drawings.

C. The Contractor shall examine the Drawings and Specifications of the other portions of the work for fixtures and finishes in connection with this work. The Contractor shall carefully examine the Drawings to determine the general construction conditions, and shall familiarize himself with all limitations caused by such conditions.

D. When discrepancies exist between scale and dimension, or between the Drawings of the various portions of the work, they shall be called to the attention of the Owner's Representative for further instruction, whose instructions shall be final and binding and work promptly resumed without any additional cost to the Owner.

E. Review the construction details of the building(s) as illustrated on the Drawings of the other portions of the work, i.e., architectural, structural, civil, landscape, etc., and be guided thereby. Route conduits and set all boxes as required by the pace of the general construction.

F. The Drawings diagrammatically show the sizes and locations of the various equipment and devices, and the sizes of the major interconnecting wires, without showing exact details as to elevations, offsets, control wiring and other installation requirements. Carefully layout the work at the site to conform to the architectural and structural conditions, to avoid obstructions and to permit proper grading of pipe associated with other portions of the work. In cooperation with other Contractors, determine the exact location of equipment and devices and connections thereto by reference to the submittals and rough-in drawings, and by measurements at the site. Make minor relocations necessitated by the conditions at the site, or directed by the Owner's Representative, without additional cost to the Owner.

G. The Drawings and Specifications are intended to describe and illustrate systems which will not interfere with the structure of the building(s), fit into the available spaces, and insure complete and satisfactory operating installations. Prepare installation drawings as required for all critical areas illustrating the installation of the work in this Division as related to the work of all other Divisions and correct all interferences with the other portions of the work or with the building structures before the work proceeds.

H. The Drawings do not indicate the existing electrical installations other than to identify modifications or extensions thereto. Visit the site and ascertain the conditions to be met and the work to be accomplished in removing and modifying the existing work, and in installing the new work. Failure to comply with this shall not constitute grounds for any additional payment in connection with removing or modifying any part of the existing installation or installing any new or temporary work under this Division.

1.11 SUBMITTALS

A. Submit product data and shop drawings in accordance with Division 1 of the Specifications.

B. Process product data and shop drawings to insure that the proposed materials, equipment and devices conform to the requirements of the Contract Documents, and that there are no omissions or duplications. Provide layouts, fabrication information and data for systems, materials, equipment and devices proposed for the project.

C. Submittals shall be provided for review and approval on all systems, equipment, devices and materials proposed for use on this project. Submittals shall include, but not be limited to, the following:

1 Lighting and Appliance Panelboards

2 Disconnect Switches

3 Circuit Breakers and Fuses

4 Materials: conduit, conductors, connectors, supports, etc.
5 Lighting Fixtures, Lamps and Control Systems/Devices
6 Wiring Devices
7 Transformers
8 Distribution Panelboards
9 Motor Control Center
10 As indicated on each submittal section

D. The product data shall not consist of manufacturer's catalogs or cut sheets that contain no indication of the exact item offered. The submission on individual items shall designate the exact item offered.

E. Do not submit detailed quantitative listings of materials, equipment and devices. It is the Contractor's responsibility to provide proper sizes and quantities to conform to Contract Documents.

F. Assemble submittals on related items procured from a single manufacturer in bound brochures or other suitable package form, rather than submitting a multiplicity of loose sheets.

G. Prepare shop drawings whenever equipment proposed varies in physical size and arrangement from that indicated thus causing rearrangement of equipment space, where tight spaces require extreme coordination between this work and other work, where called for elsewhere in these Specifications and where specifically requested by the Owner's Representative. Shop drawings shall be prepared at a scale of not less than 1/4 inch equals 1 foot.

H. The Contractor shall sign the submittal as an indication of compliance with the Contract Documents. If there are any deviations from the Contract Documents, he shall so indicate on the submittal. Any deviations not so indicated shall be cause for rejection and removal of the non-complying equipment at the Contractor's expense.

1.12 SUBSTITUTIONS

A. Where a single manufacturer is mentioned by trade name or manufacturer's name, unless specifically noted otherwise, it is the only manufacturer that will be accepted.

B. Where multiple manufacturers are listed, none other than those manufacturers will be accepted.

C. Manufacturers not listed will be considered for substitution prior to bid only. The substitute manufacturer shall submit a complete copy of the appropriate technical specification section minimum seven (7) business days prior to bid with each sub-paragraph noted with the comment, "compliance", "deviation", "alternate" or "not applicable". In the case of non-primary, vendor-supplied items, the name of the sub-vendor supplying said item, including model number, shall be indicated.

1 By noting the term "compliance" or "C", it shall be understood that the manufacturer is in full compliance with the item specified and will provide exactly the same with no deviations.

2 By noting the term "deviation" or "D", it shall be understood that the manufacturer prefers to provide a different component in lieu of that specified. Manufacturer shall indicate all deviations.

3 By noting the term "alternate" or "A", it shall be understood that the manufacturer proposes to provide the same operating function but prefers to do it in a different manner. An alternate shall be fully described as to what the manufacturer proposes to provide.

4 By noting the term "not applicable" or "N/A", it shall be understood that the specified item is not applicable to the project.

D. It shall be understood that space allocations have been made on the basis of present and known future requirements and the dimensions of items of equipment or devices of a particular manufacturer whether indicated or not. If any item of equipment or device is offered in substitution which differs substantially in dimension or configuration from that indicated on the Drawings or specifications, provide as part of the submittal 1/4 inch equals 1 foot scaled drawings showing that the substitute can be installed in the space available without interfering with other portions of the work or with access for operations and maintenance in the completed project.

E. Where substitute equipment or devices requiring different arrangement or connections from that

indicated is accepted by the Owner's Representative, install the equipment or devices to operate properly and in harmony with the intent of the Contract Documents, making all incidental changes in piping, ductwork or wiring resulting from the equipment or device selection without any additional cost to the Owner. The Contractor shall pay all additional costs incurred by other portions of the work in connection with the substituted equipment or device.

F. The Owner's Representative reserves the right to call for samples of any item of material, equipment or device offered in substitution, together with a sample of the specific item when, in their opinion, the quality of the item and/or the appearance is involved, and it is deemed that an evaluation of the item may be better made by visual inspection.

G. When any request for a substitution of material, equipment or device is submitted and rejected, the item named in the Contract Documents shall be furnished. Repetitive submittal of substitutions for the same item will not be considered.

1.13 INSTALLATION DRAWINGS

A. Prepare installation drawings for coordinating the work of this Division with the work of other Divisions, to illustrate its concealment in finished spaces, to avoid obstructions, and to demonstrate the adaptability of any item of material, equipment or device in the space upon which the Contract Documents are based.

B. Use these drawings in the field for the actual installation of this work. Provide three (3) copies, not for approval, to the Owner's Representative for his information, review and record.

1.14 WORKMANSHIP AND INSTALLATION

A. In no case shall the Contractor provide a class of material, equipment, device or workmanship less than that required by the Contract Documents or applicable codes, regulations, ordinances or standards. All modifications which may be required by a local authority having legal jurisdiction over all or any part of the work shall be made by the Contractor without any additional charge. In all cases where such authority requires deviations from the requirements of the Drawings or Specifications, the Contractor shall report same to the Owner's Representative and shall secure his approval before the work is started.

B. The work shall be performed by properly licensed technicians skilled in their respective trades. All materials, equipment and devices shall be installed in accordance with the recommendations of the manufacturer and in the best standard practice to bring about results of a first class condition.

C. The NECA "Standards of Installation" as published by the National Electrical Contractors Association shall be considered a part of these Specifications, except as specifically modified by other provisions contained in these Specifications.

1.15 INSPECTION OF SITE

A. The accompanying drawings do not indicate existing installations other than to identify modifications of and extensions thereto. The Contractor shall visit the site, inspect the installations and ascertain the conditions to be met and the work to be performed. Failure to comply with this shall not constitute ground for any additional payments in connection with removing or modifying any part of the existing installations and/or installing any new work under this Division.

B. Review construction details of the adjacent building presently under construction during the site inspection and include all work required to modify the existing installations and install new materials, comprising a part of the installation. Review all construction details of the new building as illustrated on the drawings and be guided thereby.

1.16 WARRANTY

A. All materials, equipment, devices and workmanship shall be warranted for a period of one year from the date of acceptance by the Owner's Representative for beneficial use by the Owner, except that where specific equipment is noted to have extended warranties. The warranty shall be in accordance with AIA Document A201. The Contractor shall be responsible for the proper registration of these warranties so that the Owner can make all proper claims should future need develop.

B. The Contractor shall furnish to the Owner's Representative for transmittal to the Owner, the name, address and telephone number of those persons responsible for service on systems and equipment covered by the warranty.

1.17 OPERATION PRIOR TO ACCEPTANCE

A. When any equipment is operable, and it is to the advantage of the Contractor to operate the equipment, the Contractor may do so provided that he properly supervises the operation, and retains full responsibility for the equipment operated. Regardless of whether or not the equipment has or has not been operated, the Contractor shall clean the equipment properly, make required adjustments and complete punch list items before final acceptance by the Owner.

1.18 INSTRUCTION OF OWNER'S PERSONNEL

A. Provide the services of competent engineers and/or technicians acceptable to the Owner's Representative to instruct other representatives of the Owner in the complete and detailed operation of each item of equipment or device of all the various electrical systems. These instructions shall be provided for whatever periods may be necessary to accomplish the desired results. Upon completion of these instructions, the Contractor shall obtain a letter of release, acknowledged by the Owner or his authorized representative, stating the dates on which the various kinds of instruction were given, and the personnel to whom the instructions were given.

B. The Contractor shall be fully responsible for proper maintenance of equipment and systems until the instructions have been given to the Owner's personnel and the letter of release acknowledged.

C. In providing the instructions to the Owner's personnel, the written operating and maintenance manuals shall be followed in all instances, and the Owner's personnel shall be familiarized with such manuals. Operating and maintenance manuals used for instructions shall include wiring diagrams, manufacturer's operating and maintenance instructions, parts lists (with sources identified), and other data as appropriate for each system.

1.19 SCHEDULE AND SEQUENCE OF WORK

A. The Contractor shall meet and cooperate with the Owner and Owner's Representative to schedule and sequence this work so as to insure meeting scheduled completion dates and avoid delaying other portions of the work. Work requiring special sequencing shall be at no additional cost to the Owner and shall have no impact on the schedule.

1.20 INSTALLATION INSPECTIONS AND CERTIFICATIONS

A. Obtain timely inspections of the installation by the regulatory authorities. Remedy any deficiencies to the satisfaction of the inspecting official.

B. Upon final completion of the work, obtain certificates of acceptance from the regulatory authorities. Deliver the certificates to the Owner's Representative for transmission to the Owner.

1.21 EQUIPMENT INSTALLATION

A. Install equipment and devices in a manner to permit access to all surfaces or components, requiring such access, without the need to disassemble other unrelated parts of the work.

B. Equipment specified to be factory assembled and tested prior to shipment shall not be disassembled at the job site and reassembled at its final location. Apparatus not so specified may be disassembled and reassembled in the proper location.

C. Furnish all scaffolding, rigging and hoisting required for the installation of all the work.

1.22 CONCRETE HOUSEKEEPING PADS

A. Concrete housekeeping pads shall be provided for all floor mounted equipment, unless noted or required otherwise.

B. All pads shall be not less than 3-1/2" high and extend a maximum 3" beyond the actual equipment size. Coordinate the proper size of the pad with the equipment furnished. Pads shall be poured in forms built of new dressed lumber with corners chamfered using sheet metal or triangular wood strips nailed to the form. Use 6 x 6 No. 3 mesh for reinforcing. Install heavy duty adjustable anchor bolts, set in the form and positioned using templates, prior to pouring concrete. After the equipment is set on the pad, the equipment shall be aligned, leveled and fully grouted to the pad and all void spaces shall be filled with a non-shrinking grout.

C. Perform all concrete work specified to be provided under this Division in strict accordance with the applicable provisions of Division 3, CONCRETE.

1.23 SLEEVES

A. Each conduit, regardless of material, which passes through a concrete slab, masonry wall, or roof or portion of the building structure shall be free from the structure and shall pass through a sleeve.

B. All sleeves shall be constructed from electrical-metallic tubing or equivalent weight galvanized

steel tubing and shall be flush on both sides of the surface penetrated, unless noted otherwise. All sleeves penetrating the roof areas shall extend a minimum 10 inches above the roof with approved weatherproof counterflashing attached to the conduit above the roof. All sleeves penetrating floors shall extend a minimum of 6 inches above the finished floors. The sleeves shall be sized to allow free passage of the conduit to be inserted.

C. Sleeves passing through walls or floors on or below grade or in moist areas shall be constructed of galvanized rigid steel and shall be designed with a suitable flange in the center to form a waterproof passage. After the conduit has been installed in the sleeves, the void space around the conduit shall be caulked and filled with an asphalt-base compound to insure a waterproof penetration. Jute twine caulking shall not be used due to susceptibility to termite infestation.

1.24 ESCUTCHEONS

A. In each finished space, provided a chromium plated, sectional escutcheon on each conduit, or hanger rod penetrating a wall, floor or ceiling.

B. Size escutcheons and collars to fit snugly around conduit and rods.

C. Where required, provide escutcheons with set screws so that they fit snugly against the finished surface.

1.25 ACCESS PANELS

A. Provide wall and ceiling access panels for unrestricted access to all concealed electrical equipment items and devices installed behind furrings, chases or non-removable suspended ceilings.

B. Access panels shall be UL listed and labeled as required to suit the fire rating of the surface in which installed, with mounting straps, concealed hinges, screwdriver locks, 180 degree open door design, 16 gauge steel construction and door and frame finished in prime coat finish. Panels shall be 12-inch by 12-inch minimum size, but shall be larger as the access requirement of the concealed electrical equipment item or device increases.

1.26 SEALING OF PENETRATIONS

A. All penetrations in horizontal or vertical fire-rated construction shall be sealed using approved fire-rated sealing materials equivalent to the following:

1 Foam: Dow Corning 3-6548 RTV silicone foam, liquid component Part 4 (black) and liquid component Part B (off-white).

2 Sealant: Dow Corning 96-081 RTV silicone adhesive sealant.

3 Damming Materials: Mineral fiberboard, mineral fiber matting, mineral fiber putty, plywood or particle board, as selected by applicator.

B. Preparation: Remove combustible materials and loose impediments from penetration opening and involved surfaces. Remove free liquid and oil from penetration surfaces.

C. Installation: In accordance with manufacturer's instructions, install damming materials and sealant to cover and seal penetration openings; inject foam mixtures into openings.

D. In addition to the Dow Corning products, equal products by Spec Seal Firestop Products, 3M Fire Barrier or CS240 Firestop are acceptable.

1.27 PROTECTION OF APPARATUS

A. At all times take every precaution to properly protect apparatus from damage due to dust, dirt, water, etc. or from damage due to physical forces. Include the erection of temporary shelters as required, to adequately protect any apparatus stored at the site, the cribbing of any apparatus directly above the construction, and the covering of apparatus in the incomplete building with tarpaulins or other protective covering. Failure on the part of the Contractor to comply with the above to the entire satisfaction of the Owner's Representative will be sufficient cause for the rejection of the pieces of apparatus in question.

B. Responsibility for the protection of apparatus extend also to existing apparatus involved in this Division of the work, whether such apparatus is designated to be used temporarily and later removed, or is to be reused as a part of the permanent installation. Erect temporary sheltering structures, provide temporary bracing and supports, or cover equipment as required or directed to afford proper protection for that equipment.

C. The Contractor shall protect this work and the work of all other Contractors from damage by his work or workmen and shall make good any damage thus caused. He shall also be responsible for the proper protection of his equipment, machinery, materials and accessories delivered and installed on the job.

1.28 INSTALLATION OF CONTROL AND OPERATING DEVICES

A. The highest operable part of controls (light switches, dimmer switches, emergency power off devices, etc.), receptacles (electrical and communications) and other operable devices shall be 48" above finish floor. The lowest operable part shall be no less than 15" above finished floor. For purposes of uniformity, unless noted otherwise, the top of a device shall be maximum 48" AFF and the bottom of a device shall be minimum 15" AFF. Refer to the electrical symbols list on the Drawings for specific requirements.

B. Visual alarm appliances shall be placed 80" above finished floor (the highest floor level within a space) or 6" below the ceiling, whichever is lower.

1.29 INSTALLATION AND CONNECTION OF OTHER DIVISION'S EQUIPMENT

A. Verify the electrical requirements of all equipment furnished under other Divisions, separate contracts, or by the Owner. Install conduit, power wiring, control wiring, devices, etc. as required for complete operation of all equipment.

1.30 OPTION TO RELOCATE OUTLETS AND RELATED DEVICES

A. The location of power, data and telephone outlets, wall switches and other related devices may be relocated at the Owner's option, at no additional cost to the Owner, to a point within 10 feet of their present location provided the Contractor is notified prior to installation.

1.31 COOPERATION AND CLEAN-UP

A. It shall be the responsibility of the Contractor to cooperate fully to keep the job site in a clean and safe condition. Upon the completion of the job, the Contractor shall immediately remove all of his tools, equipment, surplus materials and debris.

B. After the installation is complete, and before the equipment is energized, clean the interior and exterior of all equipment thoroughly. Clean equipment, removing all debris, rubbish and foreign materials. Each component shall be cleaned and all dust and other foreign material removed. Components shall be cleaned of oxidation. The inside and outside of all switchgear shall also be wiped clean with a lemon-oil rag after all other cleaning is complete.

C. Any portion of the work requiring touch-up finishing shall be so finished to equal the specified finish on the product.

1.32 RECORD DRAWINGS AND DOCUMENTATION FOR OWNER

A. The Contractor shall obtain at his own expense a complete set of blueline prints on which to keep an accurate record of the installation of all materials, equipment and devices covered by the Contract. The Contractor shall record up to date information at least once a week and retain the set of prints on site for periodic review by the Architect/Engineer. The record drawings shall indicate the location of all equipment and devices, and the routing of all systems. If the Contractor prepared large scale installation drawings of electrical rooms, conduit routing, busduct, routing, etc., these drawings or reproducible sepias therefrom shall be revised as required to accurately illustrate the actual installation. All conduit buried in concrete slabs, walls and below grade shall be located by dimension; both horizontally and by vertical elevation, unless a surface mounted device in each space indicates the exact location.

B. Upon anticipated completion of the job, obtain one complete reproducible set of the original drawings on which to neatly, legibly and accurately transfer all project related notations and deliver these record drawings to the Architect/Engineer at job completion before final payment and delivery to the Owner. This information shall be delivered prior to final acceptance.

C. The Contractor shall accumulate in duplicate during the job progress, the following data prepared in indexed 3-ring looseleaf, hard-back binders sized for 8-1/2 inch by 11 inch sheets. No binder shall exceed 3-1/2 inches thick. This data shall be turned over to the Owner's Representative for review and subsequent delivery to the Owner prior to final acceptance.

1. Warranties, guarantees and manufacturer's directions on material, equipment and devices covered by the Contract.
2. Approved lighting fixture brochures, wiring diagrams and control diagrams.
3. Copies of approved submittals and shop drawings.
4. Operating instructions and recommended maintenance procedures for major apparatus.
5. Copies of all other data and/or drawings required during construction.
6. Repair parts list of major apparatus, including name, address and telephone number of local supplier or representative.

7 Tag charts and diagrams hereinbefore specified.

1.33 FINAL OBSERVATION

A. The purpose of the final observation is to determine whether the Contractor has completed the construction in accordance with the Contract Documents and that in the Owner Representative's opinion the installation is satisfactory for final acceptance by the Owner.

B. It shall be the responsibility of the Contractor to assure that the installation is ready for final acceptance prior to calling upon the Owner's Representative to make a final observation.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

DIVISION 16050
BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Raceways.
   2. Building wire and connectors.
   3. Supporting devices for electrical components.
   4. Electrical identification.
   5. Electricity-metering components.
   6. Concrete equipment bases.
   7. Electrical demolition.
   8. Cutting and patching for electrical construction.
   9. Touchup painting.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.
B. FMC: Flexible metal conduit.
C. IMC: Intermediate metal conduit.
D. LFMC: Liquidtight flexible metal conduit.
E. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

A. Product Data: For electricity-metering equipment.
B. Shop Drawings: Dimensioned plans and sections or elevation layouts of electricity-metering equipment.
C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
B. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.
   1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.
B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.
C. Coordinate electrical service connections to components furnished by utility companies.
   1. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for electricity-metering components.
   2. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.
D. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces. Access doors and panels are specified in Division 8 Section "Access Doors."
E. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.
F. Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.

PART 2 - PRODUCTS

2.1 EQUIPMENT FOR UTILITY COMPANY'S ELECTRICITY METERING

A. Current-Transformer Cabinets: Comply with requirements of electrical power utility company.
B. Meter Sockets: Comply with requirements of electrical power utility company.

2.2 CONCRETE BASES

A. Concrete Forms and Reinforcement Materials: As specified in Division 3 Section "Cast-in-Place Concrete."

B. Concrete: 3000-psi (20.7-MPa), 28-day compressive strength as specified in Division 3 Section "Cast-in-Place Concrete."

2.3 TOUCHUP PAINT

A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.

B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.

B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

D. Right of Way: Give to raceways and piping systems installed at a required slope.

3.2 RACEWAY AND CABLE INSTALLATION

A. Conceal raceways and cables, unless otherwise indicated, within finished walls, ceilings, and floors.

B. Install raceways and cables at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Locate horizontal raceway runs above water and steam piping.

C. Use temporary raceway caps to prevent foreign matter from entering.

D. Make conduit bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.

E. Use raceway and cable fittings compatible with raceways and cables and suitable for use and location.

F. Install raceways embedded in slabs in middle third of slab thickness where practical, and leave at least 1-inch (25-mm) concrete cover.

1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
2. Space raceways laterally to prevent voids in concrete.
3. Install conduit larger than 1-inch trade size (DN27) parallel to or at right angles to main reinforcement. Where conduit is at right angles to reinforcement, place conduit close to slab support.
4. Transition from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor.
5. Make bends in exposed parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for exposed parallel raceways.

G. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of the pull wire.

H. Install telephone and signal system raceways, 2-inch trade size (DN53) and smaller, in maximum lengths of 150 feet (45 m) and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements, in addition to requirements above.

I. Connect motors and equipment subject to vibration, noise transmission, or movement with a maximum of 72-inch (1830-mm) flexible conduit. Install LFMC in wet or damp locations. Install separate ground conductor across flexible connections.

J. Set floor boxes level and trim after installation to fit flush to finished floor surface.

3.3 ELECTRICAL SUPPORTING DEVICE APPLICATION

A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.

B. Dry Locations: Steel materials.

C. Support Clamps for PVC Raceways: Click-type clamp system.

D. Selection of Supports: Comply with manufacturer's written instructions.

E. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb (90-kg) design load.

3.4 SUPPORT INSTALLATION

A. Install support devices to securely and permanently fasten and support electrical components.

B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.

C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

D. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.

E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.

F. Install 1/4-inch- (6-mm-) diameter or larger threaded steel hanger rods, unless otherwise indicated.

G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2-inch (38-mm) and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.

H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.

I. Simultaneously install vertical conductor supports with conductors.

J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches (610 mm) from the box.

K. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.

L. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

M. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:

1. Wood: Fasten with wood screws or screw-type nails.
2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
3. New Concrete: Concrete inserts with machine screws and bolts.
4. Existing Concrete: Expansion bolts.
5. Instead of expansion bolts, threaded studs driven by a powder charge and provided with lock washers may be used in existing concrete.
6. Steel: Welded threaded studs or spring-tension clamps on steel.
   a. Field Welding: Comply with AWS D1.1.
7. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
8. Light Steel: Sheet-metal screws.
9. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.5 IDENTIFICATION MATERIALS AND DEVICES

A. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.

C. Self-Adhesive Identification Products: Clean surfaces before applying.

D. Identify raceways and cables with color banding as follows:

1. Bands: Pretensioned, snap-around, colored plastic sleeves or colored adhesive marking tape. Make each color band 2 inches (51 mm) wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side.
2. Band Locations: At changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (8-m) maximum intervals in congested areas.
3. Colors: As follows:
   a. Fire Alarm System: Red.

b. Security System: Blue and yellow.
c. Telecommunication System: Green and yellow.

E. Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.

F. Install continuous underground plastic markers during trench backfilling, for exterior underground power, control, signal, and communication lines located directly above power and communication lines. Locate 6 to 8 inches (150 to 200 mm) below finished grade. If width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches (400 mm), overall, use a single line marker.

G. Color-code 208/120-V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:
1. Phase A: Black.
2. Phase B: Red.
3. Phase C: Blue.
4. Neutral: White.
5. Ground: Green.

H. Color-code 480/277-V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:
1. Phase A: BROWN.
2. Phase B: ORANGE.
3. Phase C: YELLOW.
4. Neutral: White with a colored stripe or gray.
5. Ground: Green.

I. Install warning, caution, and instruction signs where required to comply with 29 CFR, Chapter XVII, Part 1910.145, and where needed to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.

J. Install engraved-laminated emergency-operating signs with white letters on red background with minimum 3/8-inch- (9-mm-) high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

3.6 UTILITY COMPANY ELECTRICITY-METERING EQUIPMENT

A. Install equipment according to utility company's written requirements. Provide grounding and empty conduits as required by utility company.

3.7 FIRESTOPPING

A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly. Firestopping materials and installation requirements are specified in Division 7 Section "Firestopping."

3.8 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger, in both directions, than supported unit. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

3.9 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.10 FIELD QUALITY CONTROL

A. Inspect installed components for damage and faulty work, including the following:
1. Raceways.
2. Building wire and connectors.
3. Supporting devices for electrical components.
4. Electrical identification.

5. Electricity-metering components.
6. Concrete bases.
7. Electrical demolition.
8. Cutting and patching for electrical construction.
9. Touchup painting.

B. Test Owner's electricity-metering installation for proper operation, accuracy, and usability of output data.
1. Connect a load of known kW rating, 1.5 kW minimum, to a circuit supplied by the metered feeder.
2. Turn off circuits supplied by the metered feeder and secure them in the "off" condition.
3. Run the test load continuously for eight hours, minimum, or longer to obtain a measurable meter indication. Use a test load placement and setting that ensure continuous, safe operation.
4. Check and record meter reading at end of test period and compare with actual electricity used based on test load rating, duration of test, and sample measurements of supply voltage at the test load connection. Record test results.
5. Repair or replace malfunctioning metering equipment or correct test setup; then retest. Repeat for each meter in installation until proper operation of entire system is verified.

3.11 REFINISHING AND TOUCHUP PAINTING

A. Refinish and touch up paint. Paint materials and application requirements are specified in Division 9 Section "Painting."
1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.12 CLEANING AND PROTECTION

A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.

B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 16055
SITE ELECTRICAL

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

A. The General Provisions, Supplemental General Provisions, Special Provisions and Division 1 Specification sections, apply to work covered by this Section.

1.2 SCOPE OF WORK

A. Provide labor, materials, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing of all site electrical work.

B. The site electrical work shall include, but not be limited to, the furnishing and installation of necessary materials and making arrangements for:

1. The connection of electrical and telephone utilities.
2. Underground conduit.

1.3 SUBMITTALS

A. Submit product data and shop drawings in accordance with Division 1 for products specified under PARTS 2 PRODUCTS.

1.4 REFERENCE STANDARDS

A. National Electrical Code (NEC), Article 300

B. Service installation standards of the serving utility company(s).

PART 2 PRODUCTS

2.1 ELECTRICAL SERVICE

A. Coordination: The location of the service entrance shall be coordinated with all other trades. Provide materials and equipment required to connect the electrical service. Contractor shall coordinate with the Power Company for all requirements prior to bid date. Contractor shall include all cost to for Utility Company to extend service to project site bid.

B. Materials: Provide materials in accordance with other Sections of these Specifications.

2.2 COMMUNICATION SERVICE

A. Coordination: The location of the telephone, cable, and internet service entrance shall be coordinated with all other trades. Provide materials and equipment required to connect the telephone, cable and internet services. Contractor shall coordinate with the Telephone , cable, and internet company for all requirements prior to bid date. Contractor is responsible to coordinate with utility companies.

B. Materials: Provide materials in accordance with other sections of this specification.

PART 3 EXECUTION

3.1 GENERAL

A. Underground installation of more than one conduit shall be in a duct arrangement as indicated. All conduits shall be laid so joints are staggered. All bends and stub-ups shall be rigid steel.

B. Pour a red colored concrete envelope 3" thick over utility service, emergency generator and fire pump conduits. Where conduits cross a driveway, road or parking area, reinforcing rods shall be installed.

C. Perform excavation, shoring, backfilling and concrete work in connection with electrical work in accordance with other Divisions of the Specifications.

D. All conduit shall be sloped away from the building to negate water entering the building through the conduit system.

3.2 UTILITIES

A. The locations, elevations and voltage of electrical lines and the location of the telephone lines included within the area of this work are indicated on the Drawings or in the Specifications in accordance with information received by the Architect/Engineer and Owner.

B. The Contractor shall examine the site and shall verify, to his own satisfaction, the location and elevation of all utilities, and shall adequately inform himself as to their relation to the work.

C. Existing utility lines not indicated but encountered during construction shall be protected, relocated or capped as directed by the Architect/Engineer. All precautions shall be exercised to prevent damage to existing lines not shown, but should work become necessary, it must be authorized prior to execution except in an emergency situation.

D. Before beginning excavations of any nature whatsoever, the Contractor shall make an attempt to locate all underground utilities of every nature occurring within the bounds of the area to be excavated. The

Contractor shall then proceed with caution in his excavation work so that no utility shall be damaged with a resultant loss of service.

E. Should a damage result to any utility through the Contractor's negligence or failure to comply with the above directive, he shall be liable for such damage and for all expense incurred in the expeditious repair or replacement of such damaged utilities.

F. Repair of damaged utilities shall be to a condition equal to or better than the adjacent undamaged portion of such utility and to the complete satisfaction of the Architect/Engineer and Owner.

END OF SECTION

DIVISION 16060
GROUNDING AND BONDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes grounding and bonding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

B. Related Sections include the following:

1. Division 2 Section "Underground Ducts and Utility Structures" for ground test wells.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Data: For the following:

1. Ground rods.
2. Chemical rods.

C. Qualification Data: For firms and persons specified in "Quality Assurance" Article.

D. Field Test Reports: Submit written test reports to include the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1. Comply with UL 467.

B. Comply with NFPA 70; for overhead-line construction and medium-voltage underground construction, comply with IEEE C2.

C. Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Grounding Conductors, Cables, Connectors, and Rods:
   a. Apache Grounding/Erico Inc.
   b. Boggs, Inc.
   c. Chance/Hubbell.
   d. Copperweld Corp.
   e. Dossert Corp.
   f. Erico Inc.; Electrical Products Group.
   g. Framatome Connectors/Burndy Electrical.
   h. Galvan Industries, Inc.
   i. Hastings Fiber Glass Products, Inc.
   j. Ideal Industries, Inc.
   k. ILSCO.
   l. Kearney/Cooper Power Systems.
   m. Korns: C. C. Korns Co.; Division of Robroy Industries.
   n. Lightning Master Corp.
   o. Lyncole XIT Grounding.
   p. O-Z/Gedney Co.; a business of the EGS Electrical Group.

q. Raco, Inc.; Division of Hubbell.
r. Robbins Lightning, Inc.
s. Salisbury: W. H. Salisbury & Co.
t. Superior Grounding Systems, Inc.
u. Thomas & Betts, Electrical.

2.2 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Division 16 Section "Conductors and Cables."
B. Material: copper.
C. Equipment Grounding Conductors: Insulated with green-colored insulation.
D. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.
E. Grounding Electrode Conductors: Stranded cable.
F. Underground Conductors: stranded, unless otherwise indicated.
G. Copper Bonding Conductors: As follows:
1. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG copper conductor, 1/4 inch (6.4 mm) in diameter.
2. Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.
3. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches (42 mm) wide and 1/16 inch (1.5 mm) thick.
4. Tinned Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches (42 mm) wide and 1/16 inch (1.5 mm) thick.
H. Ground Conductor and Conductor Protector for Wood Poles: As follows:
1. No. 4 AWG minimum, soft-drawn copper conductor.
2. Conductor Protector: Half-round PVC or wood molding. If wood, use pressure-treated fir, or cypress or cedar.
I. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

2.3 CONNECTOR PRODUCTS

A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.
B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.
C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

2.4 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel.
1. Size: 3/4 by 120 inches (19 by 3000 mm) in diameter.
B. Chemical Electrodes: Copper tube, straight or L-shaped, filled with nonhazardous chemical salts, terminated with a 4/0 bare conductor. Provide backfill material recommended by manufacturer.
C. Test Wells: Provide handholes as specified in Division 2 Section "Underground Ducts and Utility Structures."

PART 3 - EXECUTION

3.1 APPLICATION

A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.
B. In raceways, use insulated equipment grounding conductors.
C. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells.
D. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.
E. Ground Rod Clamps at Test Wells: Use bolted pressure clamps with at least two bolts.
F. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
1. Use insulated spacer; space 1 inch (25.4 mm) from wall and support from wall 6 inches (150 mm) above finished floor, unless otherwise indicated.

2. At doors, route the bus up to the top of the door frame, across the top of the doorway, and down to the specified height above the floor.

G. Underground Grounding Conductors: Use tinned copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches (600 mm) below grade or bury 12 inches (300 mm) above duct bank when installed as part of the duct bank.

3.2 EQUIPMENT GROUNDING CONDUCTORS

A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.

B. Install equipment grounding conductors in all feeders and circuits.

C. Install insulated equipment grounding conductor with circuit conductors for the following items, in addition to those required by NEC:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.

D. Busway Supply Circuits: Install insulated equipment grounding conductor from the grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.

E. Computer Outlet Circuits: Install insulated equipment grounding conductor in branch-circuit runs from computer-area power panels or power-distribution units.

F. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

G. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate equipment grounding conductor. Isolate equipment grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

H. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.

I. Air-Duct Equipment Circuits: Install an equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners and heaters. Bond conductor to each unit and to air duct.

J. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate equipment grounding conductor to each electric water heater, heat-tracing, and antifrost heating cable. Bond conductor to heater units, piping, connected equipment, and components.

K. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch (6.4-by-50-by-300-mm) grounding bus.
2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

L. Metal Poles Supporting Outdoor Lighting Fixtures: Provide a grounding electrode in addition to installing a separate equipment grounding conductor with supply branch-circuit conductors.

3.3 COUNTERPOISE

A. Ground the steel framework of the building with a driven ground rod at the base of every corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart. Provide a grounding

conductor (counterpoise), electrically connected to each ground rod and to each steel column, extending around the perimeter of the building. Use tinned-copper conductor not less than No. 2/0 AWG for counterpoise and for tap to building steel. Bury counterpoise not less than 18 inches (450 mm) below grade and 24 inches (600 mm) from building foundation.

3.4 INSTALLATION

A. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.
   1. Drive ground rods until tops are 2 inches (50 mm) below finished floor or final grade, unless otherwise indicated.
   2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make connections without exposing steel or damaging copper coating.

B. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

C. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

D. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

E. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.

F. Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters, and air cleaners. Use braided-type bonding straps.

G. Bond each aboveground portion of gas piping system upstream from equipment shutoff valve.

H. Install one test well for each service at the ground rod electrically closest to the service entrance. Set top of well flush with finished grade or floor.

I. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70, Paragraph 250-81(c), using a minimum of 20 feet (6 m) of bare copper conductor not smaller than No. 4 AWG. If concrete foundation is less than 20 feet (6 m) long, coil excess conductor within the base of the foundation. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building grounding grid or to a grounding electrode external to concrete.

3.5 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
   1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
   2. Make connections with clean, bare metal at points of contact.
   3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
   4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
   5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

D. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

E. Connections at Test Wells: Use compression-type connectors on conductors and make bolted- and clamped-type connections between conductors and ground rods.

F. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

G. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

H. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.6 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.
3. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

3.7 GRADING AND PLANTING

A. Restore surface features, including vegetation, at areas disturbed by Work of this Section. Reestablish original grades, unless otherwise indicated. If sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition. Include application of topsoil, fertilizer, lime, seed, sod, sprig, and mulch. Comply with Division 2 Section "Landscaping." Maintain restored surfaces. Restore disturbed paving as indicated.

END OF SECTION

DIVISION 16075
ELECTRICAL IDENTIFICATION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

A. The General Provisions, Supplemental General Provisions, Special Provisions and Division 1 Specification sections, apply to work covered by this Section.

B. Comply with Division 16 Sections, as applicable. Refer to other Divisions for coordination of work.

1.2 SCOPE OF WORK

A. Provide labor, material, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing of electrical identification, including related accessories.

B. Provide electrical identification for the following:

1. Panelboards, motor starters, contactors, disconnect switches, circuit breakers and other electrical equipment with nameplate identifying the item of equipment and the equipment serving the same.
2. Raceways, junction boxes and pull boxes.
1. Label each panelboard index indicating the room #s to the related circuit. Also add the index sheet in a laminated white core, plastic with beveled edges, minimum 1/16 inch thick. Lettering shall be machine-engraved, not less than 1/4" high, cut through the black or red surface to the white core.
3. Wiring devices.
4. Wiring.
5. Three phase motor rotation.

1.3 SUBMITTALS

A. Submit product data in accordance with Division 1 for products specified under PART 2 - PRODUCTS.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

B. Brady
C. Panduit
D. Thomas & Betts
E. Seton

2.2 IDENTIFICATION

A. Nameplates

1. Nameplates shall be black engraved surface on white core for normal power circuits and red engraved surface on white core for emergency power circuits.
2. Provide for each distribution panelboard, branch circuit panelboard, transformer and any other similar equipment furnished under this Division identification as to its given name, voltage and origination of service. Examples are as follows:

‘LR’ 480Y/277V FED FROM ‘MDP’	‘HD’ 480Y/277V FED FROM ‘MDP’
‘LR’ 208Y/120V FED FROM TX-R FED FROM ‘MDP’	‘TX-LR’ 75 KVA, 480V to 208Y/120V

3. Provide for each motor starter enclosure, circuit breaker enclosure, disconnect switch and any other similar equipment furnished under this Division, identification as to the specific load that it serves and the origination of service. Examples are as follows:

‘HVLS-1'
FED FROM ‘MDP'

4. Provide for each feeder protective device in each distribution panelboard and any other similar equipment furnished under this Division, identification as to the specific load that it serves.
5. Nameplates shall be laminated, white core, plastic with beveled edges, minimum 1/16 inch thick. Lettering shall be machine-engraved, not less than 1/4" high, cut through the black or red surface to the white core.

B. Junction Boxes and Pull Boxes
1. Identification shall be with a black permanent marking pen on the top of 4" x 4" junction box covers or on the back of an outlet box cover plate identifying the branch circuits and systems within the conduit. Pull boxes shall be provided with a nameplate stating voltage and system served.

C. Wiring Device Wall Plates
1. On the back side of wiring device wall plates identify with a black permanent marking pen the panelboard and branch circuit number the device is served from.

D. Wire Markers
1. Wire markers for identification of wiring shall be self-adhesive type having letters and numerals indicating serving equipment and feeder or branch circuit number.

F. Rotation Tags
1. Rotation tags shall be brass or aluminum securely attached to equipment.

PART 3 EXECUTION

3.1 PREPARATION
A. Surfaces to receive labels or nameplates shall be carefully prepared in accordance with the manufacturer's instructions and recommendations.

3.2 NAMEPLATES
A. Nameplates shall be properly attached to identify panelboards, feeder circuit breakers, disconnect switches, pull boxes and other similar equipment furnished under this Division.

3.3 WIRE MARKERS
A. Wire markers shall be applied to each conductor or cable within panelboards, motor starter enclosures, circuit breaker enclosures, disconnect switches, cabinets, junction boxes, pull boxes, and other similar equipment identifying the serving equipment and feeder or branch circuit from which the conductors originate.

END OF SECTION

SECTION 16120
BUILDING WIRE AND CABLE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.3 SUBMITTALS

A. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.4 QUALITY ASSURANCE

A. Listing and Labeling: Provide wires and cables specified in this Section that are listed and labeled.
   1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.

B. Comply with NFPA 70.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver wires and cables according to NEMA WC 26.

1.6 COORDINATION

A. Coordinate layout and installation of cables with other installations.

B. Revise locations and elevations from those indicated, as required to suit field conditions and as approved by Architect.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Wires and Cables:
      a. American Insulated Wire Corp.; Leviton Manufacturing Co.
      b. BICC Brand-Rex Company.
      c. Carol Cable Co., Inc.
      d. Senator Wire & Cable Company.
      e. Southwire Company.
   2. Connectors for Wires and Cables:
      a. AMP Incorporated.
      b. General Signal; O-Z/Gedney Unit.
      c. Monogram Co.; AFC.
      d. Square D Co.; Anderson.
      e. 3M Company; Electrical Products Division.

2.2 BUILDING WIRES AND CABLES

A. UL-listed building wires and cables with conductor material, insulation type, cable construction, and rating as specified in Part 3 "Wire and Insulation Applications" Article.

B. Rubber Insulation Material: Comply with NEMA WC 3.

C. Thermoplastic Insulation Material: Comply with NEMA WC 5.

D. Ethylene Propylene Rubber Insulation Material: Comply with NEMA WC 8.

E. Conductor Material: Copper.

F. Stranding: Solid conductor for No. 10 AWG and smaller; stranded conductor for larger than No. 10 AWG.

G. Plenum rated cable for all cables above the ceiling.

2.3 CONNECTORS AND SPLICES

A. UL-listed, factory-fabricated wiring connectors of size, ampacity rating, material, type, and class for application and service indicated. Comply with Project's installation requirements and as specified in Part 3 "Wire and Insulation Applications" Article.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine raceways and building finishes to receive wires and cables for compliance with requirements for installation tolerances and other conditions affecting performance of wires and cables. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 WIRE AND INSULATION APPLICATIONS

A. Service Entrance: Type RHW or THWN, in raceway.
B. Feeders: Type 75C insulation THHN/THWN, in raceway.
C. Fire-Pump Feeder: Type MI, 3-conductor.
D. Branch Circuits: Type THHN/THWN, in raceway.
E. Fire Alarm Circuits: Type THHN/THWN, in raceway.
F. Class 1 Control Circuits: Type THHN/THWN, in raceway.
G. Class 2 Control Circuits: Type THHN/THWN, in raceway.
H. Equipment or any device rated 100 amperes or less, conductor shall be rated 60C as per National Electrical Code.
I. Equipment or any device rated over 100 amperes, conductor shall be rated 75C as per National Electrical Code.

3.3 INSTALLATION

A. Install wires and cables as indicated, according to manufacturer's written instructions and NECA's "Standard of Installation."
B. Remove existing wires from raceway before pulling in new wires and cables.
C. Pull Conductors: Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
E. Install exposed cables, parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
F. Support cables according to Division 16 Section "Basic Electrical Materials and Methods."
G. Seal around cables penetrating fire-rated elements according to Division 7 Section "Firestopping."
H. Identify wires and cables according to Division 16 Section "Basic Electrical Materials and Methods."
I. Identify wires and cables according to Division 16 Section "Electrical Identification."

3.4 CONNECTIONS

A. Conductor Splices: Keep to minimum.
B. Install splices and tapes that possess equivalent or better mechanical strength and insulation ratings than conductors being spliced.
C. Use splice and tap connectors compatible with conductor material.
D. Use oxide inhibitor in each splice and tap connector for aluminum conductors.
E. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches (300 mm) of slack.
F. Connect outlets and components to wiring and to ground as indicated and instructed by manufacturer.
G. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 FIELD QUALITY CONTROL

A. Testing: On installation of wires and cables and before electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
   1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.
B. Correct malfunctioning conductors and cables at Project site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

END OF SECTION

DIVISION 16130
RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
   1. Raceways include the following:
      a. RMC.
      b. IMC.
      c. PVC externally coated, rigid steel conduits.
      d. PVC externally coated, IMC.
      e. EMT.
      f. FMC.
      g. LFMC.
      h. LFNC.
      i. RNC.
      j. ENT.
      k. Wireways.
      l. Surface raceways.
   2. Boxes, enclosures, and cabinets include the following:
      a. Device boxes.
      b. Floor boxes.
      c. Outlet boxes.
      d. Pull and junction boxes.
      e. Cabinets and hinged-cover enclosures.

B. Related Sections include the following:
   1. Division 16 Section "Basic Electrical Materials and Methods" for raceways and box supports.
   2. Division 16 Section "Wiring Devices" for devices installed in boxes and for floor-box service fittings.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.
B. ENT: Electrical nonmetallic tubing.
C. FMC: Flexible metal conduit.
D. IMC: Intermediate metal conduit.
E. LFMC: Liquidtight flexible metal conduit.
F. LFNC: Liquidtight flexible nonmetallic conduit.
G. RMC: Rigid metal conduit.
H. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: Include layout drawings showing components and wiring for nonstandard boxes, enclosures, and cabinets.

1.5 QUALITY ASSURANCE

A. Listing and Labeling: Provide raceways and boxes specified in this Section that are listed and labeled.
   1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.
   2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

B. Comply with NECA's "Standard of Installation."

C. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate layout and installation of raceways and boxes with other construction elements to ensure adequate headroom, working clearance, and access.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Metal Conduit and Tubing:
   a. Alflex Corp.
   b. Anamet, Inc.; Anaconda Metal Hose.
   c. Anixter Brothers, Inc.
   d. Carol Cable Co., Inc.
   e. Cole-Flex Corp.
   f. Electri-Flex Co.
   g. Flexcon, Inc.; Coleman Cable Systems, Inc.
   h. Grinnell Co.; Allied Tube and Conduit Div.
   i. Monogram Co.; AFC.
   j. Spiraduct, Inc.
   k. Triangle PWC, Inc.
   l. Wheatland Tube Co.
2. Nonmetallic Conduit and Tubing:
   a. Anamet, Inc.; Anaconda Metal Hose.
   b. Arnco Corp.
   c. Breeze-Illinois, Inc.
   d. Cantex Industries; Harsco Corp.
   e. Certainteed Corp.; Pipe & Plastics Group.
   f. Cole-Flex Corp.
   g. Condux International; Electrical Products.
   h. Electri-Flex Co.
   i. George-Ingraham Corp.
   j. Hubbell, Inc.; Raco, Inc.
   k. Lamson & Sessions; Carlon Electrical Products.
   l. R&G Sloan Manufacturing Co., Inc.
   m. Spiraduct, Inc.
   n. Thomas & Betts Corp.
3. Conduit Bodies and Fittings:
   a. American Electric; Construction Materials Group.
   b. Crouse-Hinds; Div. of Cooper Industries.
   c. Emerson Electric Co.; Appleton Electric Co.
   d. Hubbell, Inc.; Killark Electric Manufacturing Co.
   e. Lamson & Sessions; Carlon Electrical Products.
   f. O-Z/Gedney; Unit of General Signal.
   g. Scott Fetzer Co.; Adalet-PLM.
   h. Spring City Electrical Manufacturing Co.
4. Metal Wireways:
   a. Hoffman Engineering Co.
   b. Keystone/Rees, Inc.
   c. Square D Co.

2.2 METAL CONDUIT AND TUBING

A. Rigid Steel Conduit: ANSI C80.1.

B. Rigid Aluminum Conduit: ANSI C80.5.

C. IMC: ANSI C80.6.

D. EMT and Fittings: ANSI C80.3.

1. Fittings: Set-screw type.

E. Fittings: NEMA FB 1; compatible with conduit/tubing materials.

2.3 NONMETALLIC CONDUIT AND TUBING

A. RNC: NEMA TC 2, Schedule 40 or 80 PVC.

B. RNC Fittings: NEMA TC 3; match to conduit or conduit/tubing type and material.

C. LFNC: UL 1660.

2.4 METAL WIREWAYS

A. Material: Sheet metal sized and shaped as indicated.

B. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

C. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

D. Wireway Covers: Screw – cover type flanged-and-gasketed type.

E. Finish: Manufacturer's standard enamel finish.

2.5 OUTLET AND DEVICE BOXES

A. Sheet Metal Boxes: NEMA OS 1.

B. Cast-Metal Boxes: NEMA FB 1, Type FD, cast box with gasketed cover.

2.6 PULL AND JUNCTION BOXES

A. Small Sheet Metal Boxes: NEMA OS 1.

B. Cast-Metal Boxes: NEMA FB 1, cast aluminum with gasketed cover.

2.7 ENCLOSURES AND CABINETS

A. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic, finished inside with radio-frequency-resistant paint.

B. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage, and include accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to receive raceways, boxes, enclosures, and cabinets for compliance with installation tolerances and other conditions affecting performance of raceway installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 WIRING METHODS

A. Outdoors: Use the following wiring methods:

1. Exposed: Rigid steel.
2. Concealed: Rigid steel.
3. Underground, Single Run: RNC.
4. Underground, Grouped: RNC.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
6. Boxes and Enclosures: NEMA 250, Type 3R .

B. Indoors: Use the following wiring methods:

1. Exposed: EMT.
2. Concealed: EMT.
3. Underground, Single Run: RNC.
4. Underground, Grouped: RNC
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except in wet or damp locations, use LFMC.
6. Damp or Wet Locations: Rigid steel conduit.
7. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
   a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel.

3.3 INSTALLATION

A. Install raceways, boxes, enclosures, and cabinets as indicated, according to manufacturer's written instructions.

B. Minimum Raceway Size: 3/4-inch trade size (DN21).

C. Conceal conduit and EMT, unless otherwise indicated, within finished walls, ceilings, and floors.

D. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

E. Install raceways level and square and at proper elevations. Provide adequate headroom.

F. Complete raceway installation before starting conductor installation.

G. Support raceways as specified in Division 16 Section "Basic Electrical Materials and Methods."

H. Use temporary closures to prevent foreign matter from entering raceways.

I. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above the finished slab.

J. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.

K. Use raceway fittings compatible with raceways and suitable for use and location. For intermediate steel conduit, use threaded rigid steel conduit fittings, unless otherwise indicated.

L. Run concealed raceways, with a minimum of bends, in the shortest practical distance considering the type of building construction and obstructions, unless otherwise indicated.

M. Raceways Embedded in Slabs (Must be indicated on drawings to be embedded. Please notify Engineer if required but not shown): Install in middle third of slab thickness where practical, and leave at least 1-inch (25-mm) concrete cover.

1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
2. Space raceways laterally to prevent voids in concrete.
3. Run conduit larger than 1-inch trade size (DN27) parallel to or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
4. Transition from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor.

N. Install exposed raceways parallel to or at right angles to nearby surfaces or structural members, and follow the surface contours as much as practical.

1. Run parallel or banked raceways together, on common supports where practical.
2. Make bends in parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

O. Join raceways with fittings designed and approved for the purpose and make joints tight.

1. Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight.
2. Use insulating bushings to protect conductors.

P. Tighten set screws of threadless fittings with suitable tools.

Q. Terminations: Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against the box. Where terminations are not secure with 1 locknut, use 2 locknuts: 1 inside and 1 outside the box.

R. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align raceways so the coupling is square to the box and tighten the chase nipple so no threads are exposed.

S. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of the pull wire.

T. Telephone and Signal System Raceways, 4-Inch Trade Size (DN53) and Smaller: In addition to the above requirements, install raceways in maximum lengths of 150 feet (45 m) and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

U. Install raceway sealing fittings according to manufacturer's written instructions. Locate fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as the boundaries of refrigerated spaces.

2. Where otherwise required by NFPA 70.

V. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with the finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches (150 mm) above the floor. Install screwdriver-operated, threaded flush plugs flush with floor for future equipment connections.

W. Flexible Connections: Use maximum of 6 feet (1830 mm) of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use liquidtight flexible conduit in wet or damp locations. Install separate ground conductor across flexible connections.

X. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in a nonmetallic sleeve.

Y. Do not install aluminum conduits embedded in or in contact with concrete.

Z. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.

AA. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying the raceways to receptacle or fixture ground terminals.

1. Select each surface raceway outlet box, to which a lighting fixture is attached, of sufficient diameter to provide a seat for the fixture canopy.
2. Where a surface raceway is used to supply a fluorescent lighting fixture having central-stem suspension with a backplate and a canopy (with or without extension ring), no separate outlet box is required.
3. Provide surface metal raceway outlet box, and the backplate and canopy, at the feed-in location of each fluorescent lighting fixture having end-stem suspension.
4. Where a surface metal raceway extension is made from an existing outlet box on which a lighting fixture is installed, no additional surface-mounted outlet box is required. Provide a backplate slightly smaller than the fixture canopy.

BB. Set floor boxes level and adjust to finished floor surface.

CC. Set floor boxes level and trim after installation to fit flush to finished floor surface.

DD. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

EE. NO PVC CONDUIT ALLOWED ABOVE THE CEILING OR IN THE A/C RETURN PLENUM. PROVIDE RIGID CONDUIT. Verify all MEP documents.

3.4 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure coatings, finishes, and cabinets are without damage or deterioration at the time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.5 CLEANING

A. On completion of installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

END OF SECTION

DIVISION 16140
WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes receptacles, connectors, switches, and finish plates.

1.3 DEFINITIONS

A. GFI: Ground-fault circuit interrupter.
B. TVSS: Transient voltage surge suppressor.

1.4 SUBMITTALS

A. Product Data: For each product specified.
B. Shop Drawings: Legends for receptacles and switch plates.
C. Samples: For devices and device plates for color selection and evaluation of technical features.
D. Maintenance Data: For materials and products to include in maintenance manuals specified in Division 1.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
B. Comply with NEMA WD 1.
C. Comply with NFPA 70.

1.6 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.
B. Coordinate with pool contractor for special receptacles.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Wiring Devices:
a. Bryant Electric, Inc.
b. Eagle Electric Manufacturing Co., Inc.
c. GE Company; GE Wiring Devices.
d. Hubbell, Inc.; Wiring Devices Div.
e. Killark Electric Manufacturing Co.
f. Leviton Manufacturing Co., Inc.
g. Pass & Seymour/Legrand; Wiring Devices Div.
h. Pyle-National, Inc.; an Amphenol Co.

2.2 RECEPTACLES

A. Straight-Blade and Locking Receptacles: Heavy-Duty grade. The device shall be 20-ampere, 125-volts, Nema configuration 5-20R, back and side wired.
B. Special Receptacles for NEMA configuration refer to Manufacturer specs.
C. GFI Receptacles: Feed-through type, with integral NEMA WD 6, Configuration 5-20R duplex receptacle arranged to protect connected downstream receptacles on same circuit. Design units for installation in a 2-3/4-inch- (70-mm-) deep outlet box without an adapter. Device shall have an indicator light.
D. Isolated-Ground Receptacles: Equipment grounding contacts connected only to the green grounding screw terminal of the device with inherent electrical isolation from mounting strap. **Device shall be white finish with the orange symbol.**
1. Devices: Listed and labeled as isolated-ground receptacles.
2. Isolation Method: Integral to receptacle construction and not dependent on removable parts.

2.3 SWITCHES

A. General
1. Switches shall be toggle or decorative toggle type as indicated herein.. The body of the switch

shall be made of an arc-resistant thermoset material. All toggle switch handles shall be constructed of a thermoplastic material. All rocker switch handles shall be constructed of a thermoset material. All wall switches shall be of the quiet AC type.

1. Switches shall be SPST, DPST, 3-way or 4-way as indicated on the Drawings.
2. Switch color shall be white unless noted otherwise. Coordinate with Architect.

B. Specification Grade

1. Specification Grade switches shall be toggle type. The contact arms shall be made of one-piece copper alloy material. The switch shall include a green ground screw attached to the mounting strap. The switch shall be 20-ampere, 120/277-volts AC, horsepower rated, back and side-wired.

C. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on/off switches and audible and electromagnetic noise filters.

1. Control: Continuously adjustable slide, toggle, or rotary knob. Single-pole or three-way switch to suit connections.
2. Incandescent Lamp Dimmers: Modular, 120 V, 60 Hz with continuously adjustable slide with “on/off” switch; single pole with soft tap or other quiet switch; electromagnetic filter to eliminate noise, RF, and TV interference; and 5-inch (130-mm) wire connecting leads. Dimmer to be sized per circuit load.

2.4 WALL PLATES(All wall plates)

A. For all single and combination types match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: 0.04-inch- (1-mm-) thick, Type 302, satin-finished stainless steel.
3. Material for Unfinished Spaces: stainless steel.

2.5 FLOOR SERVICE FITTINGS

A. Power Receptacle: NEMA WD 6, Configuration 5-20R, gray finish, unless otherwise indicated.

B. Signal Outlet: Blank cover with bushed cable opening, unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install devices and assemblies plumb and secure.

B. Install wall plates when painting is complete.

C. Install wall dimmers to achieve indicated rating after derating for ganging as instructed by manufacturer.

D. Do not share neutral conductor on load side of dimmers.

E. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

F. Protect devices and assemblies during painting.

G. Adjust locations at which floor service outlets and telephone/power service poles are installed to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

A. Comply with Division 16 Section "Electrical Identification."

B. Comply with Division 16 Section "Basic Electrical Materials and Methods."

1. Switches: Where three or more switches are ganged, and elsewhere as indicated, identify each switch with approved legend engraved on wall plate.
2. Receptacles: Identify panelboard and circuit number from which served. Use machine-printed, pressure-sensitive, abrasion-resistant label tape on face of plate and durable wire markers or tags within outlet boxes.

3.3 CONNECTIONS

A. Connect wiring device grounding terminal to branch-circuit equipment grounding conductor.

B. Isolated-Ground Receptacles: Connect to isolated-ground conductor routed to designated isolated equipment ground terminal of electrical system.

C. Tighten electrical connectors and terminals according to manufacturers published torque-tightening values. If manufacturers torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Test wiring devices for proper polarity and ground continuity. Operate each device at least six times.

B. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.

C. Replace damaged or defective components.

3.5 CLEANING

A. Internally clean devices, device outlet boxes, and enclosures. Replace stained or improperly painted wall plates or devices.

END OF SECTION

DIVISION 16190
SUPPORTING DEVICES

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. The General Provisions, Supplemental General Provisions, Special Provisions and Division 1 Specification sections, apply to work covered by this Section.

B. Comply with Division 16 Sections, as applicable. Refer to other Division for coordination of work.

1.2 SCOPE OF WORK

A. Provide labor, material, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing of supporting devices, including related systems and accessories.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

B. Unistrut Corp.

C. B-Line Systems, Inc.

D. Midland Ross-Kindorf

2.2 MATERIALS

A. Suspension Hangers

1.1 Suspension hangers for individual conduit runs shall be zinc plated formed steel type.

B. Vertical Supports

1.1 Malleable iron one hole pipe straps shall be used for vertical runs.

C. Clamps

1.1 Beam clamps shall be used for bar joists and beams.

D. Anti-Vibration Hangers

1.1 Anti-vibration hangers shall be combination type having a double deflection neoprene element in series with a steel coil spring; double deflection of 0.30"; steel coil spring shall be selected from a 1" static deflection series with a minimum additional travel to solid of ½"; spring diameters shall be large enough to permit 15 degree angular misalignment of the rod connecting the hanger to the ceiling support without rubbing the hanger box.

2.3 Light Fixture Hangers

A. Refer to Section 16500

Corrosive Areas: PVC; at factory apply a minimum of 10-mil-thick PVC coating, bonded to metal, inside and outside.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Hangers

1 Approved hangers and stiff leg supports shall be installed in quantity and size as required to carry the weight of raceway and contents and shall be arranged to prevent vibration transmission to the building and allow for raceway movement.

2 Hangers shall be supported by means of uncoated solid steel rods which are threaded to allow vertical adjustments. Lock nuts shall be provided in sufficient number and location to lock all rod adjustments permanently at the adjusted height. Two lock nuts shall be used unless the nut tightens against a threaded socket. Minimum rod diameters shall be as follows:

NOMINAL CONDUIT SIZE	ROD DIAMETER
1/2" through 2"	1/4"
2-1/2" through 3"	3/8"
4" and 5"	1/2"

3 Hanger spacing shall be as required for proper and adequate support raceway, but in no case shall be less than one hanger per 8'-0" of raceway length except that conduit less than 1" diameter shall be supported at least every 6'-0".

4 Where numerous conduits are run parallel to one another, they may be supported from a trapeze type hanger arrangement with strut bottom.

5 Anti-vibration type hangers shall be provided for equipment as required to minimize vibration and/or as directed by the Architect/Engineer.

B. Supports

1 Support of hangers shall be by means of sufficient quantities of individual after set steel expansion shields, or beam clamps attached to structural steel.

2 Stiff-legs shall be furnished and installed in cases where support from overhead structure is not possible.

3 Ceiling mounted lighting fixtures shall be supported from the building structure at two opposite corners. The Contractor shall provide fixture hangers to properly interface with the ceiling system.

4 Furnish and install complete any additional structural support steel, brackets, fasteners, etc., as required to adequately support all raceway and equipment.

5 Support of hangers from concrete slabs shall be by means of sufficient quantity of "U" brackets attached with after set expansion shields and bolts.

6 Support of hangers from concrete tees shall be by means of sufficient quantity of angle iron brackets attached with after set expansion shields and bolts.

END OF SECTION

DIVISION 16440
DISCONNECT SWITCHES

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

A. The General Provisions, Supplemental General Provisions, Special Provisions and Division 1 Specification sections, apply to work covered by this Section.

1.2 SCOPE OF WORK

A. Provide labor, materials, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing of disconnect switches, including all related systems and accessories.

1.3 SUBMITTALS

A. Submit product data and shop drawings in accordance with Division 1 for products specified under PART 2 - PRODUCTS.

B. Provide outline drawings with dimensions, and equipment ratings for voltage, amperage, horsepower and short circuit.

C. Provide designations for each disconnect. RE: to section 16075.

1.4 REFERENCE STANDARDS

A. Switches shall be manufactured in accordance with the following standards:

1. UL 98 - Enclosed and Dead Front Switches
2. NEMA KS1 - Enclosed Switches
3. NEMA 250 - Enclosures for Electrical Equipment

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Eaton

B. Square D Co.

C. G.E

2.2 GENERAL

A. Switches shall be heavy duty type.

2.3 SWITCH INTERIOR

A. Switches shall have switch blades which are visible when the switch is OFF and the cover is open.

D. Lugs shall be copper and front removable and UL listed for 60°C or 75°C conductors 30-100 ampere, 75°C conductors 200 ampere and up.

E. Current carrying parts shall be plated to resist corrosion.

F. Switches shall have removable arc suppressor to facilitate easy access to line side lugs.

G. Switches shall have provisions for a field installable electrical interlock.

2.4 SWITCH MECHANISM

A. Switch operating mechanism shall be quick-make, quick-break such that, during normal operation of the switch, the operation of the contacts shall not be capable of being restrained by the operating handle after the closing or opening action of the contacts has started.

B. The operating handle shall be an integral part of the box, not the cover.

C. Provisions for padlocking the switch in the OFF position with at least three padlocks shall be provided.

D. The handle position shall travel at least 90° between OFF and ON positions to clearly distinguish and indicate handle position.

E. Switches shall have a dual cover interlock mechanism to prevent unintentional opening of the switch cover when the switch is ON and prevent turning the switch ON when the cover is open. The cover interlock mechanism shall have an externally operated override but the override shall not permanently disable the interlock mechanism. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.

2.5 SWITCH ENCLOSURES

A. Switch covers shall be attached with welded pin-type hinges (Type 1) or top-hinged, attached with removable screws and securable in the open position (Type 3R).

B. The enclosure shall be finished with gray baked enamel paint which is electrodeposited on cleaned, phosphate pre-treated steel (Type 1) or gray baked enamel paint which is electrodeposited on cleaned, phosphate pre-treated galvannealed steel (Type 3R).

C. The enclosure shall have ON and OFF markings stamped into the cover.
D. The operating handle shall be provided with a dual colored, red/black position indication.
E. Switches shall have provisions to accept up to three 3/8" hasp padlocks to lock the operating handle in the OFF position.
H. Tangential knockouts shall be provided to facilitate ease of conduit entry (Type 1).
I. Type 3R enclosure shall contain no knockouts. Supply watertight hubs.
J. Type 4x shall be stainless steel enclosure with no knockouts. Supply watertight hubs.

2.6 SWITCH RATINGS

A. Switches shall be horsepower rated.
B. The UL listed short circuit current rating of the switches shall be: 200,000 rms symmetrical amperes when used with or protected by Class R or Class J fuses 30-600 ampere employing appropriate fuse rejection schemes.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install disconnect switches where indicated shown or not shown.
B. Install fuses in fusible disconnect switches.

END OF SECTION

DIVISION 16442
PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes load centers and panelboards, overcurrent protective devices, and associated auxiliary equipment rated 600 V and less for the following types:
   1. Lighting and appliance branch-circuit panelboards.
   2. Distribution panelboards.

B. Related Sections include the following:
   1. Division 16 Section "Fuses."

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.
B. GFCI: Ground-fault circuit interrupter.
C. RFI: Radio-frequency interference.
D. RMS: Root mean square.
E. SPDT: Single pole, double throw.
F. TVSS: Transient voltage surge suppressor.

1.4 SUBMITTALS

A. Product Data: For each type of panelboard, overcurrent protective device, TVSS device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
B. Shop Drawings: For each panelboard and related equipment.
   1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:
      a. Enclosure types and details for types other than NEMA 250, Type 1.
      b. Bus configuration, current, and voltage ratings.
      c. Short-circuit current rating of panelboards and overcurrent protective devices.
      d. UL listing for series rating of installed devices.
      e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
   2. Wiring Diagrams: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.
C. Qualification Data: Submit data for testing agencies indicating that they comply with qualifications specified in "Quality Assurance" Article.
D. Field Test Reports: Submit written test reports and include the following:
   1. Test procedures used.
   2. Test results that comply with requirements.
   3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
E. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.
F. Maintenance Data: For panelboards and components to include in maintenance manuals specified in Division 1. In addition to requirements specified in Division 1 Section "Contract Closeout," include the following:
   1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
   2. Time-current curves, including selectable ranges for each type of overcurrent protective device.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
B. Comply with NEMA PB 1.
C. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance requirements.

1.7 EXTRA MATERIALS

A. Keys: [SIX] 6 spares of each type of panelboard cabinet lock.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:
   a. Eaton
   b. Square D Co.
   c. G.E

2.2 FABRICATION AND FEATURES

A. Enclosures: Flush- and surface-mounted cabinets. NEMA PB 1, Type 1, to meet environmental conditions at installed location.
   1. Outdoor Locations: NEMA 250, Type 3R.
   2. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
   3. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.

B. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.

C. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.

D. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.

E. Directory Card: With transparent protective cover, mounted inside metal frame, inside panelboard door.

F. Bus: Hard-drawn copper, 98 percent conductivity.

G. Main and Neutral Lugs: Copper mechanical type suitable for use with conductor material.

H. Equipment Ground Bus: Copper and adequate for feeder and branch-circuit equipment ground conductors; bonded to box.

I. Service Equipment Label: UL labeled for use as service equipment for panelboards with main service disconnect switches.

J. Isolated Equipment Ground Bus: Copper and adequate for branch-circuit equipment ground conductors; insulated from box.

K. Extra-Capacity Neutral Bus: Copper neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads.

L. Split Bus: Vertical buses divided into individual vertical sections.

M. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.

N. Gutter Barrier: Arrange to isolate individual panel sections.

O. Column-Type Panelboards: Narrow gutter extension, with cover, to overhead junction box equipped with ground and neutral terminal buses.

P. Feed-through Lugs: Copper mechanical type suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

2.3 PANELBOARD SHORT-CIRCUIT RATING

A. Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Branch Overcurrent Protective Devices: Plug-in or bolt on circuit breakers, replaceable without disturbing adjacent units.

B. Doors: Front mounted with concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.5 DISTRIBUTION PANELBOARDS

A. Doors: Front mounted, except omit in fused-switch panelboards; secured with vault-type latch with tumbler lock; keyed alike.

B. Main Overcurrent Protective Devices: Circuit breaker.

C. Branch overcurrent protective devices shall be one of the following:
   1. For Circuit-Breaker Frame Sizes 125 A and Smaller: Plug-in or Bolt-on circuit breakers.

2. For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.6 OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Electronic Trip Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:
   a. Instantaneous trip.
   b. Long- and short-time pickup levels.
   c. Long- and short-time time adjustments.
   d. Ground-fault pickup level, time delay, and I^2t response.
3. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
4. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker; trip activation on fuse opening or on opening of fuse compartment door.
5. GFCI Circuit Breakers: Single- and two-pole configurations with [5] [30]-mA trip sensitivity.

B. Molded-Case Circuit-Breaker Features and Accessories. Standard frame sizes, trip ratings, and number of poles.

1. Lugs: Mechanical style, suitable for number, size, trip ratings, and material of conductors.
2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

C. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Mounting Heights: Top of trim 74 inches (1880 mm) above finished floor, unless otherwise indicated.

C. Mounting: Plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.

D. Circuit Directory: Create a directory to indicate installed circuit loads after balancing panelboard loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

E. Install filler plates in unused spaces.

F. Wiring in Panelboard Gutters: Arrange conductors into groups and bundle and wrap with wire ties after completing load balancing.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 16 Section "Basic Electrical Materials and Methods] [Electrical Identification."

B. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.3 CONNECTIONS

A. Install equipment grounding connections for panelboards with ground continuity to main electrical ground bus.

B. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

B. Testing: After installing panelboards and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

C. Balancing Loads: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes as follows:

1. Measure as directed during period of normal system loading.
2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data-processing, computing, transmitting, and receiving equipment.
3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

3.5 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges.

3.6 CLEANING

A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION

DIVISION 16460
TRANSFORMERS - INDOOR DRY TYPE

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

A. The General Provisions, Supplemental General Provisions, Special Provisions and Division 1 Specification sections, apply to work covered by this Section.

B. Comply with Division 16 Sections, as applicable. Refer to other Divisions for coordination of work.

C. Provide concrete pad for each pad mount transformer.

1.2 DESCRIPTION

A. Provide labor, material, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing of the indoor dry type transformers as indicated, including related systems and accessories.

1.3 SUBMITTALS

A. Submit product data and shop drawings in accordance with Division 1 for products specified under Part 2 - Products.

B. Typical test data shall be submitted for transformers of identical design to the proposed units and shall include, but not be limited to, efficiency at 25%, 50%, 75%, and 100% load, percent regulation at 80% and 100% power factor, no load and full load loss in watts, % X and % R values, maximum sound level of transformer in enclosure, and maximum hot spot and average temperature rise over a 40 degree C ambient.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Eaton

B. Square D

C. G.E

2.2 GENERAL

A. Transformers shall be UL listed and labeled, ENERGY EFFICIENT, and constructed in accordance with NEMA standards.

2.3 STANDARD DRY TYPE TRANSFORMERS

A. Transformer coils shall be of the continuous aluminum wound construction and shall be impregnated with nonhygroscopic, thermosetting varnish.

B. Transformers 15kVA and larger shall be 115°C temperature rise above 40°C ambient. Transformers 25kVA and larger shall have a minimum of 4-2 1/2% full capacity primary traps.

C. All insulating materials shall be in accordance with NEMA ST20 Standards for 220°C UL component recognized insulation system. Transformers shall be manufactured and tested in accordance with ANSI Standards C57.12.01 and C57.12.91.

D. Transformer Construction

1. All cores shall be constructed of high grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Magnetic flux densities shall be kept well below the saturation point. The core laminations shall be clamped together with steel angles. The completed core and coil shall then be bolted to the base of the enclosure but isolated there- from by means of rubber, vibration-absorbing mounts. There shall be no metal-to-metal contact between the core and coil and the enclosure. On transformers 500KVA and smaller the vibration isolating system shall be designed to provide a permanent fastening of the core and coil to the enclosure. Sound isolation systems requiring the complete removal of all fastening devices will not be acceptable.
2. The core of the transformer shall be visibly grounded in the enclosure by means of a flexible grounding conductor sized in accordance with applicable UL and NEC standards.
3. The transformer enclosure shall be ventilated and be fabricated of heavy gauge, sheet steel construction. The entire enclosure shall be finished utilizing a continuous process consisting of degreasing, cleaning and phosphatizing, followed by electrostatic deposition of a polymer polyester powder coating and baking cycle to provide uniform coating of all edges and surfaces. The coating color shall be ANSI 49 gray.
4. The maximum temperature of the top of the enclosure shall not exceed 50°C rise above a 40°C ambient.
5. Sound levels shall be warranted by the manufacturer not to exceed the following:

a. 15 to 50kVA - 45db
b. 51 to 150kVA - 50db
c. 151 to 300kVA - 55db
d. 301 to 500kVA - 60db

PART 3 EXECUTION

3.1 INSTALLATION

A. Mounting
1. Transformers 15 KVA or less shall be wall or floor mounted or suspended, as indicated. 30 KVA and 50KVA transformers shall be floor mounted or suspended as indicated. Transformers greater than 50 KVA shall be floor mounted.
2. Floor mounted units shall be set on a concrete housekeeping pad.
3. Wall mounted and suspended units shall utilize appropriate hardware based on the weight of the unit and installation location.

B. Connections
1. Wiring connections to transformer enclosure shall be made using flexible metal conduit with minimum 12" length.
2. Provide transformer grounding in accordance with Section 16450.

END OF SECTION

DIVISION 16475
FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Fuses.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
B. Product Data for each fuse type specified.
C. Field test reports indicating and interpreting test results.
D. Maintenance data for tripping devices to include in the operation and maintenance manual specified in Division 1.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses from one source and by a single manufacturer.
B. Comply with NFPA 70 for components and installation.
C. Listing and Labeling: Provide fuses specified in this Section that are listed and labeled.
   1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
   2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

1.5 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
   1. Spare Fuses: Furnish quantity equal to 20 percent of each fuse type and size installed, but not less than 1 set of 3 of each type and size.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering fuses that may be incorporated into the Work include, but are not limited to, the following:
B. Manufacturers: Subject to compliance with requirements, provide fuses by one of the following:
   1. Cooper Industries, Inc.; Bussmann Div.
   2. Eagle Electric Mfg. Co., Inc.
   3. Ferraz Corp.
   4. General Electric Co.; Wiring Devices Div.
   5. Gould Shawmut.
   6. Tracor, Inc.; Littelfuse, Inc. Subsidiary.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class as specified or indicated; current rating as indicated; voltage rating consistent with circuit voltage.

2.3 SPARE FUSE CABINET

A. Cabinet: Wall-mounted, 0.05-inch- (1.27-mm-) thick steel unit with full-length, recessed piano-hinged door with key-coded cam lock and pull.
   1. Size: Adequate for orderly storage of spare fuses specified with 15 percent spare capacity minimum.
   2. Finish: Gray, baked enamel.
   3. Identification: Stencil legend "SPARE FUSES" in 1-1/2-inch (40-mm) letters on door.
   4. Fuse Pullers: For each size fuse.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine utilization equipment nameplates and installation instructions to verify proper fuse locations, sizes, and characteristics.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Motor Branch Circuits: Class RK1, time delay.

B. Other Branch Circuits: Class RK5, non-time delay.

3.3 INSTALLATION

A. Install fuses in fusible devices as indicated. Arrange fuses so fuse ratings are readable without removing fuse.

B. Install spare fuse cabinet where indicated.

3.4 IDENTIFICATION

A. Install typewritten labels on inside door of each fused switch to indicate fuse replacement information.

END OF SECTION

DIVISION 16511
INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes interior lighting fixtures, lighting fixtures mounted on exterior building surfaces, lamps, ballasts, emergency lighting units, and accessories.

B. Related Sections include the following:

1.3 SUBMITTALS

A. Product Data: For each type of lighting fixture indicated, arranged in order of fixture designation. Include data on features, accessories, and the following:

1. Dimensions of fixtures.
2. Certified results of laboratory tests for fixtures and lamps for photometric performance.
3. Emergency lighting unit battery and charger.
4. Fluorescent and high-intensity-discharge ballasts.
5. Types of lamps.

B. Shop Drawings: Show details of nonstandard or custom fixtures. Indicate dimensions, weights, method of field assembly, components, features, and accessories.

1. Wiring Diagrams: Detail wiring for fixtures and differentiate between manufacturer-installed and field-installed wiring.

C. Coordination Drawings: Reflected ceiling plans and sections drawn to scale and coordinating fixture installation with ceiling grid, ceiling-mounted items, and other components in the vicinity. Include work of all trades that is to be installed near lighting equipment.

D. Product Certificates: Signed by manufacturers of lighting fixtures certifying that products comply with requirements.

E. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

F. Maintenance Data: For lighting fixtures to include in maintenance manuals specified in Division 1.

1.4 QUALITY ASSURANCE

A. Fixtures, Emergency Lighting Units, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by an acceptable to authorities having jurisdiction.

B. Comply with NFPA 70.

C. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

1.5 COORDINATION

A. Fixtures, Mounting Hardware, and Trim: Coordinate layout and installation of lighting fixtures with ceiling system and other construction.

1.6 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranties for Fluorescent Ballasts: Written warranty, executed by manufacturer agreeing to replace fluorescent ballasts that fail in materials or workmanship within specified warranty period.

1. Special Warranty Period for Electronic Ballasts: Five years from date of manufacture, but not less than four years from date of Substantial Completion.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products indicated in the Interior Lighting Fixture Schedule at the end of Part 3.

B. Products: Subject to compliance with requirements, provide one of the products indicated for each designation in the Interior Lighting Fixture Schedule in the plans. Submit Manufacturers as is in the Lighting Fixture Schedule or Equal. Submit Equal Manufacturers 10 days prior to bidding day for approval. For Equal Manufacturers submit lighting calculation for each equal fixture submitted for approval.

2.2 FIXTURES AND FIXTURE COMPONENTS, GENERAL

A. Metal Parts: Free from burrs, sharp corners, and edges.

B. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.

C. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in operating position.

D. Reflecting Surfaces: Minimum reflectance as follows, unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.
4. Laminated Silver Metallized Film: 90 percent.

E. Lenses, Diffusers, Covers, and Globes: 100 percent virgin acrylic plastic or annealed crystal glass, unless otherwise indicated.

1. Plastic: High resistance to yellowing and other changes due to aging, exposure to heat, and ultraviolet radiation.
2. Lens Thickness: 0.125 inch (3 mm) minimum, unless greater thickness is indicated.

2.3 FLUORESCENT LAMP BALLASTS

A. General Requirements: Unless otherwise indicated, features include the following:

1. Designed for type and quantity of lamps indicated at full light output.
2.

B. Electronic Ballasts for Linear Lamps: Unless otherwise indicated, features include the following, besides those in "General Requirements" Paragraph above:

1. Certified Ballast Manufacturer Certification: Indicated by label.
2. Encapsulation: Without voids in potting compound.
3. Parallel Lamp Circuits: Multiple lamp ballasts connected to maintain full light output on surviving lamps if one or more lamps fail.

C. Ballasts for Compact Lamps in Recessed Fixtures: Unless otherwise indicated, additional features include the following:

1. Type: Electronic or electromagnetic, fully encapsulated in potting compound.
2. Power Factor: 90 percent, minimum.
3. Operating Frequency: 20 kHz or higher.
4. Flicker: Less than 5 percent.
5. Lamp Current Crest Factor: Less than 1.7.
6. Transient Protection: Comply with IEEE C62.41 for Category A1 locations.

7. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.

D. Ballasts for Compact Lamps in Nonrecessed Fixtures: Unless otherwise indicated, additional features include the following:

1. Power Factor: 90 percent, minimum.
2. Ballast Coil Temperature: 65 deg C, maximum.
3. Transient Protection: Comply with IEEE C62.41 for Category A1 locations.
4. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.

2.4 EXIT SIGNS

A. General Requirements: Comply with UL 924 and the following:

1. Sign Colors and Lettering Size: Comply with authorities having jurisdiction.

B. Internally Lighted Signs: As follows:

1. Lamps for AC Operation: Light-emitting diodes, 70,000 hours minimum rated lamp life.

2.5 EMERGENCY LIGHTING UNITS

A. General Requirements: Self-contained units. Comply with UL 924. Units include the following features:

1. Battery: Sealed, maintenance-free, lead-acid type with minimum 5-year nominal life and special warranty.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically turns lamp on when supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps, and battery is automatically recharged and floated on charger.

2.6 EMERGENCY FLUORESCENT POWER SUPPLY UNIT

A. Internal Type: Self-contained, modular, battery-inverter unit factory mounted within fixture body. Comply with UL 924.

1. Test Switch and Light-Emitting Diode Indicator Light: Visible and accessible without opening fixture or entering ceiling space.
2. Battery: Sealed, maintenance-free, nickel-cadmium type with minimum 5-year nominal life.
3. Charger: Fully automatic, solid-state, constant-current type.
4. Operation: Relay automatically energizes lamp from unit when normal supply circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamp, and battery is automatically recharged and floated on charger.

2.7 LAMPS

A. Noncompact Fluorescent Lamp Life: Rated average is 20,000 hours at 3 hours per start when used on rapid-start circuits.

2.8 FINISHES

A. Fixtures: Manufacturer's standard, unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fixtures: Set level, plumb, and square with ceiling and walls, and secure according to manufacturer's written instructions and approved submittal materials. Install lamps in each fixture.

B. Support for Fixtures in or on Grid-Type Suspended Ceilings: Do not use grid for support.

1. Install a minimum of two ceiling support system wires for each fixture. Locate not more than 6 inches (150 mm) from fixture corners.
2. Support Clips: Fasten to fixtures and to ceiling grid members at or near each fixture corner.

3. Fixtures of Sizes Less Than Ceiling Grid: Arrange as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.

C. Suspended Fixture Support: As follows:

1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.

2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.

3.2 CONNECTIONS

A. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Advance Notice: Give dates and times for field tests.

C. Provide instruments to make and record test results.

D. Tests: As follows:

1. Verify normal operation of each fixture after installation.

2. Emergency Lighting: Interrupt electrical supply to demonstrate proper operation.

3. Verify normal transfer to battery source and retransfer to normal.

4. Report results in writing.

E. Malfunctioning Fixtures and Components: Replace or repair, then retest. Repeat procedure until units operate properly.

F. Corrosive Fixtures: Replace during warranty period.

3.4 CLEANING AND ADJUSTING

A. Clean fixtures internally and externally after installation. Use methods and materials recommended by manufacturer.

B. Adjust aimable fixtures to provide required light intensities.

END OF SECTION

DIVISION 16521
EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies the furnishing, installation, and connection of exterior fixtures, poles, and supports. The terms “lighting fixtures”, “fixture” and “luminaire” are used interchangeably.

1.2 RELATED WORK

A. Section CAST-IN-PLACE CONCRETE.

B. Section SCHEDULE FOR FINISHES: Finishes for exterior light poles and luminaires.

C. Section REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements and items that are common to more than one section of Division 26.

D. Section LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW): Low voltage power and lighting wiring.

E. Section GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.

F. Section RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduits, fittings, and boxes for raceway systems.

G. Section UNDERGROUND ELECTRICAL CONSTRUCTION: Underground handholes and conduits.

H. SectionLIGHTING CONTROLS: Controls for exterior lighting.

1.3 QUALITY ASSURANCE

A. Refer to Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES), in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1.4 SUBMITTALS

A. Submit six copies of the following in accordance with Section REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1. Shop Drawings:

   a. Submit the following information for each type of lighting fixture designated on the LIGHTING FIXTURE SCHEDULE, arranged in order of lighting fixture designation.

   b. Material and construction details, include information on housing and optics system.

   c. Physical dimensions and description.

   d. Wiring schematic and connection diagram.

   e. Installation details.

   f. Energy efficiency data.

   g. Photometric data based on laboratory tests complying with IES Lighting Measurements testing and calculation guides.

   h. For LED lighting fixtures, submit US DOE LED Lighting Facts label, and IES L70 rated life.

i. Submit site plan showing all exterior lighting fixtures with fixture tags consistent with Lighting Fixture Schedule as shown on drawings. Site plan shall show computer generated point–by-point illumination calculations. Include lamp lumen and light loss factors used in calculations.

2. Manuals:
   a. Submit, simultaneously with the shop drawings, complete maintenance and operating manuals, including technical data sheets, wiring diagrams, and information for ordering replacement parts.
   b. If changes have been made to the maintenance and operating manuals originally submitted, submit updated maintenance and operating manuals two weeks prior to the final inspection.
3. Certifications: Two weeks prior to final inspection, submit the following.
   a. Certification by the Contractor that the exterior lighting systems have been properly installed and tested.

1.5 APPLICABLE PUBLICATIONS

A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.

B. Aluminum Association Inc. (AA):
   AAH35.1-06 .....Alloy and Temper Designation Systems for Aluminum

C. American Association of State Highway and Transportation Officials (AASHTO):
   32-LTS-6 .....Structural Supports for Highway Signs, Luminaires and Traffic Signals

D. American Concrete Institute (ACI):
   318-05 .....Building Code Requirements for Structural Concrete

E. American National Standards Institute (ANSI):
   C81.61-09 .....Electrical Lamp Bases – Specifications for Bases (Caps) for Electric Lamps

F. American Society for Testing and Materials (ASTM):
   A123/A123M-12 .....Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
   A153/A153M-09 .....Zinc Coating (Hot-Dip) on Iron and Steel Hardware
   B108-03a-08 .....Aluminum-Alloy Permanent Mold Castings
   C1089-13 .....Spun Cast Prestressed Concrete Poles

G. Federal Aviation Administration (FAA):
   AC 70/7460-IK-07 .....Obstruction Lighting and Marking
   AC 150/5345-43F-06 .....Obstruction Lighting Equipment

H. Illuminating Engineering Society of North America (IESNA):
   HB-9-00.....Lighting Handbook
   RP-8-05 .....Roadway Lighting
   LM-52-03 .....Photometric Measurements of Roadway Sign Installations
   LM-72-10 .....Directional Positioning of Photometric Data

LM-79-08 .....Approved Method for the Electrical and Photometric Measurements of Solid-Sate Lighting Products

LM-80-08 .....Approved Method for Measuring Lumen Maintenance of LED Light Sources

TM-15-07 .....Backlight, Uplight and Glare (BUG) Ratings

I. National Electrical Manufacturers Association (NEMA):

C78.41-06.....Electric Lamps – Guidelines for Low-Pressure Sodium Lamps

C78.42-07 .....Electric Lamps – Guidelines for High-Pressure Sodium Lamps

C78.43-07 .....Electric Lamps – Single-Ended Metal-Halide Lamps

C78.1381-98.....Electric Lamps – 70-Watt M85 Double-Ended Metal-Halide Lamps

C82.4-02 .....Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type)

C136.3-05 .....For Roadway and Area Lighting Equipment – Luminaire Attachments

C136.17-05 .....Roadway and Area Lighting Equipment – Enclosed Side-Mounted Luminaires for Horizontal-Burning High-Intensity-Discharge Lamps – Mechanical Interchangeability of Refractors

ICS 2-00 (R2005) .....Controllers, Contactors and Overload Relays Rated 600 Volts

ICS 6-93 (R2006) .....Enclosures

J. National Fire Protection Association (NFPA):

70-11 .....National Electrical Code (NEC)

K. Underwriters Laboratories, Inc. (UL):

496-08 .....Lampholders

773-95 .....Plug-In, Locking Type Photocontrols for Use with Area Lighting

773A-06 .....Nonindustrial Photoelectric Switches for Lighting Control

1029-94 .....High-Intensity-Discharge Lamp Ballasts

1598-08 .....Luminaires

8750-09.....Light Emitting Diode (LED) Equipment for Use in Lighting Products

1.6 DELIVERY, STORAGE, AND HANDLING

Provide manufacturer's standard provisions for protecting pole finishes during transport, storage, and installation. Do not store poles on ground. Store poles so they are at least 305 mm (12 inches) above ground level and growing vegetation. Do not remove factory-applied pole wrappings until just before installing pole.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

Luminaires, materials and equipment shall be in accordance with NEC, UL, ANSI, and as shown on the drawings and specified.

2.2 POLES – N/A

2.3 FOUNDATIONS FOR POLES-N/A

2.4 LUMINAIRES

A. Luminaires shall be weatherproof, heavy duty, outdoor types designed for efficient light utilization, adequate dissipation of lamp and ballast heat, and safe cleaning and relamping.

B. Illumination distribution patterns, BUG ratings and cutoff types as defined by the IESNA shall be as shown on the drawings.

C. Incorporate ballasts in the luminaire housing, except where otherwise shown on the drawings.

D. Lenses shall be frame-mounted, heat-resistant, borosilicate glass, with prismatic refractors, unless otherwise shown on the drawings. Attach the frame to the luminaire housing by hinges or chain. Use heat and aging-resistant, resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

E. Lamp sockets for high intensity discharge (H.I.D) fixture shall have locking-type porcelain enclosures in conformance to the applicable requirements of ANSI C81.61-09 and UL 496-08.

F. Pre-wire internal components to terminal strips at the factory.

G. Bracket-mounted luminaires shall have leveling provisions and clamp-type adjustable slip-fitters with locking screws.

H. Materials shall be rustproof. Latches and fittings shall be non-ferrous metal.

I. Provide manufacturer's standard finish, as scheduled on the drawings. Where indicated on drawings, match finish process and color of pole or support materials. Where indicated on drawings, provide finishes as indicated in Section 09 06 00, SCHEDULE FOR FINISHES.

J. Luminaires shall carry factory labels, showing complete, specific lamp and ballast information.

2.5 LAMPS

A. LED sources shall meet the following requirements:

1. Operating temperature rating shall be between -40 degrees C (-40 degrees F) and 50 degrees C (120 degrees F).
2. Correlated Color Temperature (CCT): 5000K.
3. Color Rendering Index (CRI): ≥ 85.
4. The manufacturer shall have performed reliability tests on the LEDs luminaires complying with Illuminating Engineering Society (IES) LM79 for photometric performance and LM80 for lumen maintenance and L70 life.//

2.6 LED DRIVERS

A. LED drivers shall meet the following requirements:

1. Drivers shall have a minimum efficiency of 85%.
2. Starting Temperature: -40 degrees C (-40 degrees F).
3. Input Voltage: 120 to 480 (±10%) volt.

4. Power Supplies: Class I or II output.
5. Surge Protection: The system must survive 250 repetitive strikes of "C Low" (C Low: 6kV/1.2 x 50 µs, 10kA/8 x 20 µs) waveforms at 1-minute intervals with less than 10% degradation in clamping voltage. "C Low" waveforms are as defined in IEEE/ASNI C62.41.2-2002, Scenario 1 Location Category C.
6. Power Factor (PF): $\geq$ 0.90.
7. Total Harmonic Distortion (THD): $\leq$ 20%.
8. Comply with FCC Title 47 CFR Part 18 Non-consumer RFI/EMI Standards.
9. Drivers shall be reduction of hazardous substances (ROHS)-compliant.//

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install lighting in accordance with the NEC, as shown on the drawings, and in accordance with manufacturer's recommendations.

B. Pole Foundations:

1. Excavate only as necessary to provide sufficient working clearance for installation of forms and proper use of tamper to the full depth of the excavation. Prevent surface water from flowing into the excavation. Thoroughly compact backfill with compacting arranged to prevent pressure between conductor, jacket, or sheath, and the end of conduit.
2. Set anchor bolts according to anchor-bolt templates furnished by the pole manufacturer.
3. Install poles as necessary to provide a permanent vertical position with the bracket arm in proper position for luminaire location.
4. After the poles have been installed, shimmed, and plumbed, grout the spaces between the pole bases and the concrete base with non-shrink concrete grout material. Provide a plastic or copper tube, of not less than 9 mm (0.375-inch) inside diameter through the grout, tight to the top of the concrete base to prevent moisture weeping from the interior of the pole.

C. Install lamps in each luminaire.

D. Adjust luminaires that require field adjustment or aiming.

3.2 GROUNDING

Ground noncurrent-carrying parts of equipment, including metal poles, luminaires, mounting arms, brackets, and metallic enclosures, as specified in Section 16060, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS. Where copper grounding conductor is connected to a metal other than copper, provide specially-treated or lined connectors suitable and listed for this purpose.

3.3 ACCEPTANCE CHECKS AND TESTS

Verify operation after installing luminaires and energizing circuits.

E N D

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior luminaries and accessories, underground conduit, wiring, and terminations.

B. Poles and foundations.

C. Component installation and system testing.

D. Underground conduit, wires and controls to illuminated pylon sign. Coordinate circuit requirements with owner.

1.02 RELATED SECTIONS

A. Section 03300 - Cast-in-Place Concrete (See Architectural/ Building Specifications)

B. Section 02222 - Excavation, Backfilling and Compacting for utilities

C. Section 16011 - Electrical Systems Testing (See Architectural/Building Specifications)

1.03 REFERENCES

A. ANSI C78.379 - Electric Lamps - Incandescent and High- Intensity Discharge Reflector Lamps - Classification of Beam Patterns.

B. ANSI C82.1 - Ballasts for Fluorescent Lamps - Specifications.

C. ANSI C82.4 - Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type).

D. ANSI/NFPA 70 - National Electrical Code.

E. ANSI/IES RP-8 - Recommended Practice for Roadway Lighting.

F. EIS Lighting Handbook - 1987 Application Volume

1.04 OWNER-FURNISHED ITEMS

A. Unless otherwise indicated on Drawings or in Special Conditions to the Contract, Owner will furnish lighting poles, anchor bolts, fixtures, lamps and touch-up paint for installation by Electrical Contractor.

B. Owner will furnish and erect signage for illuminated canopy, automotive, roadside and mall entrance signs.

1.05 SYSTEM PERFORMANCE

A. A "Cut-Off Luminaire" is defined by the following limitations of light distribution:

1. At any lateral angle around the luminaire, the candle power per 1000 lumens shall not exceed 25 lumens at an angle of 90 degrees above horizontal and 100 lumens at a vertical angle 80 degrees above horizontal.

B. The optical system specified herein shall be capable of maintaining a minimum of one horizontal foot-candle on areas of paved surface as measured at walking or driving surface based on a four fixture mounting style with Type V vertical lamps optics at a mounting height of 42' and a pole spacing of 190 feet.

C. Lighting layout shall produce maximum to minimum uniformity ratio of not more than 5 to 1 and average to minimum uniformity ratio of 2.2 to 1 in accordance with IES visual comfort and lighting safety recommendations.

D. All point-by-point photometric performance test grids shall be based on the following criteria:

1. Maintenance Factor = 0.75

2. Mounting Height = 42 ft.

3. Grid = 10 ft. centers all points between 4 poles (484 points).

4. Initial Lumens = 40,000 (each of 4 lamps/poles)

1.06 WARRANTY

Provide Owner with one year warranty certificate signed by Contractor and by company providing actual warranty labor. This certificate must be received by Owner prior to final payment.

1.07 SUBMITTALS

When required by the Owner, each submittal transmitted for approval shall contain:

A. Computer prepared photometric layout of proposed lighted area which indicates by isofootcandle readings the system performance.

B. A photometric report from a national independent testing laboratory with report number, date, fixture catalog number, luminaire and lamp specifications; IES classification, candlepower tabulations, zone lumen summary and isolux plot.

C. The Underwriters Laboratory listing and file number for the specific fixture(s) to be utilized.

D. Pole manufacturer AASHTO calculations indicating the pole and anchor bolts being submitted are capable of supporting the pole and fixture systems being utilized in accordance with specifications.

E. Catalog cuts proving complete conformance to specifications.

1.08 SPECIFICATION COMPLIANCE

The Owner reserves the right to request standard production model fixture samples for inspection and to order such tests as the Owner deems necessary to insure compliance with these specifications and to

reject those luminaries failing such tests, or those luminaries with improper or inadequate light distribution. The Owner shall be the sole judge as to acceptability.

PART 2 PRODUCTS

2.01 MATERIALS

A. Poles: One piece, 39'-0" long, round, tapered at 0.14 inches per foot, single, uniform thickness, U.S. domestic steel having a guaranteed minimum yield strength of 55,000 psi after fabrication complying with ASTM A 595, Grade A, Steel with seamless appearing longitudinal weld. Erected poles and anchor bolts shall be capable of supporting maximum vertical and horizontal loads exerted on the completed structure in accordance with the latest AASHTO edition meeting the requirements of 120 mph winds with a 1.3 gust factor. The pole shall have a 4" x 6" reinforced hand hole located approximately 18" above base plate and grounding lug welded to interior of pole opposite hand hole. Fabricated poles delivered to the job site shall be factory painted both inside and out. The inside shall be painted with a red oxide rust-inhibitive alkyd primer to a dried film thickness of 1.0 mils. The exterior shall be coated with a Polyester Black SG139 Powder (Polyester Bronze SG146 Powder shall be used to match existing poles) to a minimum dry film thickness of 3.0 mils. An aliphatic Polyurethane #D1016 (#BM07 for Bronze) touch-up kit shall be included to finish any scratched coatings.

B. Pole Base Plates: The base plate shall be fabricated from a commercial quality, hot-rolled carbon steel conforming to the requirements of ASTM A36 having a minimum yield strength of 36,000 psi. The base plate shall telescope the pole's shaft and be circumferentially welded top and bottom. The base plate shall be slotted to accommodate a ±1/2" variation in the nominal bolt circle.

C. Anchor Bolt: Supply 4 anchor bolts with each pole. Anchor bolts shall be 1" minimum diameter hot-rolled domestic steel bar complying with ASTM A36 (modified) and have minimum guaranteed yield strength of 55,000 psi and shall be 36" long with additional 4" hook at 90 degree totally galvanized. Each anchor bolt shall be supplied with 2 galvanized hex-nuts per ASTM A 307, two galvanized flat washers, one galvanized lock washer and one die-cast nut cover with a 1/4" stainless steel, hex-head, self tapping screw.

D. Fixtures: Fabricate fixtures from formed or extruded aluminum only. Assemble to form weatherproof and bug-proof unit. Each fixture shall bear the UL label for wet location and shall have an Architectural Class I anodized finish or an Owner approved baked-on polyester finish. Color shall be #DU313 dark bronze or #DU314 black. Injected silicon used as a weatherproofing seal shall not be directly exposed to sunlight and shall not be the sole means to prevent water intrusion. Lens frame shall be mitered, extruded anodized aluminum with stainless steel spring loaded latches and hinge pins. Tool-less access is required to optic chamber and ballast. Lens door frame shall be essentially watertight with a memory retentive extruded silicon rubber gasket.

Lens shall be heat tempered glass or polycarbonate material. Bolts shall be hardened domestic steel. Fixture arm shall have an internal extruded bolt channel guide and an integral hand hold with a cover for the field wiring connections.

E. Fixture Optical Assembly: One universal "cut-off luminaire" fixture housing shall be capable of containing the following general optical systems without modification and each optical system shall be field interchangeable and rotatable in 90 degree increments without the use of tools:

1. Type I - Optics that produce a longer narrower light pattern that concentrates light distribution equally on both sides of luminaire.

2. Type III - Optics that produce an asymmetrical light pattern that directs 2/3 of the light in front of the luminaire.

3. Type V, Horizontal Lamp - Optics that produce a symmetrical square light pattern about the luminaire.

4. Floodlight - Optics that will sharply confine any back light behind the pole. The patterns shall be in the forward direction.

5. Type V, Vertical Lamp - Optics that produce a symmetrical square light pattern about the luminaire with a maximum of 7% of the total output lumens above the 75 degree cutoff line.

Optics are based on square light distribution patterns with the other optical patterns used to effectively cover odd-shaped areas. Optical assemblies that produce a round light distribution pattern are not acceptable. All optics with the exception of Type V vertical lamp shall have no more than 3% of total output lumens above the 75 degree cutoff line.

The Owner shall be the sole judge regarding acceptability of optical system performance.

F. Ballast and Ballast Housing: Premium type ballast that will provide power for only one (1) metal halide lamp; capable of providing reliable lamp starting at temperatures as low as -20 degree Fahrenheit and shall have a minimum power factor of 90%; regulating type ±10% lamp power regulation with ±10% variation from 480 volt, single phase, input voltage. Ballast assembly shall be easily accessible and removable with quick disconnects to the reflector.

G. Lamps: 400 watt, 40,000 lumen, 20,000 hour, clear super metalarc manufactured by Sylvania or 400 watt, 40,000 lumen, 20,000 hour manufactured by General Electric.

Horizontal Mounted Lamp: Sylvania # MS 400/HOR or General Electric #MVR 400/HOR.

Vertical (Base-up) Mounted Lamp: Sylvania # MS 400/BU or General Electric #MVR 400/VBU

PART 3 EXECUTION

3.01 SIZING

A. Size wiring feeders to parking lot lights in accordance with the following table which is based on 480 volt, 400 watt metal halide lamps, maximum circuit amperage and a 5% maximum voltage drop to farthest fixture. There shall be no more than fifteen (15) 400 watt metal halide lamps per 20 amp circuit. There shall be no more than ten (10) 400 watt metal halide lamps on the 20 amp circuit with roadside sign.

B. Wire Size Schedule: Use the following wire sizes for corresponding distances from panel:

1. 600 feet: #10

2. 1000 feet: #8

3. 1600 feet: #6

4. 2400 feet: #4

For circuit distances of more than 2400 feet, size conductors for a five percent maximum voltage drop to farthest fixture.

C. Drawings indicate two 480 volt, single phase, 20 amp circuits for parking lot lights. If more circuits are required to comply with Site Lighting Plan and Specification requirements, Contractor shall furnish and install necessary additional breakers, contractors, photocells, etc., under this Section of these Specifications.

D. Underground circuits shall have equipment grounding conductors sized in accordance with NEC (#10AWG minimum).

E. Parking lot lighting conduit shall be sized in accordance with NEC (3/4 inch minimum).

3.02 INSTALLATION

Install pole foundations in accordance with details shown on Drawings. Install poles on concrete foundations in accordance with detail shown on Drawings as part of electrical work.

3.03 TESTING

Perform and record voltmeter measurements as described in Section 16011. In addition, provide labor, material, and energy to conduct a parking lot light test at least 30 days prior to Substantial Completion date. This test shall consist of continuous operation of fixtures and lamps for a time period of 100 hours. Contractor shall witness and certify the continuous operation and time duration of the test. At the end of the testing period, immediately request warranty parts and replace defective components at least three days prior to Substantial Completion date.

END OF SECTION 16530

DIVISION 16693
BRANCH CIRCUIT PANELBOARD POWER CONDITIONING SURGE PROTECTION DEVICE

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. The General Provisions, Supplemental General Provisions, Special Provisions, apply to work covered by this Section.

B. Comply with Division 16 Sections, as applicable. Refer to other Divisions for coordination of work.

1.2 SCOPE OF WORK

A. Provide labor, material, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing of a high-energy power conditioning surge protection device(s) at branch circuit panelboards where indicated on the Drawings. The device shall incorporate transient voltage surge suppression (TVSS) and high-frequency electrical line noise filtering. The device shall provide effective high energy transient voltage suppression, surge current diversion, high-frequency attenuation, and line stabilization in ANSI/IEEE C62.41-2002 environments connected downstream from the facility's main overcurrent protective device. The device shall be connected in parallel with the facility's wiring system.

B. The device shall be installed as an integral part or external of the panelboard, switchboard.

1.3 SUBMITTALS

A. Submit product data and shop drawings for products specified under PART 2 - PRODUCTS.

B. Manufacturers' Product Data: Submit material specifications and installation data for products specified under PART 2 - PRODUCTS.

C. Shop Drawings: Submit shop drawings to indicate information not fully described by the product data to indicate compliance with the contract documents.

1 Include electrical characteristics and ratings for the specified equipment.
2 Include wiring diagrams indicating the internal connections of the specified equipment within its enclosure.
3 Drawings shall be provided indicating device dimensions, weights, mounting provisions, connection details and wiring diagrams.
4 Documentation of the specified device UL 1449 3rd Edition voltage protection rating (VPR) and per mode surge current rating shall be included. All submittals without this documentation will be rejected.
5 The manufacturer shall make available upon request certified documentation of applicable Location Category Testing in full compliance with ANSI/IEEE C62.41-1991 and ANSI/IEEE C62.45-1987 Guidelines.

D. Record Drawings

1 A complete set of manufacturers' product data and shop drawings indicating all post bid revisions and field changes.

1.4 QUALITY ASSURANCE

A. Industry Reference Standards and Publications: The device shall be designed, manufactured, tested and installed in compliance with the latest editions of:
1 American National Standards Institute (ANSI) and Institute of Electrical and Electronic Engineers (ANSI/IEEE C62.41-2002 and C62.45-2002)
2 Federal Information Processing Standards Publication 94 (FIPS PUB 94)
3 National Electrical Manufacturers Association (NEMA LS-1)
4 National Fire Protection Association (NFPA 70, National Electrical Code (NEC), 75 and 78)
5 Underwriters Laboratories UL 1449 Standard for Transient Voltage Surge Suppressors Surge Protection Devices and UL 1283 Standard for Electromagnetic Interference Filters.

B. The device shall be UL listed under UL 1449 and UL 1283 complimentary listed.

C. The device shall be warranted against defects in material and/or workmanship and any failure or end-of-life event including lighting for a minimum of TEN (10) years from the date of shipment.

D. The device shall be thoroughly factory-tested before shipment. Testing of the device shall include but not be limited to quality control checks, maximum continuous operating voltage (MCOV) check, and clamping voltage verification tests. The MCOV check shall consist of a minimum of one (1) hour burn-in at the applicable MCOV.

1.5 SYSTEM DESCRIPTION

A. Environmental Requirements

1 Storage Temperature: Storage temperature range shall be -40º to +85º C (-40º to +185º F).

2 Operating Temperature: Operating temperature range shall be -40º to +60º C (-40º to 140º F).

3 Relative Humidity: Operation shall be reliable in an environment with 5% to 95% non-condensing relative humidity.

4 Operating Altitude: The device shall be capable of operation in an altitude of 0 - 12,000 feet above sea level.

5 Audible Noise: The device shall not generate any audible noise.

6 Magnetic Fields: No appreciable magnetic fields shall be generated. The device shall be capable of use directly in computer rooms in any location without danger to data storage systems or devices.

B. Electrical Requirements

1 Device Operating Voltage: The nominal operating voltage and configuration shall be that of the switchgear, distribution panel, sub or branch panelboard. Maximum Continuous Operating Voltage (MCOV): The allowable maximum continuous operating voltage of all suppression components utilized in the unit shall not be less than 115% of the nominal operating voltage.

2 Operating Frequency: The operating frequency range of the device shall be 47 to 63 Hertz.

3 Protection Modes: The devices primary mode of protection shall be line-to-neutral. The secondary modes of protection shall be line-to-ground and neutral-to-ground.

4 Surge Current Capacity and Voltage Protection Rating: Unless specifically noted on the drawings and/or the schedules, the surge current capacity, and the voltage protection rating of the SPD shall be not less than listed on the following table.
The above text gives you the option to request a specific surge current rating on the riser or panel schedules

Location	Per Mode Surge Current Rating	120/208vac 3 phase VPR	277/480vac 3 phase VPR
Switchgear	200,000 amps	900v	1200v
Distribution Panel	150,000 amps	900v	1200v
Sub or Branch Panel	100,000 amps	900v	1200v

5. Construction: SPD's with a surge current rating of greater than 155,000 amps per mode shall be field serviceable modular devices. SPD's with a surge current rating of less than 155,000 amps may be non-modular.

1.6 DOCUMENTATION

A. Equipment Manual. The manufacturer shall furnish an equipment manual with installation, operation, and maintenance instructions for the system.

PART 2 - PRODUCTS

2.1 MANUFACTURER

1 Square D
2 Eaton
3 Current Technology
4 THOR SYSTEMS

2.2 TRANSIENT VOLTAGE SURGE SUPPRESSION COMPONENTS

A. The device shall include a solid-state suppression system which includes arrays of fused non-linear voltage dependent metal oxide varistors (MOV's) with similar operating characteristics. The suppression system shall not utilize gas tubes, spark gaps, silicon avalance diodes or other components which might short or crowbar the line, thus leading to interruption of normal power flow to or system upset of connected loads. The suppression system shall not incorporate any other components which may degrade performance or reliability of the

2.3 HIGH-FREQUENCY FILTER

A. The device shall include a UL 1283 high frequency extended range tracking filter. The filter shall reduce fast rise-time, high-frequency, error-producing transients and electrical line noise eliminating disturbances which may lead to system upset. The filter shall provide minimum insertion loss of 45 dB at 100 kHz attenuation frequency utilizing the MIL-STD-E220A 50 ohm insertion loss methodology.

2.4 INTERNAL CONNECTIONS

A. All internal wiring associated with the suppression/filter device and subject to surge currents shall utilize low-impedance copper bus bar and/or #4 AWG copper conductor or larger. All internal connections associated with the suppression/filter device and subject to surge currents shall be made with compression solderless-type lugs and shall be bolted to the bus bars in order to reduce overall system impedance.

2.5 FIELD CONNECTIONS

A. The device shall include mechanical lugs for each phase, neutral and ground, or permanently connected conductors as applicable. The lugs shall accommodate up to #4 AWG copper conductor.

2.6 ENCLOSURE

A. The device shall be provided in a surface mounted NEMA 1 type hinged enclosure, with a NEMA rating that matches or exceeds that of the switchgear, distribution panel, sub or branch panelboard that is being protected. of minimum 14 gauge steel, painted inside and out. Enclosure width shall not be greater than 24 inches.

2.7 MONITORING

A. The device shall include solid-state, long-life externally mounted LED visual status indicators that indicate the on-line status of each phase of the unit.

B. Dry Contacts

C. Audible alarm with silence switch

D. For Service Entrance or Switchgear SPD's: LED visual status indicators, Audible alarm with silence switch, Dry Contacts plus Surge Event Counter.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The installation and testing of the system shall be in full accordance with the manufacturer's installation, operation and maintenance instructions, and all national and local codes.

B. The device shall be installed as close as practical to the facility's wiring system in accordance with NEC Article 285, IEEE 1100-2005 section 8.4.2.5, plus applicable national/local electrical codes and the manufacturer's recommended installation instructions. Connection shall be from a minimum 40A branch circuit breaker in the switchgear, distribution panel or panelboard with #4 AWG copper conductors not any longer than necessary, avoiding unnecessary bends. Advise the engineer if the installed In no case shall conductors will be longer than 3 feet in length. Verify circuit breaker size with manufacturer.

3.2 TESTING

A. The system shall be field tested in the presence of the Owner. At the same time operational procedures shall be reviewed with the Owner.

B. If external test equipment is required, two (2) testers shall be furnished to the owner and two (2) training sessions shall be furnished. The first training session shall be with 90 days of occupancy and the second training session shall be not less eight months, but not more than 12 months after the first training session. Training and test equipment shall be furnished at no additional cost to the owner.

END OF SECTION

DIVISION 16721
FIRE ALARM/LIFE SAFETY SYSTEM

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. The General Provisions, Supplemental General Provisions, Special Provisions and Division 1 Specification Sections apply to Work covered by this Section.

B. Comply with other Division 16 Sections, as applicable. Refer to other Divisions for coordination of the Work.

1.2 SCOPE OF WORK

A. Provide labor, materials, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing additional devices for the building fire alarm system, including all related systems and accessories.

1. Fire alarm control panel
2. Remote Annunciator
3. Addressable or conventional manual fire alarm stations.
4. Addressable analog and conventional area smoke detectors.
5. Conventional beam detectors.
6. Addressable analog and conventional duct smoke detectors.
7. Addressable analog and conventional heat detectors.
8. Sprinkler water flow alarm switches.
9. Foam alarm switches.
10. Audible notification appliances; bells, horns, chimes.
11. Visual notification appliances; strobes.
12. Central station alarm connection control.
13. Air handling systems shutdown control.
14. Magnetic door holder release.
15. Dry pipe sprinkler release valve/deluge valve control.
16. Sprinkler supervisory switches and tamper switch supervision.
17. Dry pipe sprinkler release valve/deluge valve supervision.
18. Emergency generator supervision.
19. Fire pump supervision.
20. Battery standby.
21. System shall activate the overhead gates. Provide all accessories for an active system.

1.3 SUBMITTALS

A. Submit product data and shop drawings in accordance with Division 1 for products specified under PART 2 - PRODUCTS.

B. The submittal data shall include, but not necessarily be limited to, the following:

1 Complete bill of material indicating quantity, part numbers and brief description.
2 Data sheets for all products. If multiple models are shown on the same data sheet, highlight the specific model used.
3 Provide drawing with all devices.
4 Provide single line riser diagram showing all equipment and type, number and size of all conductors.

1.4 REFERENCE STANDARDS

A. The fire alarm system devices specified herein shall be designed, manufactured, installed and tested according to the latest version of the following standards:

1 National Fire Protection Association Standards
1 NFPA 70 - National Electric Code (NEC), Articles 725 & 760.
2 NFPA 71 - Central Station Signaling Systems
3 NFPA 72 - National Fire Alarm Code (NFAC)
4 NFPA 92A - Smoke Control Systems
5 NFPA 101 - Life Safety Code
2 Underwriters Laboratories, Inc.
1 UL 38 - Manually Activated Signaling Boxes
2 UL 228 - Door Holders for Fire Protective Signaling Systems
3 UL 268 - Smoke Detectors for Fire Protective Signaling Systems

4 UL268A - Smoke Detectors for Duct Applications
5 UL 346 - Waterflow Indicators for Fire Protective Signaling Systems
6 UL 464 - Audible Signaling Appliances
7 UL 864/UOJZ/APOU - Control Units for Fire Protective Signaling Systems
8 UL 1481 - Power Supplies for Fire Protective Signaling Systems
9 UL 1638 - Visual Signaling Appliances
10 UL 1711 - Amplifiers for Fire Protective Signaling Systems
11 UL 1971 - Standard for Fire Protective Signaling Systems
3 Americans with Disabilities Act (ADA)
4 Local and State Building Codes
5 Local Authorities Having Jurisdiction (LAHJ)

1.5 QUALITY ASSURANCE

A. The fire alarm system devices shall be listed and labeled by Underwriters Laboratories, Inc. for use in fire protective signaling system.

B. The Installing Contractor shall be factory authorized and trained and shall be NICET certified in the sub-field of Fire Alarm Systems, for the engineering and technical installation and supervision of the system. This certification shall be Level III for engineering and Level II for technical installation and supervision. Proof of certification shall be provided. All work shall be performed by skilled technicians, under the supervision and direction of the designated NICET engineering technician, all of whom shall be properly trained and qualified for the work.

C. The fire alarm contractor shall not sub out portion of the work. The fire alarm shall be responsible to complete the job.

1.6 QUALIFICATIONS

1. The fire alarm contractor, as a business entity, shall be an authorized and designated representative of the equipment manufacturer and shall have been actively engaged in the business of selling, installation and servicing fire alarm systems for a period of at least (5) years prior to the bid date.

2. The fire alarm contractor shall have an office within Rio Grande Valley area of the job site staffed with trained technicians who are qualified to manage the installation, to be responsible that the system is installed as submitted, to conduct system start-up, to instruct the project coordinators representatives and local authorities in the proper operation of the system, and to provide service throughout the warranty period. 3. The fire alarm contractor **SHALL NOT HAVE** any grievances or complaints on record regarding workmanship, code compliance, or service response with either the project coordinator, Architect, Engineer, Owner or the State Fire Marshals office. A contractor that has any prior finding(s) of a Fire Alarm license violation or has any litigation in process with the State Fire Marshal is **unacceptable**.

3. The fire alarm contractor shall be an active installer on the approved manufacturer for a minimum of 5 years.

1.7 WARRANTY

Warranty of all control equipment, sensors, I/O modules and all other peripherals and of materials, installation and workmanship shall be for one (1) year from date of acceptance.

2.The Contractor shall guarantee all wiring and raceways to be free from inherent mechanical or electrical defects for one (1) year from date of final acceptance.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Silent Knight

2.2 CIRCUITING GUIDELINES

A. Each addressable analog loop shall be circuited as shown on the drawings but device loading in not to exceed 80% of loop capacity in order to leave for space for future devices. The loop shall have Class A B operation. When it is necessary to interface conventional initiating devices provide intelligent input modules to supervise Class A B zone wiring. The audio system components shall be an integral part of the fire alarm system control panel.

B. Audio Amplifiers

1 Each audio power amplifier shall have integral audio signal de-multiplexers, allowing the amplifier to select any digitized audio channels. The channel selection shall be directed by the system software. Multiple and different audio signals shall be able to be broadcast simultaneously from the same system network node.

2 Each amplifier output shall include a dedicated, supervised speaker circuit which is suitable for connection of emergency speaker appliances. Each amplifier shall also include a notification appliance circuit for connection of visual (strobe) appliances. This circuit shall be fully programmable and it shall be possible to define the circuit for the support of audible, visible, or ancillary devices.

3 Standby audio amplifiers shall be provided that automatically sense the failure of a primary amplifier, and automatically program themselves to select and de-multiplex the same audio information channel of the failed primary amplifier, and fully replace the function of the failed amplifier.

4 In the event of a total loss of audio data communications, all amplifiers will default to the local "EVAC" tone generator channel. If the local panel has an alarm condition, then all amplifiers will sound the EVAC signal on their connected speaker circuits.

5 In the event of a loss of the fully digitized, multiplexed audio riser, the audio amplifiers shall automatically default to an internally generated alarm tone.

6 Audio amplifiers shall automatically detect a short circuit condition on the connected speaker circuit wiring, and shall inhibit itself from driving into that short circuit condition.

2.3 DETECTORS

A. General

1 Detectors shall be capable of full digital communications using both broadcast and polling protocol. Each detector shall be capable of performing independent fire detection algorithms. The fire detection algorithm shall measure sensor signal dimensions, time patterns and combine different fire parameters to increase reliability and distinguish real fire conditions from unwanted deceptive nuisance alarms. Signal patterns that are not typical of fires shall be eliminated by digital filters.

2 Detectors shall have an integral microprocessor capable of making alarm decisions based on fire parameter information stored in the detector head. Distributed intelligence shall improve response time by decreasing the data flow between detector and loop controller. Detectors not capable of making independent alarm decisions shall not be acceptable. Maximum total loop response time for detectors shall be 0.5 seconds.

3 Detectors shall have a separate means of displaying communication and alarm status. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. Both LEDs on steady shall indicate alarm-standalone mode status. Both LEDs shall be visible through a full 360 degree viewing angle.

4 Detectors shall be capable of identifying diagnostic codes to be used for system maintenance. The diagnostic codes shall be stored at the detector.

5 Detectors shall be capable of transmitting pre-alarm and alarm signals in addition to the normal, trouble and need cleaning information. It shall be possible to program control panel activity to each level. Each detector shall be individually programmable to operate at various sensibility settings.

6 The detector microprocessor shall contain an environmental compensation algorithm which identifies and sets ambient "environmental thresholds." The microprocessor shall continually monitor the environmental impact of temperature, humidity, other contaminates as well as detector aging. The process shall employ digital compensation to adapt the detector to both long term and short term environmental changes. The microprocessor shall monitor the environmental compensation value and alert the system operator when the detector approaches the allowable environmental compensation value. Differential sensing algorithms shall maintain a constant differential between selected detector sensitivity and the "learned" base line sensitivity. The base line sensitivity information shall be permanently stored at the detector.

7 The detector and loop controller shall provide increased reliability and inherent survivability through intelligent conventional operation. The device shall automatically change to stand alone, conventional device operation in the event of a loop controller polling communications failure. In the standalone detector mode, the detector shall continue to operate using sensitivity and environmental compensation information, stored in its microprocessor at the time of communications failure. The loop controller shall monitor the loop and activate a loop alarm if a detector reaches its alarm sensitivity threshold.

8 Detectors shall be capable of automatic electronic addressing and/or custom addressing. Devices using DIP or rotary switches for addressing, either in the base or on the detector shall not be

acceptable.

9 Detectors shall be suitable for operation in the following environment:

1 Temperature: 32ºF to 120ºF
2 Humidity: 0-93% RH, non-condensing
3 Elevation: Up to 6,000 ft.

B. Photoelectric Smoke Detectors

1 Addressable intelligent photoelectric smoke detectors shall be provided as indicated on the Drawings. The detector shall use a light scattering type photo electric smoke sensor to sense changes in air samples from its surroundings. An integral microprocessor shall dynamically examine values from the sensor and initiate an alarm based on the analysis of data. The detector shall utilize digital filters to remove signal patterns that are not typical of fires. Each detector shall have twin red/green status LEDs. The red LED shall indicate alarm condition and green LED shall indicate normal.

2 The detector shall continually monitor any changes in sensitivity due to the environmental affects of dirt, smoke, temperature and humidity. The information shall be stored in the integral processor and transferred to the loop controller.

3 Detector shall be programmable for different sensitivity during day and night periods.

4 The detector shall be suitable for direct insertion into air ducts up to 3 ft. high and 3 ft. wide with air velocities up to 5,000 ft/min.

5 The detector shall be rated for ceiling installation at a minimum of 30 foot centers.

6 The percent smoke obscuration per foot alarm setpoint for the detector shall be field selectable to various sensitive settings ranging from 1.0% to 3.5%.

C. Detector Mounting Bases

1 Detector mounting bases shall be suitable for mounting on a standard 4" square electrical outlet box. The base shall contain no electronics, support all detector types and have the following minimum requirements:

1 Removal of the respective detector shall not affect communications with other detectors.
2 Terminal connections shall be made on the room side of the base. Bases which must be removed to gain access to the terminals shall not be acceptable.
3 Capable of supporting a remote LED indicator and test station. Provide remote LED indicators and test stations as indicated on the Drawings.

D. Detector Mounting Plates

1 Provide detector mounting plate assemblies to facilitate mounting detectors for direct insertion into low velocity ductwork. The mounting plate shall be code gauge steel with corrosion resistant red enamel finish.

E. Duct Smoke Detectors

1 Air duct mounted smoke detectors shall be provided in the air supply stream of all central air handling equipment above 2000 cfm, i.e. Provide all necessary interface wiring for proper system operation.

2 The duct smoke detector shall be UL listed per UL 268A specifically for use in air handling systems. The detector shall operate at velocities of 300-4000 ft./min. The detector housing shall be equipped with an integral mounting base. It shall be capable of local testing via magnetic switch or remote testing using a remote test station. The duct detector housing shall incorporate an airtight smoke

chamber in compliance with UL 268A. The housing shall be capable of mounting to either rectangular or round ducts without adaptor brackets. An integral filter system shall be included to reduce dust and residue effects on detector housing, thereby reducing maintenance and servicing. Sampling tubes shall be easily installed after the housing is mounted to the duct by passing through the duct housing. The housing shall have a red enamel finish.

3 For each duct smoke detector provide a remote LED indicator and test station to be mounted in a location indicated on the Drawings and approved by the local authority having jurisdiction.

F. Beam Type Smoke Detectors 1. Provide projected beam type smoke detectors. Then beam detectors shall be four wire 24 Vdc and powered from the control panel 4 wire smoke power source. This unit shall consist of a separate transmitter and receiver capable of being powered separately or together. This unit shall operate in either a short range of 30 to 100 ft. (9.14 to 30.4m) or a long range of 100 to 300 ft. (30.4 to 91.4m). The detector shall feature a bank of four alignment LEDs on both the receiver and transmitter that are used to ensure proper alignment without the use of special tools. The beam detector shall feature automatic gain control which will compensate for gradual signal deterioration from dirt accumulation on lenses. Ceiling or mount as shown on the plans. Testing shall be carried out using calibrated test filters. Provide an activated remote test station>.

2.4 SYSTEM MODULES

A. Addressable intelligent modules shall support supervised Class B circuits. The modules shall be multi-function capable of field programming. The modules shall have a minimum of 2 diagnostic LEDs mounted behind a finished cover plate. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. The module shall be capable of storing diagnostic codes which can be retrieved for troubleshooting assistance. Input and output circuit wiring shall be supervised for open and ground faults. The module shall be suitable for operation in the following environment:

1 Temperature: 32ºF to 120ºF (0ºC to 49ºC)

2 Humidity: 0-93% RH, non-condensing

B. Single Input Module

1 Addressable intelligent single input modules shall be provided as required for the system configuration. The single input module shall provide one (1) supervised Class B input circuit. The module shall be suitable for mounting on 4” square electrical box. The single input module shall support the following input circuit types:

1 Normally-Open Alarm Latching (Manual Stations, Smoke Detectors, etc.)

2 Normally-Open Alarm Delayed Latching (Waterflow Switches)

3 Normally-Open Active Non-Latching (Monitors, Fans, Dampers, Doors, etc.)

4 Normally-Open Active Latching (Supervisory, Tamper Switches)

C. Dual Input Module

1 Addressable intelligent dual input modules shall be provided as required for the system configuration. The dual input module shall provide two (2) supervised Class B input circuits. The module shall be suitable for mounting on a standard 4” square electrical box. The dual input module shall support the following input circuit types:

1 Normally-Open Alarm Latching (Manual Stations, Smoke Detectors, etc.)

2 Normally-Open Alarm Delayed Latching (Waterflow Switches)

3 Normally-Open Active Non-Latching (Monitors, Fans, Dampers, Doors, etc.)

4 Normally-Open Active Latching (Supervisory, Tamper Switches)

D. Monitor Module

1 Addressable intelligent monitor modules shall be provided as required for the system configuration. The monitor module shall support one (1) supervised Class B normally-open active non-latching monitor circuit. The monitor module shall be suitable for mounting on a standard 4” square electrical box.

E. Waterflow/Tamper Module

1 Addressable intelligent waterflow/tamper modules shall be provided as required for the system configuration. The waterflow/tamper module shall support two (2) supervised Class B input circuits. Channel A shall support a normally-open alarm delayed latching waterflow switch circuit. Channel B shall support a normally-open active latching tamper switch. The waterflow/tamper module shall be suitable for mounting on a standard 4” square electrical box.

F. Single Input Signal Module

1 Addressable intelligent single input signal modules shall be provided as required for the system configuration. The single input signal module shall provide one (1) supervised Class B output circuit capable of supporting the operation of an audible/ visual signal power selector and a telephone power selector with ring tone for fire fighter's telephone. The module shall be suitable for mounting on a standard 4" square electrical box.

G. Dual Input Signal Module

1 Addressable intelligent dual input signal modules shall be provided as required for the system configuration. The dual input signal module shall provide a means to selectively connect one of two (2) signaling circuits to one (1) supervised output circuit. The dual input signal modules shall be capable of supporting the operation of an audible/visual signal power selector. The module shall be suitable for mounting on a standard 4" square electrical box.

H. Control Relay Module

1 Addressable intelligent control relay modules shall be provided as required for the system configuration. The control relay module shall provide one form "C" dry relay contact rated at 2 amps @ 24 Vdc to control external appliances or equipment shutdown. The control relay shall be rated for pilot duty and releasing systems. The position of the relay contact shall be confirmed by the system firmware. The control relay module shall be suitable for mounting on a standard 4" square electrical box.

I. Universal Class A/B Module

1 Addressable intelligent class A/B modules shall be provided as required for the system configuration. The universal class A/B module shall be capable of numerous operations. The module shall be suitable for mounting on a standard 4" square electrical box. The universal class A/B module shall support the following circuit types:

1 Two (2) supervised Class B Normally-Open Alarm Latching.
2 Two (2) supervised Class B Normally-Open Alarm Delayed Latching.
3 Two (2) supervised Class B Normally-Open Active Non-Latching.
4 Two (2) supervised Class B Normally-Open Active Latching.
5 One (1) form "C" dry relay contact rated at 2 amps @ 24 Vdc.
6 One (1) supervised Class A Normally-Open Alarm Latching.
7 One (1) supervised Class A Normally-Open Alarm Delayed Latching.
8 One (1) supervised Class A Normally-Open Active Non-Latching.
9 One (1) supervised Class A Normally-Open Active Latching.
10 One (1) supervised Class A 2-wire Smoke Alarm Non-Verified.
11 One (1) supervised Class B 2-wire Smoke Alarm Non-Verified.
12 One (1) supervised Class A 2-wire Smoke Alarm Verified
13 One (1) supervised Class B 2-wire Smoke Alarm Verified
14 One (1) supervised Class A Signal Circuit, 24Vdc @ 2A.
15 One (1) supervised Class B Signal Circuit, 24Vdc @ 2A.

2.5 MANUAL PULL STATIONS

A. Addressable intelligent dual action, non-break glass type, key reset, semi-flush mounted manual pull stations shall be provided as indicated on the Drawings. The stations shall be of Lexan construction, finished in red with white molded raised letters "PULL IN CASE OF FIRE". The station shall be suitable for mounting on a standard 4" square electrical box. The station shall have a minimum of 2 diagnostic LEDs mounted on their integral, factory assembled single or two stage input module. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. The station shall be capable of storing diagnostic codes which can be retrieved for troubleshooting assistance. Input circuit wiring shall be supervised for open and ground faults. The fire alarm pull station shall be suitable for operation in the following environment:

1 Temperature: 32ºF to 120ºF (0ºC to 49ºC)
2 Humidity: 0-93% RH, non-condensing

2.6 NOTIFICATION APPLIANCES

A. General

1 All appliances shall be UL listed for Fire Protective Service. All audible appliances, visual

appliances and combination audible/visual appliances shall be capable of providing the equivalent facilitation which is allowed under the Americans with Disabilities Act Accesabilities Guidelines (ADA/AG), and shall be UL 1971, and ULC S526 listed.

B. Audible Only Notification Appliances

1 Audible appliances shall be a mylar cone type speaker. Paper type cones are not acceptable. The rear of the speaker shall be completely sealed protecting the cone during and after installation. Speakers shall provide power taps at 1/4w, 1/2w, 1w, and 2w. Speakers shall provide UL confirmed 90 dBA sound output at 2w.

2 Audible appliances shall be provided with in/out wiring terminals.

3 Audible appliances shall be flush for ceiling mounted and flush/semi-flush for wall mounted as indicated on the Drawings. They shall have a white faceplate for ceiling mounting and red faceplate for wall mounting. They shall mount to a standard 4" square electrical box.

C. Visual Only Notification Appliances

1 Visual appliances shall be a self-synchronized strobe. The strobe flashtube shall be enclosed in a rugged lexan lens with solid state circuitry. The strobe shall provide 15, 15/75, 30, 60 and 110 candela synchronized flash outputs. The strobe intensity selection shall be based on the installed location within the building.

2 Visual appliances shall be provided with in/out field wiring terminals.

3 Visual appliances shall have lens markings oriented for wall mounting where indicated on the Drawings. They shall have a red faceplate for flush/semi-flush wall mounting. They shall mount to a standard 4" square electrical outlet box.

D. Combination Audible/Visual Notification Appliances

1 Combination appliances shall be a combination of the audible and visual appliances specified previously. They shall have a red faceplate for flush/semi-flush wall mounting.

2 The majority, if not all, of the notification appliances shall be combination devices such that the visual and audible requirements of ADA shall be complied with. Visual notification appliances shall be located in all areas of common use, i.e. lobbies, hallways, restrooms, meeting/conference/assembly areas, break rooms, copy/fax/mail rooms, etc. Audible notification appliances shall produce a sound that exceeds the prevailing equivalent sound level in the room or space by at least 15dbA or exceeds any maximum sound level with a duration of 60 seconds by 5dbA, whichever is louder. Sound levels for alarm signals shall not exceed 120 dbA. It is the intent of the Drawings to show all devices that are required. The fire alarm system vendor/bidder shall provide all appliances shown and/or required by these specifications but it others are anticipated to be required the vendor/bidder shall qualify the provisions for the system making note of the additional cost for the anticipated additional requirements.

2.7 ANCILLARY DEVICES

A. Remote Relays

1 Multi-Voltage Control Relays

1 Remote control relays shall be provided as required for the system configuration for connection to supervised ancillary circuits for control of fans, dampers, door releases, etc. Relay contact ratings shall be SPDT or DPDT, as required, and rated for 10 amperes at 115 Vac. A single relay may be energized from a voltage source of 12 Vdc, 12 Vac, 24 Vdc, 24 Vac, 115 Vac, or 230 Vac, as required. A red LED shall indicate the relay is energized. A metal enclosure shall be provided.

2 Manual Override Control Relays

1 Remote control relays with a manual override shall be provided as required for the system configuration for connection to supervised ancillary circuits for control of fans, dampers, door releases, etc. Relay contact ratings shall be SPDT and rated for 10 amperes at 115 Vac or 24 Vdc. A single relay may be energized from a voltage source of 24 Vdc or 24 Vac. A red LED shall indicate the relay is energized.

3 Heavy Duty Power Relays

1 Remote control relays shall be provided as required for the system configuration for connection to supervised ancillary circuits for control of fans, dampers, door releases, etc. Relay contact ratings shall be DPDT and rated for 30 amperes at 300 Vac or 2 HP motor load. A single relay may be energized from a voltage source of 24 Vac,115 Vac, as required. A metal enclosure shall be provided.

2.8 ELECTROMAGNETIC DOOR HOLDERS

A. Provide single or double door, floor or wall mounted electromagnetic door holder/release devices as indicated

on the Drawings. The devices shall be rated for 24V ac/dc input. The devices shall be brushed zinc finished.

2.9 FIRE ALARM CABLE

A. The fire alarm cable shall plenum rated and be UL listed and suitable for use as power limited fire protective signaling circuit cable in accordance with National Electric Code Article 760 (Fire Alarm Systems) and Article 725 (Class 1, Class 2 and Class 3 - Remote Control, Signaling and Power-Limited Circuits).

B. Cable Construction

1 Conductors shall be solid, soft annealed, uncoated copper.

2 Insulation shall be 300 volt, 105ºC polyvinylchloride.

3 Two conductor, non-shielded cables shall be parallel; shielded and three or more conductors shall be cabled round.

4 Shielding shall be mylar backed aluminum foil, helically wrapped to provide 100% coverage. A suitable copper drain wire shall be provided with shielded cables.

5 Jacket shall be red, 105ºC polyvinylchloride, rated 300 volt.

6 Cable shall be plenum rated when installed in air handling plenums.

C. In general, non-shielded cable is acceptable for use throughout except on voice circuits. All voice circuits shall utilize shielded, twisted pair cable.

PART 3 - EXECUTION

3.1 APPROVALS

A. Complete fire alarm system drawings shall be issued to the Local Authority Having Jurisdiction for approval prior to the installation of the fire alarm system.

3.2 INSTALLATION

A. Installation of the Fire Alarm System shall be in strict compliance with manufacturers recommendations. The entire system shall be installed in accordance with approved manufacturers manuals and wiring diagrams and as approved by the Local Authority Having Jurisdiction.

B. Fire alarm cable shall be installed in conduit in areas of exposed structure and within inaccessible ceilings. Conduit shall also be provided from outlet boxes within walls stubbed up to accessible ceilings. Provide **end bushings** on conduit stub-ups. Cable only is acceptable in accessible ceilings.

C. All conduit, wiring, outlet boxes, junction boxes, cabinets and similar devices necessary for the complete installation shall be included as part of the system. All junction box blank coverplates shall be labeled with a red “F.A.” for identification purposes.

D. All wiring shall be color coded throughout.

E. The system shall be installed and fully tested under the supervision of trained manufacturer's representatives. The system shall be demonstrated to perform all the functions as specified.

END OF SECTION

SECTION 16726
INTRUSION DETECTION SYSTEM (IDS)

1.0 GENERAL

1.1 Manufacturer

A. The manufacturer shall have at least twenty-five (25) years of experience in the role of fire and security control manufacturing, and a proven track record of forward and backward compatibility for a minimum of twenty (20) years for its product's auxiliary devices, including system keypads, annunciation devices, zone expansion modules, and addressable detection devices.

B. The manufacturer must also manufacture receiving equipment that is compatible with standard dial-up telephone lines and network monitoring equipment that is compatible with a LAN, WAN, and the Internet. The receiving equipment shall be capable of receiving all status and alarm messages generated by the system. The receiving equipment shall be capable of updating the panel operating program and the system date and time.

C. Intrusion detection/Access control pane(SEC) equipment manufacturer shall be:

Digital Monitoring Products, Incorporated (DMP) #XR500N

1.2 Installer

A. The installing company shall show proof of having regular experience with design, installation, service, and maintenance of manufactured systems for a minimum of the last twelve (12) calendar months from the project start date. Each system installer and service person must provide manufacturer certification of technical training for installation, service, and system maintenance. Certification shall be proven with an official document issued by the manufacturer.

B. The installing company shall provide a minimum of 8 (eight) verifiable references from its clients where the manufacturer's system has been installed within the last twelve (12) calendar months from the project start date.

C. The installing company shall furnish and install a complete electrically supervised Command Processor™ Panel, as detailed in this specification. The system shall be inclusive of all necessary function, monitoring, and control capability as detailed herein and on accompanying shop drawings.

E. The installing company shall become familiar with all details of the work, verify all dimensions in the field, and shall advise the Architect of any discrepancy before performing the work. Materials shall be installed in strict compliance with local building codes. All work shall be performed in accordance with Digital Monitoring Products, Inc. instructions.

1.3 Central Reporting Station

A. The central reporting station contractor must possess an Underwriter's Laboratory (UL) listing as a "Mercantile Police Station" or "Mercantile Burglar Alarm Systems" company. A copy of the listing shall be attached as a part of this bid package.

B. The actual alarm signal receipt and processing is a significant portion of the scope of work. Third party and/ or contract stations are permitted. UL must list the monitoring station for Protective Signaling Services or Central Reporting Station Signaling Services. A copy of the station UL listing shall be attached as part of this bid package.

C. The monitoring station must provide openings/ closing activity reports, activity day and time, authorized individual, office name and account number and the system type being monitored. These reports are to be mailed to the user's office at the end of each month. The Office Manager or Contract Administrator may request an additional report if an incident occurs.

D. The contractor must have a valid Alarm Operator License. A copy of licenses shall be attached as part of this bid package.

E. The contractor may be required to monitor a portion of the alarm systems by way of the end user data network.

F. The Contractor shall become familiar with all work details, verify all dimensions in the field, and shall advise the Architect of any discrepancy before performing the work.

G. The end user shall not incur any central station setup charges by the contractor to receive alarm signals by way of the end user data network.2.0 SCOPE

2.1 Requirements

A. Furnish and install a complete Intrusion Detection/ Access Control system (SEC) with the performance criteria detailed in this specification. The system shall be inclusive of all necessary functions, monitoring, and control capability as detailed herein and on accompanying Shop drawings.
   - On-site or remote video monitoring
   - Heating, air conditioning, and lighting management
   - Temperature threshold detection and monitoring
   - Humidity threshold detection and monitoring
   - Pressure threshold detection and monitoring
   - Power loss detection and monitoring, generator switching
   - Leak detection and monitoring
   - Carbon Monoxide detection and monitoring
   - Tank level threshold detection and monitoring

B. This specification document provides the requirements for the installation, programming, and configuration of a complete Command Processor Panel. This system shall include, but not be limited to:
   - Control panel
   - System cabinet
   - Power supply
   - Digital Signaling Line Circuits (SLC)
   - Notification Appliance Circuits (NAC)
   - Annunciator/keypad bus
   - Batteries
   - Wiring
   - Conduit
   - Associated peripheral devices
   - Other relevant components and accessories required to furnish and install a complete and operational addressable reporting Life Safety System.

2.2 Standards

The system shall be listed as a Power Limited Device and be listed under the standards in the table. Each system shall be supplied with complete details on all installation criteria necessary to meet all of the listings.

Burglary Listings
- UL 365 Police Connect Burglar
- UL 609 Local Burglar
- UL 1023 Household Burglar Alarm System Units
- UL 1076 Proprietary Burglar
- UL 1610 Central Station Burglar Alarm Units
- UL 1635 Digital Burglar Alarm Communicator System Units

Fire Listings
- UL 864 Control Units for Fire Protective Signaling Systems
- UL 985 Household Fire Warning

Access Control Listings
- UL 294 Access Control System Units

Related Listings
- NFPA 70 National Electric Code (NEC)
- NFPA 72 Local Protective Signaling
- NFPA 72 Remote Station Protective Signaling
- NFPA 72 Proprietary Protective Signaling
- NFPA 72 Household Fire Warning

U.S. Government Standards/Listings
- Meets DCID 6/9
- Meets DoD/NIST SCIF Standards

2.3 Americans with Disabilities

All indicating and notification appliances shall comply with the Americans with Disabilities Act (ADA) requirements.

3.0 SUBMITTALS

3.1 General Requirements

The contractor shall submit three (10) complete sets of documentation within thirty (30) calendar days after contract award date. Indicated in the document shall be the manufacturers' names, catalog number, type, size, style, rating, and catalog data sheets for all items proposed to meet these specifications.

3.2 Shop Drawings

Shop drawings shall be submitted in accordance with Section 3.0 Submittals and shall consist of a complete list of equipment and materials, including manufacturer's descriptive and technical literature, performance charts and curves, catalog cuts, and installation instructions.

3.3 As-Built Drawings

The contractor shall provide a complete set of as-built drawings for the entire system upon installation completion. These drawings shall include, but not be limited to, the exact locations of all equipment, connections between all equipment, and wiring for all equipment as the system is installed.

3.4 Spare Parts Data

After shop drawings are approved, and not later than thirty (30) calendar days prior to the date of beneficial occupancy, a list of spare parts data for each item of specified materials and equipment shall be submitted. The data shall include a complete list of parts and supplies with current unit prices and source of supply. Spare parts shall consist of, but not be limited to, five (5) percent of all initiating and notification appliances with a minimum of one (1) each. All spare parts shall be on site prior to commencement of acceptance testing. Depleted spare parts shall be replaced prior to beneficial occupancy.

3.5 Operating Documents

The contractor shall furnish to the architect operating instructions outlining the step-by-step procedures required for system start-up, operation, and shutdown at least thirty (30) calendar days prior to acceptance test. The instructions shall include the manufacturer's name, system model number, service manual, parts list, and a description of all equipment and their basic operating features.

3.6 Maintenance Documents

The contractor shall furnish maintenance instructions listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides at least 30 calendar days prior to acceptance test.

3.7 Performance Test Reports

Upon the installed system completion and testing, test reports shall be submitted in booklet form showing all field tests performed to prove compliance with specified performance criteria.

3.8 Warranty

A copy of the manufacturer's warranty for all equipment and materials shall be provided. Warranty shall be for all equipment, materials, installation, and workmanship for a minimum of three (3) years, unless otherwise specified.

4.0 GENERAL COMPONENT REQUIREMENTS

4.1. Component Enclosure

Housings; power supply enclosures, terminal cabinets, control units, and other component housings, collectively referred to as enclosures shall be so formed and assembled as to be sturdy and rigid. If sheet steel is used in the fabrication of enclosures, it shall be not less than an 18 gauge door with a 20 gauge box frame. Where exposed pins, the hinges shall be of the tight pin type or the ends of hinge pins shall be tack welded to prevent ready removal. Doors having a latch edge length of less than 24 inches shall be provided with a single lock. Where the hinged door latch edge is 24 inches or more in length, doors shall be provided with three-point latching device with lock; or alternatively with two locks, one located near each end. For SCIF and High Security applications an attack proof enclosure with proper tampers UL listed for use with the XR500/XR500N/XR500E shall be used.

4.2 Electronic Components

A. All system electronic components shall be solid-state type, mounted on printed circuit boards. Light duty relays and similar switching devices shall be solid-state type or electromechanical.

B. The panel shall have an over current notification LED that lights when devices connected to the Keypad Bus and LX-Bus(es) draw more current than the panel is rated for. When the over current LED lights, the LX-Bus (es) and Keypad bus are shut down.

4.3 Control Unit

A. A battery test shall be automatically performed to test the integrity of the standby battery. The test shall disconnect the standby battery from the charging circuit and place a load on the battery. This test shall be performed no more than every 180 seconds.

B. The control unit shall be capable of operating and supervising notification appliance devices as well as addressable initiating detection devices and an integrated supervised dual line digital communicator.

C. Control unit must be "Flash ROM" updatable, and program must be held in non-volatile RAM. The panel shall be able to function while the update is in process.

D. Control unit shall be capable of operating using an optional built in Encrypted Alarm Router for SCIF (Sensitive Compartmented Information Facility) applications that is certified by NIST (National Institute of Standards and Technology) for 128 Bit AES Rijndael Encryption communications.

E. The optional built-in Encrypted Alarm Router shall be capable of compliance with DCID 6/9 and UL 2050 standards.

4.4 Remote Annunciators

A. The system shall support a maximum of sixteen (16) supervised remote annunciators with the identical capabilities, functions and display layout. Operation of the remote annunciators shall be limited to authorized users by the use of a code or key.

B. The remote annunciators shall be capable of operating at a maximum wiring distance of 15,000 feet from the control unit on unshielded, non-twisted cable.

4.5 Control Designations

Controls shall be provided to ensure ease of operation of all specified characteristics. Where applicable, clockwise rotation of controls shall result in an increasing function. Controls, switches, visual signals and indicating devices, input and output connectors, terminals and test points shall be clearly marked or labeled on the hardware to permit quick identification of intended use and location.

4.6 Test Modes

A. The system shall include a provision that permits testing from any alphanumeric keypad. The test shall include standby battery, alarm bell or siren, and communication to the central station.

B. The system shall include a provision for an automatic, daily, weekly, thirty (30) day, or up to sixty (60) day communication link test from the control panel installation site to the central station.

C. The system shall include a provision for displaying the internal system power and wiring conditions. Internal monitors shall include the bell circuit, AC power, battery voltage level, charging voltage, panel box tamper, phone trouble line 1, phone trouble line 2, transmit trouble, and network trouble.

4.7 Serial Interface

The control panel shall be capable of a serial interface to output information to a standard serial printer or serial interface to a communication port on a standard computer. Through control panel programming the system shall include a provision to allow the selection of which reports are to be output.

4.8 Power Supplies

A. Power supplies for the control unit shall operate from 120 VAC, supplied at the respective protected areas. Standby batteries shall be supplied to power the system in the event of a utility power failure. Batteries shall be sized to provide 105% capacity for eight hours. Standby batteries shall be sealed lead-acid. Power supplies shall be all Solid State.

B. Controls shall be designed to maintain full battery charge when alternating current is available. Batteries shall be recharged to 85% capacity within 24 hours from battery use. The system shall be automatically transferred to battery power upon loss of alternating current power and return to alternating current power upon restoration. Intrusion alarms shall not be initiated during switch over; a signal shall be initiated upon failure of battery or alternating current power.

C. Approved power supplies shall meet or exceed the following power supply model specifications:
- UL Listed DMP 505-12: 12VDC 5 amp with transformer and enclosure.
- UL Listed DMP 504-24: 24 VDC 4 amps with transformer and enclosure.

4.9 Software

A. The system shall interface with computer software with the capability to fully program the panel by connecting to the panel through:
- Direct cable connection interface card
- Receiver phone line connection
- Standard phone line connection
- Ethernet network connection
- Network connection across the Internet

B. The system shall interface with computer software capable of locking down all controlled doors.

C. The system shall interface with computer software capable of monitoring and logging all events.

D. The system shall interface with computer software capable of exporting reports in the following file formats:

- Excel spreadsheet (*.xls)
- Rich Text (*.rtf)
- Windows Metafile (*.wmf)
- QuickReport (*.qrp)
- Text (*.txt)
- Comma-separated (*.csv)
- HTML document (*.htm)

E. The system shall interface with computer software capable of printing custom, filtered reports including:

- All Events
- Zone Action
- Arming/Disarming
- Area Late to Close
- User Code Changes
- Door Access Granted
- Door Access Denied
- Opening/Closing Schedule Changes
- System Monitors
- System Events

4.10 Control Panel Capability

The basic control panel shall provide:

- Expansion to a total of at least 10,000 user codes with 99 user profile definitions.
- Sixteen (16) independent door/keypad addresses, each with four zones.
- Twenty (20) Holiday Dates for custom holiday scheduling by area.
- A total door access granted event buffer of at least 10,000 events.
- Anti-passback access control selectable by area and user.
- Four (4) shift schedules per area.
- A total of at least 100 programmable output relay schedules.
- Thirty-two (32) individual reporting areas.
- Built-in bell and telephone line supervision.

The networked control panel shall provide:

- All of the above features.
- Require two-man access code or credentials.
- Support programming to require the same or different access code entered within a programmed delay time of 1 to 15 minutes after disarming before activating a silent ambush alarm.
- Support area programming that disables schedule and time-of-day changes while system is armed so that area can only be disarmed during scheduled times.

The encrypted control panel shall provide:

- All of the basic and network features listed above.
- Built-in Encrypted Alarm Router.
- Certified operation that meets 128 Bit AES Rijndael Encryption communications.
- Certified operation that meets SCIF (Sensitive Compartmented Information Facility) application needs.
- Certified operation that meets NIST (National Institute of Standards and Technology) standards.
- Certification that encrypted panel is capable of meeting DCID 6/9 standards.
- Certification that encrypted panel is capable of meeting UL 2050 standards.

5.0 FUNCTIONAL DESCRIPTIONS

5.1 System Description

A. The system areas and zones shall be programmable, and the system shall store, log, display, and transmit specific custom designations for system areas, zones, and user names.

B. To ensure continued, one-call support, the system shall be constructed of sensing components provided directly by the system manufacturer, such as power supplies, motion detectors, door and window position switches, glass break detectors, or other sensing devices that the manufacturer offers.

C. The system controller, user interfaces, zone input devices, relay output devices, and the system signal receiving equipment shall be engineered, manufactured, assembled, and must be distributed from a location within the United States of America.

D. The system shall support user interaction by way of a keypad, web browser, system software, key switch, or radio frequency wireless control, using integrated or auxiliary devices provided by the system manufacturer.

E. The system shall support controller zone input connections, system keypads, system zone expansion modules, and wireless zone input modules, and must support zone input connections by way of at least two competitive products. The system shall offer a seamless integrated compatibility with hard-wire and/ or wireless zone expansion equipment for at least 200 wireless zones and/ or a maximum of 574 hardwired zones.

F. The system shall be capable of offering at least five zone expansion buses, each of which can support the connection of up to 15,000 feet of four-wire cable. Zone expansion and keypad data buses that exceed 2,500 feet of cable must include splitter/repeater modules to boost data voltage and maintain data integrity.

G. The system shall provide a seamless capability to provide a minimum of 500 addressable relays, which can be located at any connection location upon a zone expansion bus.

H. System relay outputs shall have the capability of being triggered as a result of a command from the user interface, changes in system status, changes in zone status, or by a programmable schedule.

I. System relay output states shall be programmable for momentary, maintained, pulsed, or must follow the state of an associated system zone input.

J. The system shall be completely programmable either locally from a keypad or remotely through a standard dial-up, and network connections by way of a LAN, WAN, and/or by way of the Internet.

K. The control unit shall be completely programmable remotely using remote annunciators, and/ or using upload/ download software that communicates using SDLC 300 baud, 2400 baud, or IP Addressed data network. On-site programming from a personal computer shall also be permitted.

L. The control unit shall be equipped with an anti-reversing circuit breaker to prevent damage due to accidental reversal of battery leads.

5.2 Input/Output Capacity

A. This system shall be capable of monitoring a maximum of 574 individual zones and controlling a maximum of 502 output relays.

B. The control panel shall have, as an integral part of the assembly, 2 SPDT Form C relays rated at 1 Amp at 30 VDC and four open collector 12 VDC outputs rated at 50mA each. It shall also have the capacity of a maximum of 125 output expander modules with 500 switched ground, open collector outputs, 50mA maximum and 502 auxiliary relays (Form C rated at 1.0 Amp at 30 VDC).

C. The panel shall also provide 100 programmable output schedules, and include an integral bell alarm circuit providing at least 1.5 Amps of steady, pulsed, or temporal bell output. Output type shall be programmable by zone type. Relays and voltage outputs shall be capable of being independently programmed to turn on and/or off at selected times each day.

5.3 User/Authorization Level Capacity

The system shall be capable of operation by 10,000 unique Personal Identification Number (PIN) codes with each code having one (1) of ninety-nine (99) custom user profiles. This allows for limitation of certain functions to authorized users. The operation of all keypads shall be limited to authorized users.

5.4 Keypads

A. The keypads shall be DMP # 7063. The system shall support a maximum of sixteen (16) keypads with alphanumeric display. Each keypad shall be capable of arming and disarming any system area based on a **pass code and Proximity key authorization.** The keypad alphanumeric display shall provide complete prompt messages during all stages of operation and system programming and display all relevant operating and test data.

B. Communication between the control panel and all keypads and zone expanders shall be multiplexed over a non-shielded multi-conductor cable, as recommended by the manufacturer. This cable shall also provide the power to all keypads, zone expanders, output expanders, and other power consuming detection devices.

C. If at any time a keypad does not detect polling, the alphanumeric display shall indicate "SYSTEM TROUBLE". If at any time two devices are programmed for the same address, the alphanumeric keypad shall display “4 WIRE BUS TROUBLE”. If at any time a keypad detects polling but not for its particular address, the alphanumeric display shall indicate "NON POLLED ADDR". The system shall display all system troubles at selected keypads with distinct alphanumeric messages.

D. The keypad shall include self-test diagnostics enabling the installer to test all keypad functions: display test, key test, zone test, LED test, relay test, tone test, and address test.

E. The keypad shall provide an easy-to-read English text display. The text shall exactly match the text seen in all software reports, keypad displays, and central station reports.

F. The keypad user interface shall be a simple-to-use, menu-driven help system that is completely user friendly.

G. The control panel shall support a keypad interface accessible on the World Wide Web in a browser window. The web-accessible keypad interface shall provide at least five (5) programmable hyperlinks for camera access or other use.

H. The system shall support sub-control keypads with four (4) built-in zones and capable of functioning in the following modes:
   - Panel monitors all four (4) keypad zones independently with a maximum of 125 keypads attached to the control panel
   - Panel assigns one (1) zone to each keypad and monitors all keypad zones as a single zone with a maximum of 500 keypads attached to the control panel
   - Stand-alone mode allowing keypad to operate as a self-contained security system independent of the control panel

5.5 Zone Configuration

A. A minimum of 4 Class B ungrounded zones shall be available at each keypad or zone expander on the system. The system shall have the capacity for a maximum of sixteen (16) keypads and a maximum of 125 four (4) zone expanders or 500 single zone expanders. It shall also have the capacity of a maximum of 125 supervised relay output expanders. All Class B zones shall be 2-wire, 22 AWG minimum, supervised by an end-of-line (EOL) device and shall be able to detect open and short conditions in excess of 500ms duration.

B. Each zone shall function in any of the following configurations: Night, Day, Exit, Fire, Supervisory, Emergency, Panic, Auxiliary 1, Auxiliary 2, Fire Verification, Cross Zone, Priority, and Key Switch Arming.

C. The digital SLCs and the annunciator/keypad bus shall be able to operate at a maximum wiring distance of 2500 feet from the control panel on unshielded, non-twisted cable. This distance may be extended to a total of 15,000 feet when bus repeater modules are installed.

D. The system shall have the capability to incorporate up to 200 zone expander POPIT™ points.

E. Each zone shall function in any of the following configurations:

- Night
- Day
- Exit
- Fire
- Supervisory
- Emergency
- Panic
- Auxiliary 1
- Auxiliary 2
- Fire Verification
- Cross-Zone
- Priority
- Arming

5.6 Communication

A. The system shall be capable of signaling to two remote monitoring station receivers, four telephone numbers of 32 digits each using two separate switched telephone network lines such that if two unsuccessful attempts are made on the first line to the first number, the system shall make two attempts on first line to the second number. If these two attempts are unsuccessful, the system shall make two further attempts on the first line of the first number. After the tenth unsuccessful attempt, dialing shall stop and the alphanumeric keypad shall display trouble. Should another event occur that requires a report to be transmitted, the dialing process shall be repeated. The system shall have a programmable option to dial a second set of telephone numbers after the first ten attempts using the same sequence.

B. The system shall be capable of communication using the IBM Synchronous Data Link Control format, and at least two other standard industry formats.

C. The system shall be capable of supporting Network communication with digital dialer backup, existing Ethernet or token ring data networks, satellite communication, fiber optic networks, local area networks, wide area networks, cellular communication, and retail data networks.

5.7 Network Communication

A. The control panel shall be capable of asynchronous network communication with a retry time between 3 and 15 seconds for a total of one (1) minute. If communication is unsuccessful the control panel shall be capable of attempting backup communication through any of the available communication methods to the same receiver or a backup receiver.

B. Network communication between the control panel and the receiver shall be in a proprietary communication format.

C. The control panel shall be capable of supporting Dynamic Host Communication Protocol (DHCP) Internet Protocol (IP) addressing.

D. Underwriters Laboratories (UL) shall list network communication by the control panel for Grade AA High-Line Security.

E. The control panel shall be capable of two-way network communication using standard Ethernet 10BaseT in a LAN, WAN, or Internet configuration.

F. The control panel shall be capable of communication by means of a 128 Bit AES Rijndael Encryption process certified by NIST (National Institute of Standards and Technology) to an SCS-1R receiver with a built-in Encryption Alarm Router.

G. The control panel shall be capable of meeting DCID 6/9 and UL 2050 standards.

5.8 TCP/IP Network Trapping

A. The control panel shall be capable of having communication set to Network operation. When a trap is set in Remote Link, the software shall be capable of sending a panel trap message with the panel account number to the iCOM or iCOM-E installed in an SCS-1R receiver.

B. The receiver iCOM or iCOM-E shall store the trap and monitor the panel for the next message. When the panel sends its next message, the receiver iCOM or iCOM-E shall then send a message to the panel to contact Remote Link at the IP address contained in the original trap message.

C. The trap message shall be stored in the receiver iCOM or iCOM-E for up to four hours. If the trap message is not sent to the panel within the four-hour window, the panel trap message shall be discarded and a new trap message must be sent from Remote Link.

D. The user shall be able to view the trap status in the receiver iCOM or iCOM-E in Remote Link using the Trap Query function.

5.9 NAC Circuit Configuration

A. The system shall be capable of additional Class B NAC circuits utilizing the Model 867 Notification Module. Each module shall be controlled and supervised via the SLC loop and monitor for short circuits, open circuits, and ground faults. The NAC circuits shall monitor for external NAC trouble conditions.

B. The system shall be capable of providing Class A NAC circuits utilizing the Model 865 Notification Module. Each module shall monitor for short circuits, open circuits, and ground faults. The NAC circuits shall monitor for external NAC trouble conditions and have a manual bell silence switch.

6.0 INTEGRATED INTRUSION ALARM AND ACCESS CONTROL OPERATION

6.1 Access Authority Levels

The system shall be capable of programming access credentials authority levels to check whether the user has access to a specific area and also has the authority to disarm or arm the area. If the user access credential has access and disarm/arm authority the system shall provide the user the option to disarm the area simultaneously upon opening the door, or to open the door and begin an entry delay timer. With the timer option the user then disarms the area using an intrusion control keypad inside the area. If the user only has access authority to the area and the area is in an armed condition, the user is denied access to the area.

6.2 Door Open Schedule Override

The system shall be capable of programming certain area doors to be scheduled to unlock and lock at specific times of the day or night. The lock/unlock function shall be capable of an override option depending upon the area armed/disarmed status. If the area remains in an armed status at the scheduled unlock time the armed status overrides the unlock schedule ensuring the doors remain locked and armed in situations where the business might open late, close early, is affected by inclement weather, or another emergency.

6.3 Common Area

The system shall be capable of programming a common area to be armed when the last area in the system is armed and disarmed when the first area in the system is disarmed. To ensure the common area works properly it shall not have any user codes assigned to the common area. The system shall also be capable of programming multiple common areas.

6.4 Early Morning Ambush (XR500N and XR500E only)

A. The system shall be capable of programming an area to require two user codes be entered within a programmed number of minutes to prevent an ambush message from being sent to the Central Station Receiver. If both user codes are not entered within the time an ambush message is sent to the central station receiver.

B. Both user codes shall have the authority to disarm the specific area and must be entered at the same keypad or reader. The keypad shall not display any indication that the ambush timer is running.

C. The system shall be capable of programming an output to provide an external indicator that an ambush situation is taking place.

6.5 Two-Man Rule (XR500N and XR500E only)

The system shall be capable of programming an area to require two separate user codes be entered in order to disarm and/or allow access to a specific area. Both required codes shall have at least the same or greater authority level. Both required codes shall be entered within 30 seconds or an alarm shall activate.

6.6 UL Bank Safe & Vault Operation (XR500N and XR500E only)

The system shall be capable of being programmed to only be disarmed during scheduled times regardless of the authority level of any user code or user profile in the system. The schedule and time and date set for this area shall not be capable of being changed while the area is armed. Zones assigned to Bank Safe & Vault areas shall not be able to be bypassed or force armed.

6.7 Panic Button Summary Test (XR500N and XR500E only)

A. The system shall have the ability to test panic buttons without sending a panic alarm to the Central Station Receiver.

B. The system shall also have the ability to send panic zone test verification and failure results to the Central Station Receiver.

C. During the test, each time a panic zone trips, the display number shall increment and the keypad buzzer sound for two seconds.

D. The number of panic zones tripped shall constantly display until the test ends or no panic zone activity has occurred for 20 minutes.

E. When the Panic Zone Test ends and a zone failed (did not trip) during the test, the keypad shall be able to display the zone name and number and have the buzzer sounds for one second. Additional zone failed zones shall display when a button is pressed.

7.0 FALSE ALARM REDUCTION FEATURES

The system shall be capable of providing false alarm reduction features, functions, capabilities, or processes that either require alarms be verified or potential alarms be corrected before a system or zone can be placed into an armed state.

7.1 Exit Error Alert and Reporting

The panel shall be able to provide an automatic function to prevent a false alarm from occurring if an exit door does not properly close after the system is armed.

7.2 Entry and Exit Delay Annunciation

A. When arming, the system shall provide clear annunciation indicators to the user about the need to exit the premises prior to the exit delay time expiring.

B. When disarming, the system shall notify the user the need to disarm the system prior to the entry delay time expiring.

7.3 Remote Annunciation

The system shall be able to provide entry and exit delay time period notification. This notification can be from DMP keypads, remote annunciators, or bell tests.

7.4 Abort Reporting

The system shall be capable of sending an Abort report to the central station if the system is disarmed while the alarm is still sounding. The Abort report shall be sent *after* the alarm report to notify the central station that an authorized user has cancelled the alarm.

7.5 System Testing

The system shall offer testing features that are simple, quick, and complete and provide the highest measure of safety by ensuring that alarm conditions are detected and communicated to the proper authorities in a timely manner and on a regularly scheduled basis.

7.6 Ambush Code

The system shall offer ambush codes for those dangerous encounters where the user is instructed to either arm or disarm the system under threat of harm. The duress code shall disarm the system without giving local indication of an alarm that might put the user well-being in jeopardy.

7.7 Two-Button Panic Feature

The system shall support DMP keypads that provide the option to use only two-button panic codes. The user shall be required to press and hold two designated keys for approximately two seconds before the system generates a panic alarm.

7.8 Fire Verify Zones

The system shall support Fire Verify zones to help the panel verify the existence of an actual fire condition before it sends an alarm report to the central station. The Fire Verify zone shall require the panel to perform a Sensor Reset whenever a device connected to a Fire Verify zone initiates an alarm. This shall begin a verification period during which the panel waits for a second alarm initiation. If the original zone or any other Fire Verify zone on the panel initiates an alarm within the next 120 seconds, the panel shall recognize this as an actual alarm and send an alarm report to the central station.

7.9 Cross-Zoning Protection

The system shall support cross-zoning as a means of requiring two device trips to occur within a short period of time before sounding an alarm and sending an alarm report to the central station. Supported device trips shall be from one device that trips two times, or from two devices that each trip once.

7.10 Swinger Zone Bypassing

The system shall be capable of automatically bypassing a zone if it goes into an alarm or trouble condition a specified number of times within a one-hour period. The panel shall be able to track the number of times the zone trips while armed and compare that against a programmed number. When that number is reached, the panel shall be able to automatically bypass the zone. The panel shall be capable of resetting the zone when the area to which it is assigned disarms, is manually reset from the keypad or remotely, or remains normal for one hour.

7.11 Recently Armed Report

The system shall be capable sending a System Recently Armed report, along with a zone alarm report, to the central station any time an alarm occurs within five minutes of the system arming. The System Recently Armed report allows the central station operator to follow a "call the subscriber first" procedure instead of immediately dispatching the police to what could be a false alarm.

7.12 Transmit Delay

The system shall be capable of programming the panel to wait up to 60 seconds before sending burglary alarm reports to the central station. If an alarm is accidental, the user shall be able to disarm the system within the programmed Transmit Delay time. An Abort report shall be sent in place of an alarm report after the system disarms. During the alarm, sirens and panel relay outputs shall not be delayed and shall still provide local condition annunciation.

7.13 Call Waiting Cancel

The system shall be capable of being programmed to cancel call waiting any time the panel dials the receiver number to send a report.

9.0 BURGLARY CONTROL SPECIFICATIONS

9.1 Burglary Standards

The Burglary system shall be listed as a Power Limited Device and be listed under the standards in the table below. Each system shall be supplied with complete details on all installation criteria necessary to meet all of the listings.

Burglary Listings

- UL 365 Police Connect Burglar
- UL 609 Local Burglar
- UL 1023 Household Burglar Alarm System Units
- UL 1076 Proprietary Burglar
- UL 1610 Central Station Burglar Alarm Units
- UL 1635 Digital Burglar Alarm Communicator System Units

Additional Listings

- NFPA 72 Local Protective Signaling
- NFPA 72 Remote Station Protective Signaling
- NFPA 72 Proprietary Protective Signaling

U.S. Government Standards

- Meets DCID 6/9
- Meets DoD/NIST SCIF Standards

9.2 Area System

A. The system user shall be capable of selectively arming and disarming any one or more of 32 areas within the intrusion detection system based on the user PIN code and/or keypad used. Each of the 574 zones shall be able to be assigned to any of the 32 available areas. The system shall be capable of having up to a sixteen (16) character length name programmed for each area.

B. The system user shall be capable of assigning an opening and closing schedule to all areas or to each of the 32 areas separately. Each area shall be able to arm or disarm automatically by a schedule. The system shall have the capacity for common areas that automatically disarm when any other area disarms and that automatically arm when all others areas arm.

C. The networked system shall have the ability to comply with Bank Safe & Vault application. The networked system shall also have the ability to use a two-man rule for disarming or allowing door access to an area. The system shall have the ability to operate a Common Area application.

9.3 Zones

The system shall have a minimum of eight (8) grounded burglary zones available from the control panel.

9.4 Burglary Equipment

Burglary detection equipment shall communicate to the system by way of the control panel loop expansion bus or 900MHz receiver. The detection equipment shall have a three (3) year warranty and meet or exceed features offered in the products listed in Section 9.0 of this document.

10.0 ACCESS CONTROL SPECIFICATIONS – N/A

11.0 COMPILED DETECTION EQUIPMENT LISTING

11.1 Hard-wired

Hard-wired detection equipment shall communicate to the system by way of the control panel loop expansion bus. The equipment shall have a three (3) year warranty as stated in the current DMP Product Catalog and meet or exceed features offered in the following products:

- Motion Detector – equal to #C&K 907(hallways) and #C&K 706(classrooms)
- Door Contact – DMP Model SD70 (concealed applications – requires DMP zone expander)
- Bus Splitter/Repeater Module – DMP Model 710
- Door Contact – DMP Model SM20WG (surface applications – requires DMP zone expander)
- Output Expansion Module - DMP Models 710, 716
- Graphic Annunciator Module - DMP Model 717

11.3 Power Supplies and Transformers

Power supply, transformer, and battery devices shall maintain system operation. The batteries shall be checked and replaced every three to five years. The equipment shall have a three (3) year warranty as stated in the current DMP Product Catalog and meet or exceed features offered in the following products:

- Power Supply – DMP Model 504-24LX, 115 VAC, 24 VDC
- Power Supply – DMP Model 505-12, 115 VAC, 12 VDC
- Power Supply – DMP Model 505-12LX, 115 VAC, 12 VDC
- Power Supply – DMP Model 508, 115 VAC, 12 or 24 VDC
- Transformer - DMP Model 326, 16 VAC 50 VA, Wire-in
- Transformer - DMP Model 327, 16.5 VAC 50 VA, Plug-in
- Transformer - DMP Model 322, 16.5 VAC 56 VA, Wire-in

12.0 INSTALLATION

12.1 System Component Installation

A. When used in NFPA 72 compliant installations, the Intrusion Detection/ Access Control shall be on an electrical circuit dedicated branch in accordance with the National Electrical Code (NEC) and the local authority having jurisdiction (AHJ). This circuit shall be available only to authorized personnel and shall be clearly labeled “Security Alarm CIRCUIT CONTROL”.

B. Materials shall be installed in strict compliance with all local, state, county, province, district, federal and other applicable building, safety, and fire standards, laws, codes, regulations, and guidelines including, but not limited to, all appendices and amendments and the requirements of the local authority having jurisdiction (AHJ).

C. All wiring from all devices shall be non-spliced home runs.

D. All cables shall be plenum rated.

E. All conductors from expanders shall be home runs to control panel separately and shall be non spliced.

F. All conductors terminating at zone splice box shall be identified as per detail device labeling.

G. All zone splice boxes shall be located per owner’s preference.

H. All 120vac shall be provided by contractor to all power supply and panel locations shown or not shown on plans.

I. Install siren in each inside hallway and one outdoor (weather proof).

J. Zone expanders and power supplies shall be installed in each electrical room.

The End

DIVISION 16741
TELEPHONE AND DATA COMMUNICATION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. The General Provisions, Supplemental General Provisions, Special Provisions and Division 1 Specification sections, apply to work covered by this Section.

B. Comply with Division 16 Sections, as applicable. Refer to other Divisions for coordination of work.

1.2 SCOPE OF WORK

A. Provide labor, materials, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing of a telephone and data communications empty conduit system, including all related systems and accessories.

B. Refer to section 17120 and 16740 for wiring.

1.3 SUBMITTALS

A. Submit product data and shop drawings in accordance with Division 1 for products specified under PART 2 - PRODUCTS.

PART 2 - PRODUCTS

2.1 GENERAL

A. Conduit, conduit sleeves, outlet boxes, cover plates and pullwire as indicated.

B. Fireproofing material for telephone and data communication conduit and conduit sleeves through fire rated walls and floors.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install telephone and data communication raceways as indicated.

B. Install individual raceways from telephone and data communications outlets to above accessible ceiling. In areas without a ceiling, raceways shall be routed to the nearest ceiling space. In building without a ceiling, raceways shall be extended back to the main telephone/ data communication board or to a location indicated on the Drawings.

1. Minimum size conduit: 1.25”, provide 2-Gang box with one gang adapter, that will accept conduit size. Refer to details.
2. Raceway installation shall be in accordance with Section 16130.
3. Coordinate raceway installations in millwork and other fabricated architectural items with the other portions of the Work.
4. Provide pullwire in each raceway tagged on each end.
5. Raceways shall be terminated with an **insulating bushing** or a suitable connector with an insulated throat.

C. Provide telephone and data communications outlet boxes.

1. Provide 1.5” 2-gang box with a one-gang mudring.
2. Install outlet box and device ring at each location.
3. Install telephone and data communications outlets at same height specified for convenience outlets unless noted otherwise. Group telephone and data communications outlets with related receptacle outlets unless noted otherwise.
4. Install a blank cover plate on all unused communications outlet boxes.

END OF SECTION

DIVISION 16900
EQUIPMENT CONNECTIONS AND CONTROL WIRING

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. The General Provisions, Supplemental General Provisions, Special Provisions and Division 1 Specification sections, apply to work covered by this Section.

B. Comply with Division 16 Sections, as applicable. Refer to other Divisions for coordination of work.

C. The furnishing and installation of control power wiring required for equipment furnished under Division 15 and not shown on the electrical drawings shall be furnished under Division 15. Control power wiring is defined as the line voltage (120V) power wiring for equipment control cabinets, temperature control, energy management, or building automation system panels and line voltage smoke/fire dampers. Provide 120V to equipment control devices. Coordinate with Division 15 prior to rough-ins.

D. The furnishing and installation of the temperature control wiring, energy management system or building automation wiring not shown on the electrical drawings shall be furnished under Division 15. Temperature control, energy management system and building automation system wiring is defined as the interlock or interconnecting wiring required between system control devices, appurtenances and control panels to allow the system to function automatically. This includes wiring between the fire alarm system, smoke exhaust systems, door entry systems and any other system requiring interface with the temperature control, energy management and building automation system.

1.2 SCOPE OF WORK

A. Provide labor, materials, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing of power wiring to each motor-driven and/or electrically-operated system or unit of equipment.

B. Provide labor, materials, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing of the line voltage wiring serving power to a motor(s) or piece of electric powered equipment. The wiring shall allow the motor(s) or equipment to operate in a manual mode.

C. All control wiring above the ceiling or in the A/C return plenum shall be plenum rated cable.

D. Provide labor, materials, equipment, tools and services and perform operations required for, and reasonably incidental to, the providing of control wiring for miscellaneous systems. The Contractor shall be responsible for reviewing the project specifications to ascertain the extent of the control wiring required for the miscellaneous systems and shall assume the responsibility for performing the work.

E. Provide labor, materials, equipment, tools and services, and perform operations required for and reasonably incidental to, the providing of a fully connected and operating smoke damper installation. Coordinate with the mechanical contractor th required work. The following is a description of the responsibilities for the specified system:

1 The mechanical contractor will provide the smoke dampers and actuators as indicated in the specifications and on the plans. In addition, if the smoke dampers have pneumatic actuators, the mechanical contractor will provide all control air piping from a source to each smoke damper and the electro-pneumatic (EP) and/or pneumatic-electric (PE) switches as required for actuation of the smoke dampers.

2 The electrical contractor shall provide the power wiring for the smoke damper actuators.

3 The fire alarm contractor shall provide the signal and control wiring for the operation of the smoke dampers including all wiring of EP and/or PE switches.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials and equipment provided hereinafter shall comply with other Division 16 Sections and with Division 15 of these Specifications.

PART 3 - EXECUTION

3.1 MOTORS

A. Except for items that are furnished with factory-installed, integral motors, an electric motor of required size

and electrical characteristics will be provided and installed as specified in Division 15 for each item of motor-driven equipment. As part of the work of this Section, complete the electrical installation of these motors in accordance with approved wiring diagrams and instructions.

B. Where disconnect switches or circuit breakers are not provided integral with control equipment for motors and other electrical appurtenances, provide and install all disconnect switches required by the National Electrical Code and/or as indicated on the Drawings.

3.2 SYSTEM, EQUIPMENT AND DEVICE WIRING

A. Connect complete for operation all items of heating, ventilation, air conditioning, plumbing, fire protection and all electrical systems, equipment and devices furnished by the Owner or specified in other Divisions of the Specifications. System, equipment and device outlets of various types have been indicated in the Specifications or on the drawings, but indication of exact location or scope of the work may not be indicated. Refer to the Owner and to the work specified in the other Divisions for the scope of connections to the equipment furnished by them and for the exact locations of all connections to the equipment furnished by them. Power wiring shall be provided under Division 16 as indicated. Control wiring not indicated to be provided under Division 16 shall be provided by the provider of the system, equipment, or device and installed and terminated under Division 16. Request all rough-in drawings required for proper installation of the electrical work in ample time to permit preparation of the installation drawings and thus avoid delays on the job.

END OF SECTION

MAINTENANCE HANGAR FOR SOUTH TEXAS INTERNATIONAL AIRPORT AT EDINBURG

EDINBURG, TEXAS.

CITY OF EDINBURG

CITY COUNCIL MEMBERS

MAYOR	RICHARD H. GARCIA
MAYOR PRO TEM	ELIAS LONGORIA, JR.
COUNCILMEMBER	J.R. BETANCOURT
COUNCILMEMBER	HOMER JASSO JR.
COUNCILMEMBER	RICHARD MOLINA

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MELDEN & HUNT, INC.	CIVIL ENGINEERS
CHANIN ENGINEERING, LLC.	STRUCTURAL ENGINEERS
TRINITY ENGINEERING, LLC.	M.E.P. ENGINEERS
PSI ENGINEERING	GEOTECHNICAL CONSULTANTS

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CS	COVER SHEET

SHEET INDEX-CIVIL

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C2	PROPOSED SITE PLAN WITH UTILITIES
C3	WATER AND SANITARY DETAILS

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S1.1	GENERAL NOTES
S1.2	COMPONENTS/CLADDING ROOF UPLIFT PLAN
S1.3	EXCAVATION PLAN
S2.0	FOUNDATION TYPICAL DETAILS
S2.1	STEEL TYPICAL DETAILS
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A1.6	REFLECTED CEILING PLAN - 1st. FLOOR
A1.7	REFLECTED CEILING PLAN - 2nd. FLOOR
A2.1	ENLARGED PLAN & INT. ELEVATIONS
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A5.4	WALL SECTIONS
A5.5	WALL SECTIONS
A5.6	WALL SECTIONS
A5.7	WALL SECTION STAIRS
A5.8	WALL SECTIONS
A6.1	DOOR & WINDOW DETAILS
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A8.1	NOT USED
A9.1	ROOM AND DOOR SCHEDULES

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M1.2	MECHANICAL 2ND. FLOOR PLAN
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E3.1	ELEC. LEGENDS & SCHEDULE

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E5.1	ELECTRICAL DETAILS
E5.2	ELECTRICAL DETAILS

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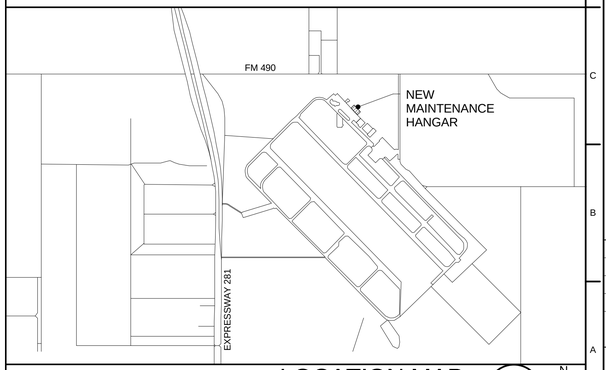
P1.1	SEWER & VENT PLUMBING FLOOR PLAN
P2.1	DOMESTIC WATER PLUMBING FLOOR PLAN
P3.1	PLUMBING SCHEDULES/LEGENDS

SHEET INDEX-PLUMBING

P4.1	PLUMBING DETAILS
FP1.1	FIRE PROTECTION SITE PLAN



LOCATION MAP 1

1" = 100'-0"

rofa architects

Rike • Ogden • Figueroa • Allex

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McAllen Harlingen

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CONSULTANTS:

REGISTERED ARCHITECT JULIO A. FIGUEROA 12858 STATE OF TEXAS

08-01-2014

NO.	DATE	DESCRIPTION

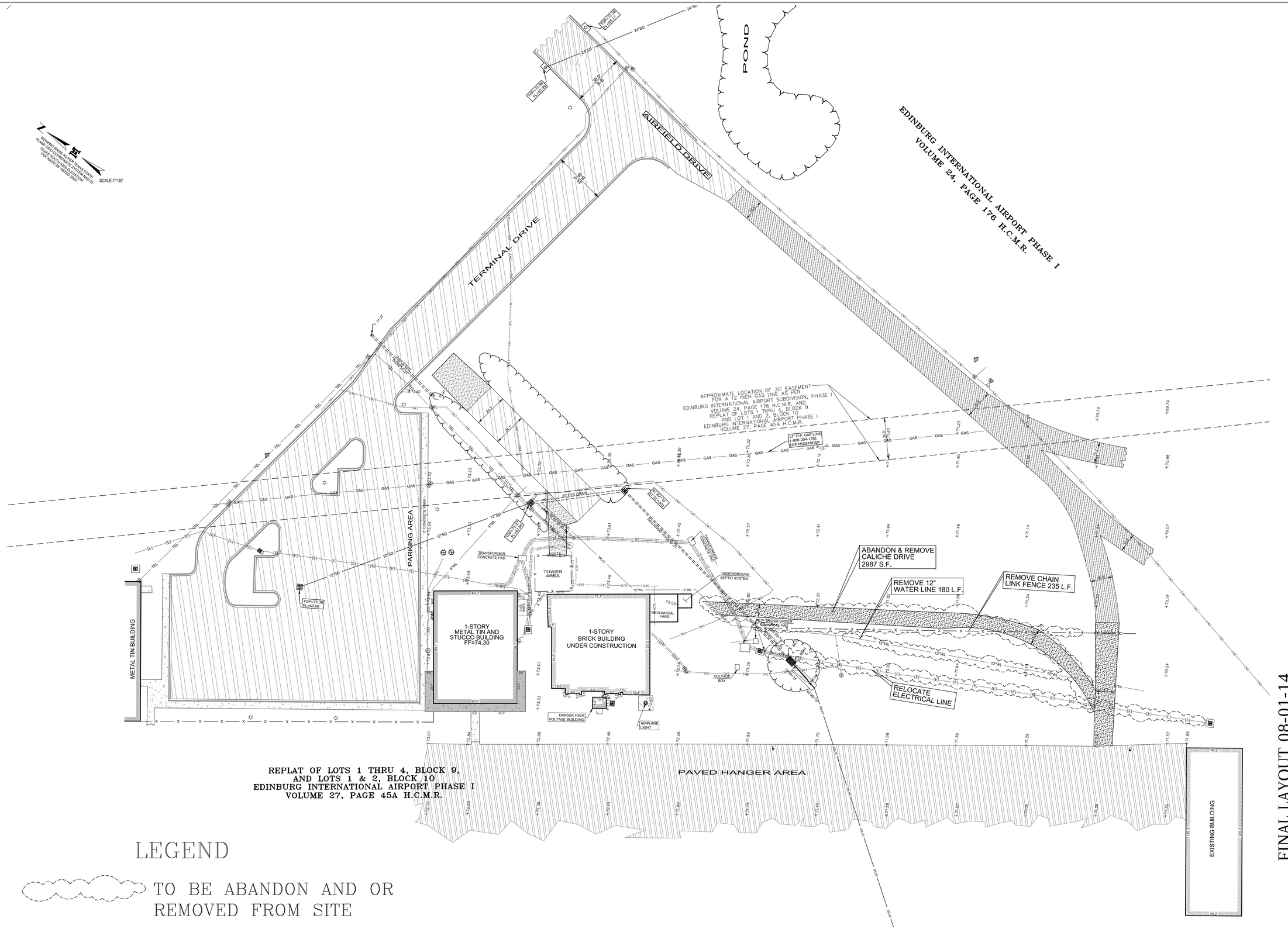
MAINTENANCE HANGAR FOR SOUTH TEXAS INTERNATIONAL AIRPORT AT EDINBURG CITY OF EDINBURG

EDINBURG, TEXAS

PROJECT NO:	201320
DATE:	8/5/2014 10:01:00 AM
STARTING DATE:	01.01.2013
CK BY:Checker	DWN BY: VDV

COVER SHEET

CS



LEGEND

TO BE ABANDON AND OR REMOVED FROM SITE

FINAL LAYOUT 08-01-14

EXISTING SITE PLAN

JOB No. 14062.00

REVISION	DATE	BY

MELDEN & HUNT, INC.
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RIO GRANDE CITY, TX 78582
PH: (956) 487-5256
FAX: (956) 486-2591
www.meldenandhunt.com
TBPLS No. 10066900

ENG. TECH:
PROJECT ENG:
F.B/OOK: , P.G.
1. RELEASE DATE: 08-01-14
2. RELEASE DATE:
3. RELEASE DATE:
SCALE: 1" = 30'

MELDEN & HUNT, INC.
TEXAS REGISTRATION F-1435

STATE OF TEXAS
FRED L. KURTH
54151
LICENSED
PROFESSIONAL ENGINEER

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MAINTENANCE HANGAR FOR
SOUTH TEXAS INTERNATIONAL
AIRPORT AT EDINBURG

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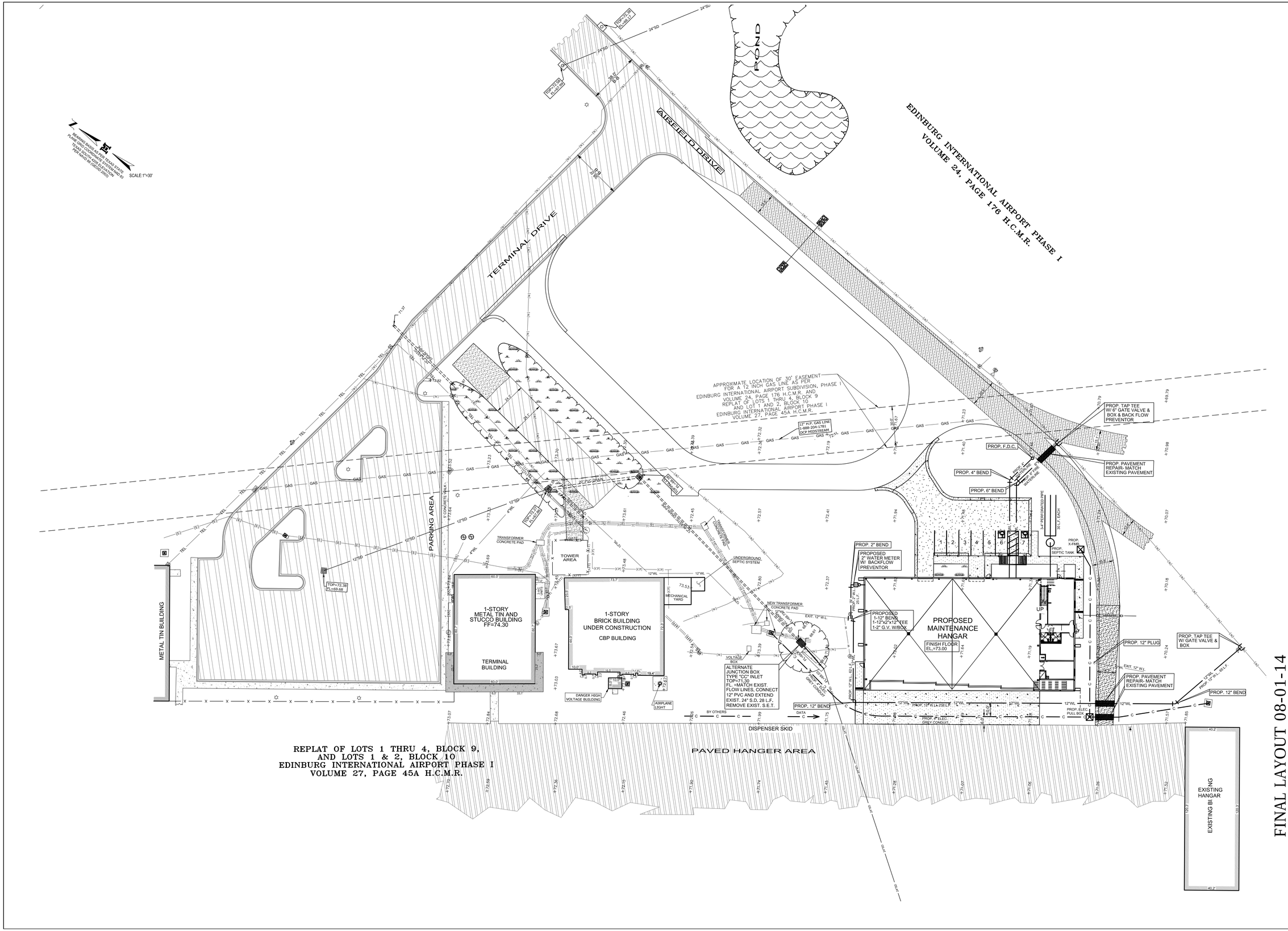
File Name: SIE PLAN

SHEET C1 OF 3



JOB No.
14062.00

REVISION	DATE	BY

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ENG. TECH:
PROJECT ENG:
T-BOOK: , PG.
1. RELEASE DATE: 08-01-14
2. RELEASE DATE:
3. RELEASE DATE:
SCALE: 1" = 30'

MELDEN & HUNT, INC.
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MAINTENANCE HANGAR FOR SOUTH TEXAS INTERNATIONAL AIRPORT AT EDINBURG

FINAL LAYOUT 08-01-14

PROPOSED SITE PLAN WITH UTILITIES

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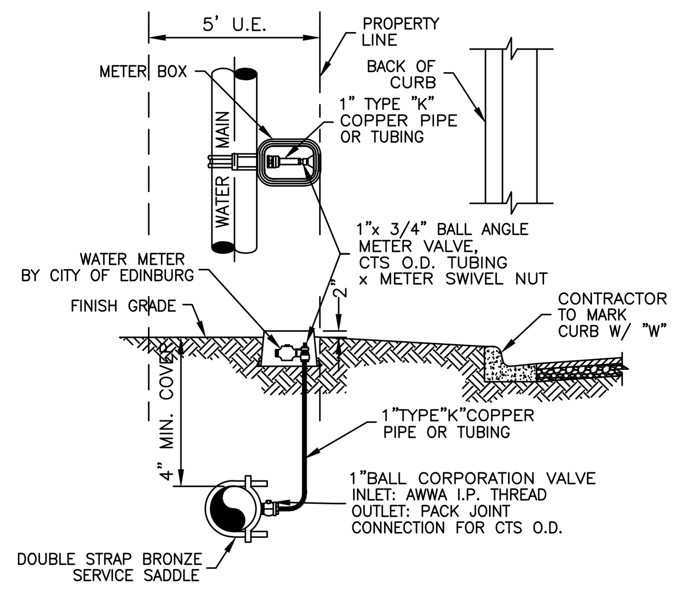
File Name: SIE PLAN

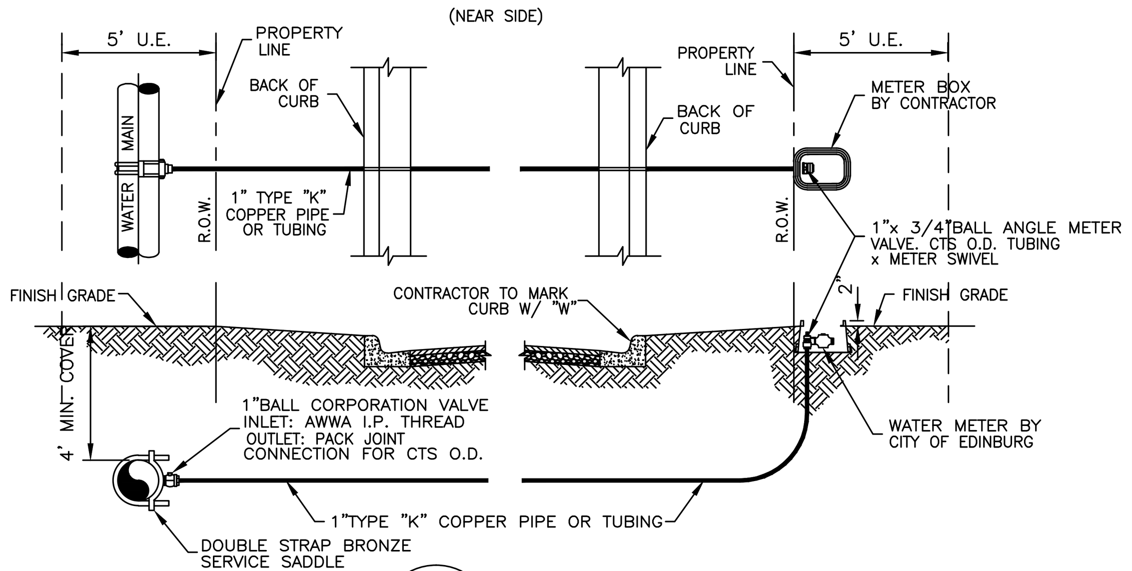
SHEET C2 OF 3

NOTES:
1– METER AND METER BOX TO BE PROVIDED BY CONTRACTOR. (MUTI–FAMILY ONLY).
2– FOR MORE THAN FOURPLEX OR FOUR COMMERCIAL BUILDING USE 4" BALL CORP. VALVES, 4" TYPE "K" COPPER AND 8" PVC CASING.
3– 4' MIN. COVER FOR WATER MAINS 5' MIN. FOR ALL ARTERIAL OR GREATER CLASSIFICATIONS.
4– COMMERCIAL INSTALLATIONS TO BE 2" SINGLE SERVICE UNLESS OTHERWISE APPROVED BY CITY ENGINEER.



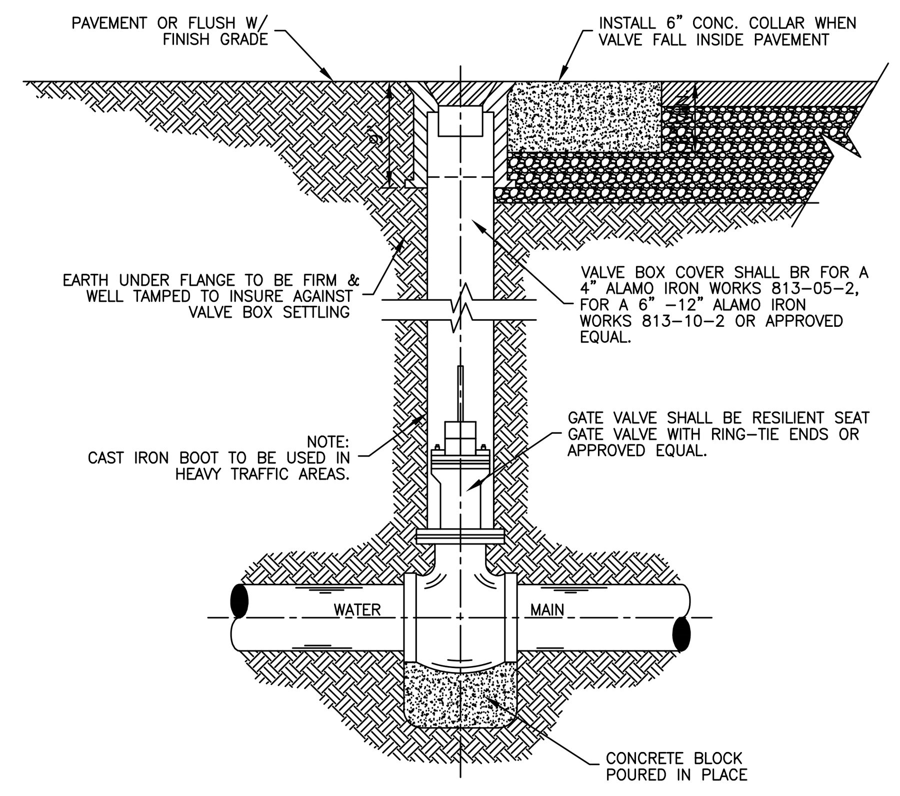
TYPICAL SINGLE WATER SERVICE CONNECTION

(NEAR SIDE)



W-1A TYPICAL SINGLE WATER SERVICE CONNECTION

OPTION 1 (FAR SIDE)



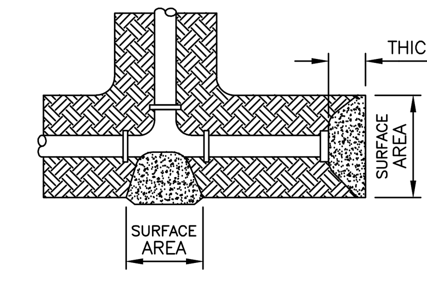
W-8 TYPICAL VALVE AND VALVE BOX INSTALLATION ON MAIN LINE

MUELLER (A–2360 SERIES) OR AMERICAN FLOW CONTROL (AFC–2500) ONLY

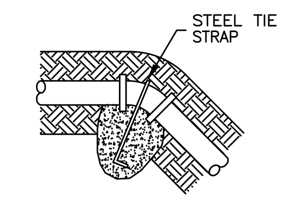
NOTE: ALL FITTINGS TO BE GREASED AND WRAPPED IN PLASTIC.

THRUST BLOCK SIZE			
HORIZONTAL BENDS			
DIAMETER OF PIPE IN INCHES	SURFACE AREA SQ. FT.	THICKNESS IN INCHES	WEIGHT AT VERTICAL BENDS–LBS.
22–1/2" BENDS			
6 OR LESS	2	8	1,700
8	3	12	3,000
10	3.5	12	4,500
12	4	14	6,600
14	5	18	9,000
16	6	18	11,800
45° BENDS			
6 OR LESS	4	12	3,200
8	5	14	5,800
10	6	18	9,000
12	7	18	13,000
14	8	24	17,000
16	11.5	24	23,200
90° BENDS			
6 OR LESS	6	12	6,000
8	8	15	10,700
10	10	18	16,700
12	12	18	24,000
14	18	24	32,600
16	21	24	42,700
TEES & DEAD ENDS			
6 OR LESS	3	12	––
8	4	15	––
10	6	18	––
12	8.5	18	––
14	11.5	24	––
16	15	24	––

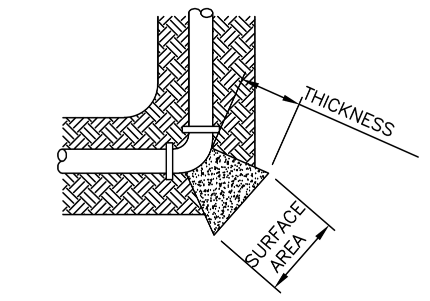
NOTE:
ALL VALUES SHOWN ARE MIN. FOR A HYDROSTATIC PRESSURE OF 150 P.S.I. AND A SOIL RESISTANCE OF 2,000 LBS. PER SQ./FT. WITH PIPELINE HAVING A MIN. OF 3 FT. OF COVER WITH CURB & GUTTER AND A 5 FT. MIN. WITHOUT CURB & GUTTER



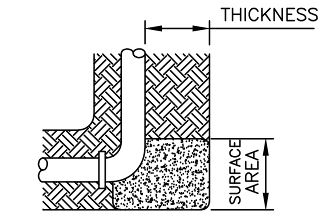
TEES & DEAD ENDS



VERTICAL BENDS



HORIZONTAL BENDS

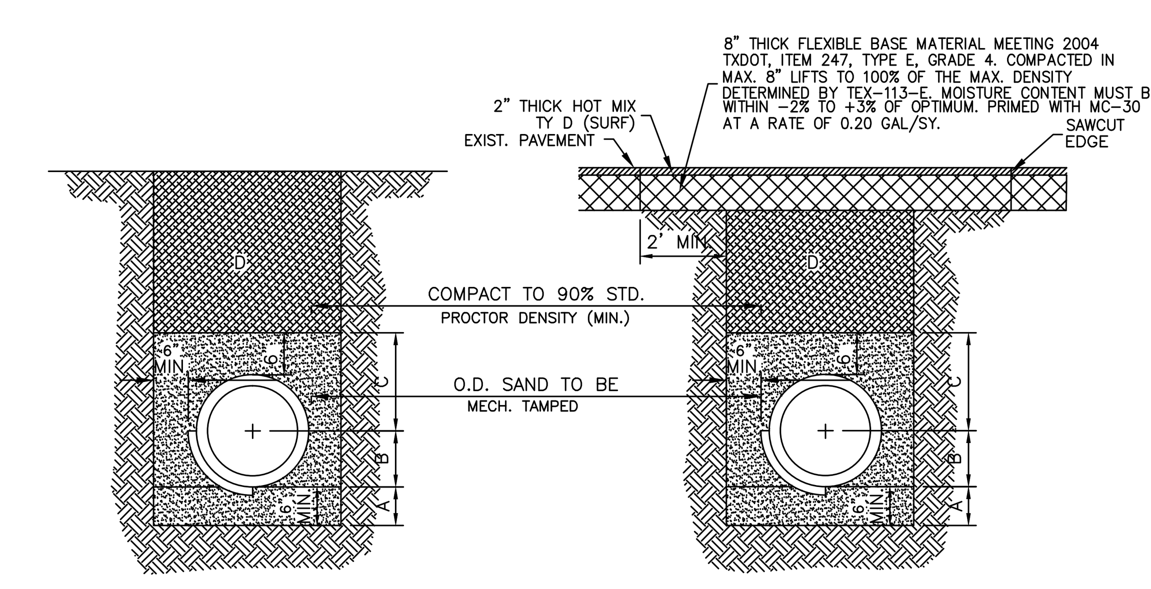


HYDRANT BURYS

W-5 THRUST BLOCKS DETAILS

NOTE: SEE THRUST SIZE CHART FOR PROPER THICKNESS AND SURFACE AREAS

NOTE: WHEN UTILITY LOCATED WITHIN CITY R.O.W., ALL BACK FILL IS SUBJECT TO INSPECTION AND APPROVAL BY THE CITY ENGINEER'S OFFICE



W-4 STANDARD PIPE BEDDING (MAIN & SERVICE LATERALS)

APPLICABLE BENEATH FUTURE/UNPAVED STREETS

A. SAND BEDDING PLACED BEFORE PIPE IS LAID UP TO FLOW LINE OF PIPE. (MIN. THICKNESS = 6")

B. SAND BACK FILL PLACED AFTER PIPE IS LAID FROM BOTTOM OF PIPE TO SPRING LINE OF PIPE. (4" LIFTS, MECH. TAMPED).

C. SAND BACK FILL PLACED FROM SPRING LINE OF PIPE TO 6" ABOVE TOP OF PIPE. (6" LIFTS, MECH. TAMPED).

D. FILL TRENCH W/SELECT BACKFILL. W/12" LIFTS COMPACT TO 90% STD. PROCTOR.

FOUNDATION PREPARATION (WELL POINTS, GRAVEL OR CEMENT ATABILIZATION, OR APPROVED SUBSTITUTE) SHALL BE REQUIRED WHEN TRENCH BOTTOM IS UNSTABLE.

BACK FILLING AT STRUCTURES SHALL BE PLACED IN UNIFORM LAYERS, MOISTENED AS REQUIRED TO APPROXIMATE OPTIMUM MOISTURE CONTENTS AND COMPACTED TO 95% STANDARD PROCTOR DENSITY. THE THICKNESS OF EACH LOOSE LAYER SHALL BE SAND, APPROVED SITE SOIL OR OTHER APPROVED SUBSTITUTE.

STANDARD PIPE BEDDING (MAIN ONLY)

(PARALLEL WITHIN EXIST. STREET)

A. SAND BEDDING PLACED BEFORE PIPE IS LAID UP TO FLOW LINE OF PIPE. (MIN. THICKNESS = 6")

B. SAND BACK FILL PLACED AFTER PIPE IS LAID FROM BOTTOM OF PIPE TO SPRING LINE OF PIPE. (4" LIFTS, MECH. TAMPED).

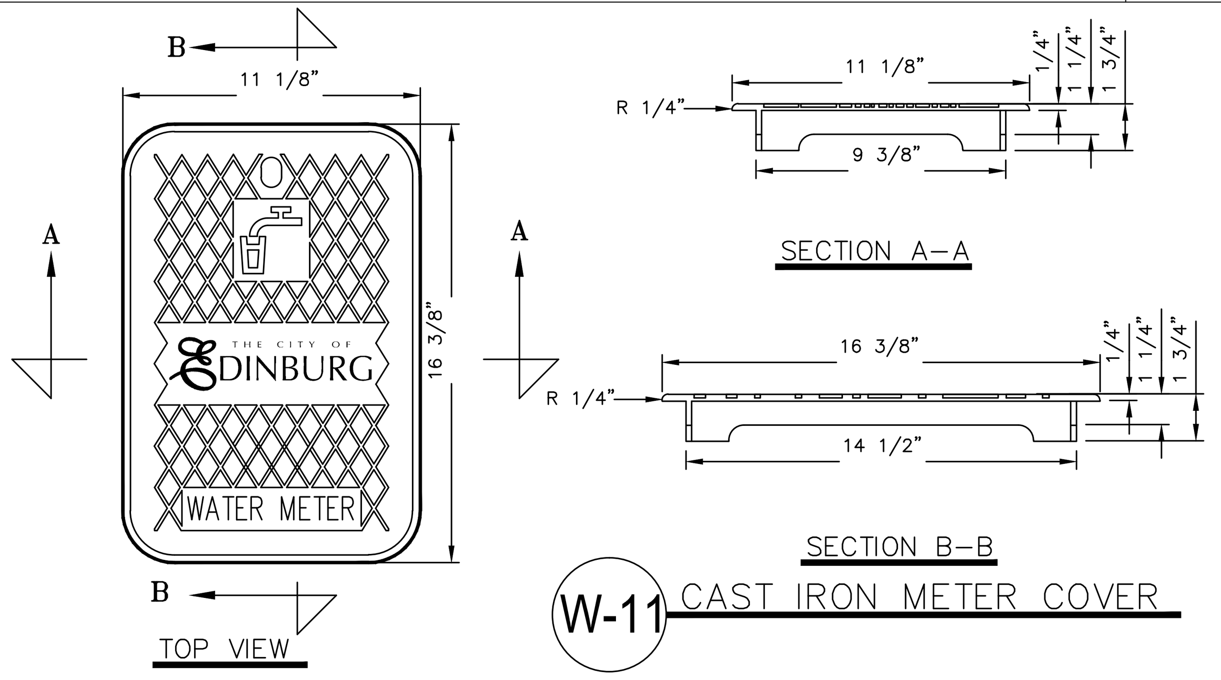
C. SAND BACK FILL PLACED FROM SPRING LINE OF PIPE TO 6" ABOVE TOP OF PIPE. (6" LIFTS, MECH. TAMPED).

D. FILL TRENCH W/SELECT BACKFILL. W/12" LIFTS COMPACT TO 90% STD. PROCTOR.

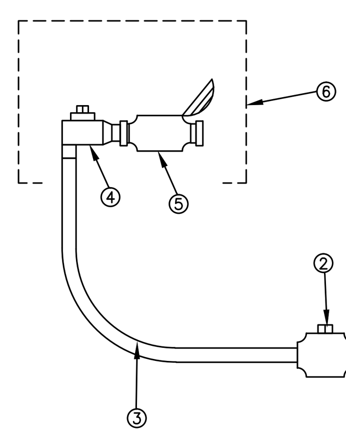
FOUNDATION PREPARATION (WELL POINTS, GRAVEL OR CEMENT ATABILIZATION, OR APPROVED SUBSTITUTE) SHALL BE REQUIRED WHEN TRENCH BOTTOM IS UNSTABLE.

BACK FILLING AT STRUCTURES SHALL BE PLACED IN UNIFORM LAYERS, MOISTENED AS REQUIRED TO APPROXIMATE OPTIMUM MOISTURE CONTENTS AND COMPACTED TO 95% STANDARD PROCTOR DENSITY. THE THICKNESS OF EACH LOOSE LAYER SHALL BE SAND, APPROVED SITE SOIL OR OTHER APPROVED SUBSTITUTE.

NOTE: ALL EXISTING/ACTIVE STREET CROSSINGS SHALL REQUIRE SAND BACKFILL OF ENTIRE TRENCH. (SEE DETIL S–6)



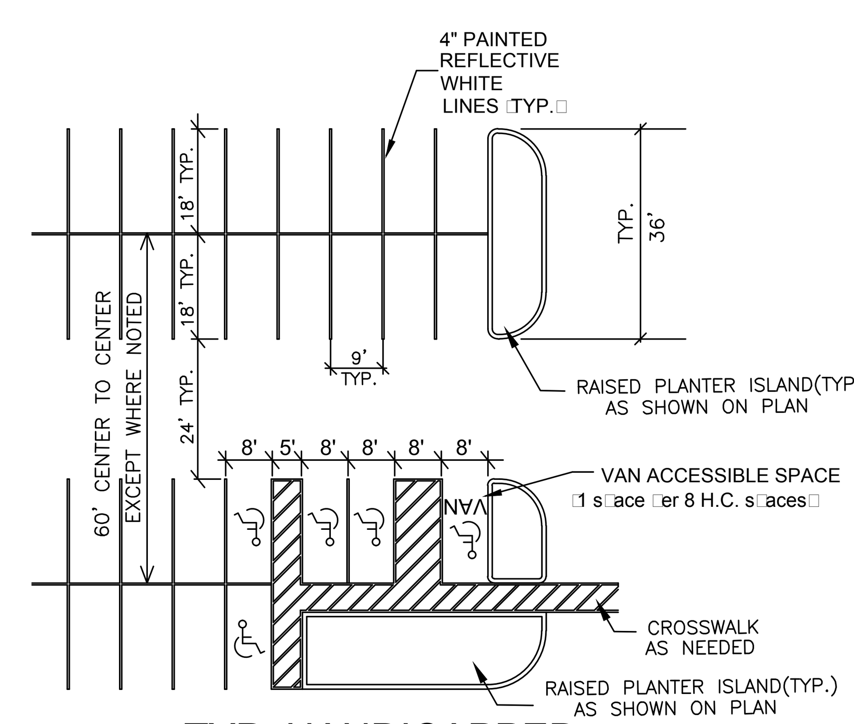
W-11 CAST IRON METER COVER



W-3 2" METER SERVICE

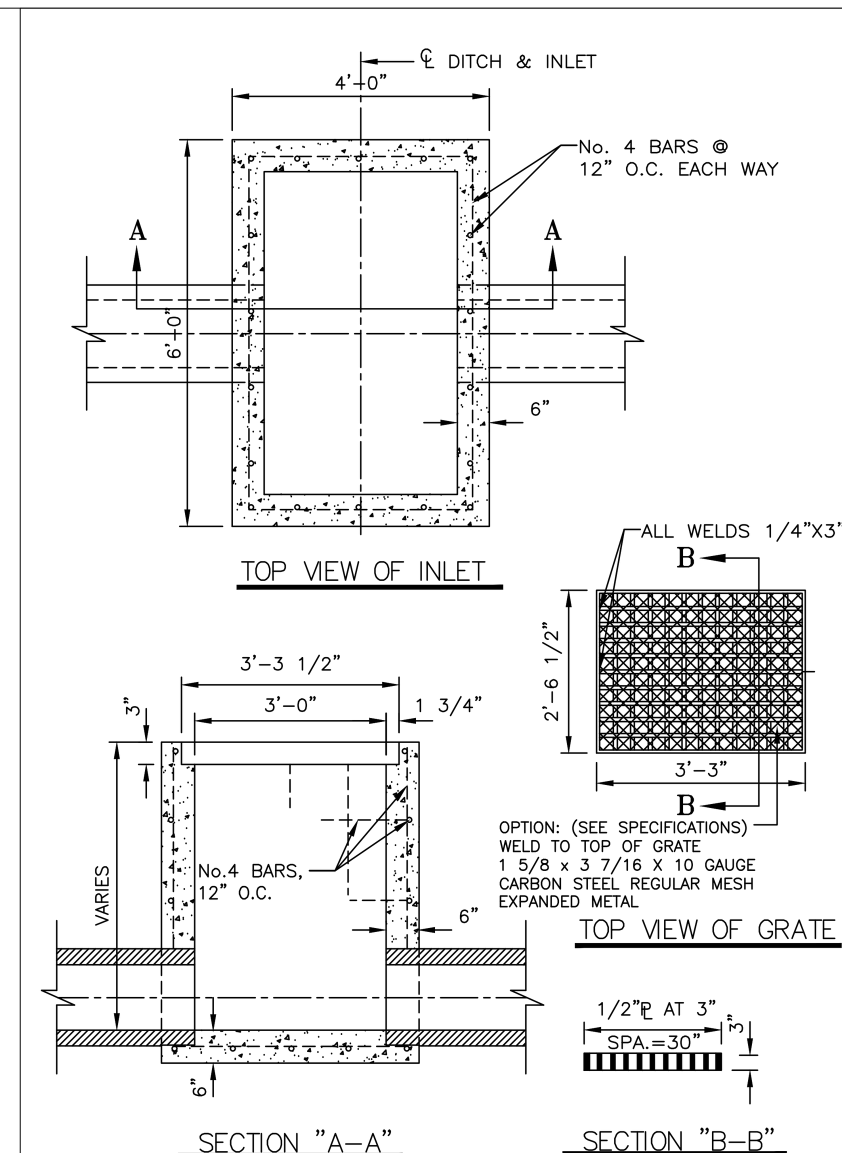
2" METER SERVICE

1.) X" x 2" DOUBLE STRAP BRASS SADDLE
2.) 2" BALL CORP. MIPX C.T.S.
3.) 2" COPPER TUBING TYPE "K" (OPTION 1) OR 2" RIGID PIPE TYPE"K" (OPTION 1) OR POLYETHYELENE TUBING (OPTION 2)
4.) 2" BRASS ANGLE STOP
5.) WATER METER BY CITY OF EDINBURG
6.) LAGE C.I. METER BOX



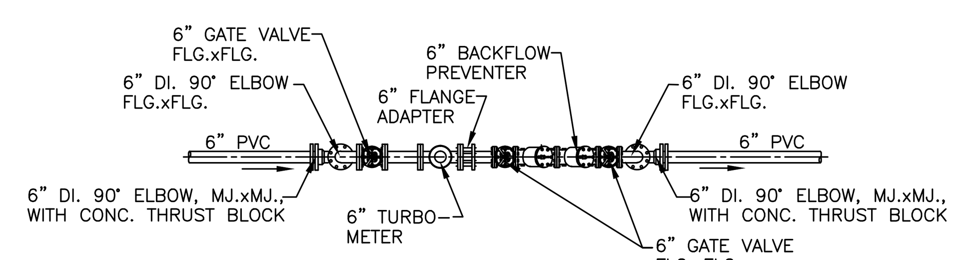
TYP. HANDICAPPED PARKING DETAIL

NOT TO SCALE

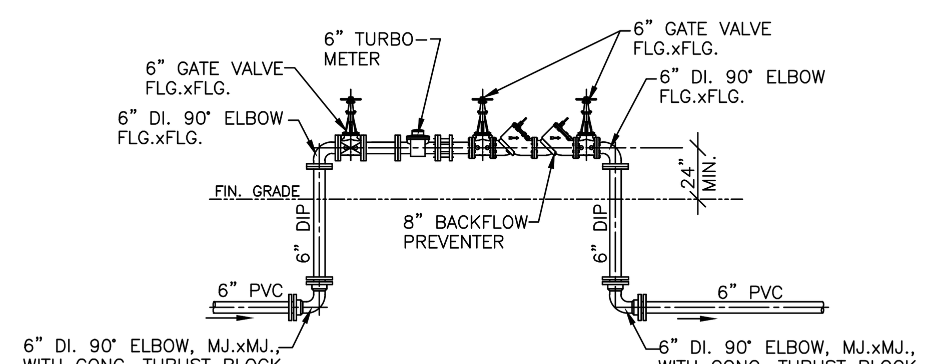


D-3 TYPE "C–C" GRATED INLET

(TWO GRATES PER INLET)



PLAN VIEW



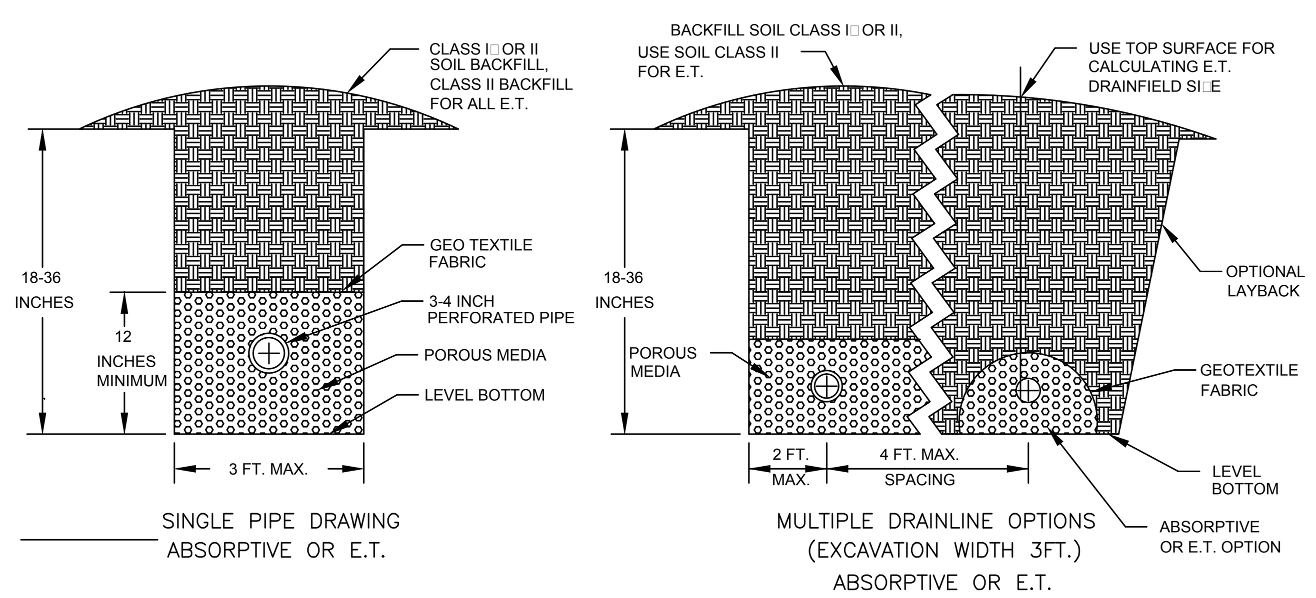
ELEVATION

BACKFLOW PREVENTER DETAIL

SCALE: N.T.S.

NOTES:
CONTRACTOR SHALL MATCH BACKFLOW PREVENTER ASSEMBLY TO SIZE OF THE WATER SUPPLY LINE.

THE RP DOUBLE CHECK BACKFLOW PREVENTER SHALL BE SERIES 909 REDUCED PRESSURE ZONE ASSEMBLIES SIZE 6" BY WATTS REGULATOR OR APPROVED EQUAL.



SOIL ABSORPTION TRENCH DETAIL

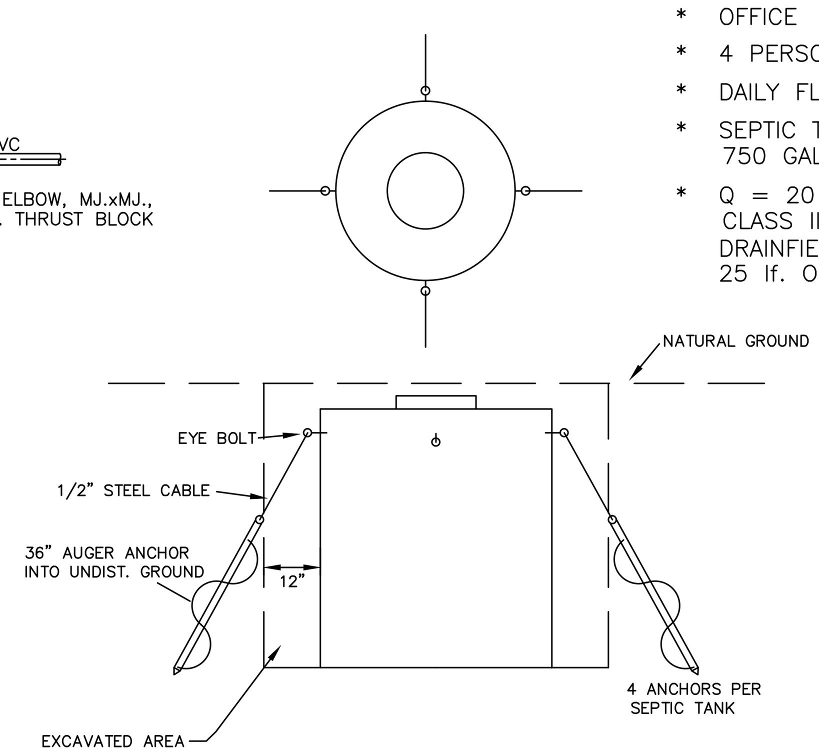
- * OFFICE
- * 4 PERSONS AT 5 G.P.D./ PERSON
- * DAILY FLOW= 4x5= 20 G.P.D.
- * SEPTIC TANK CAPACITY 750 GAL. MIN. 2–500 GAL. TANKS
- * Q = 20 GPD; SOIL CLASSIFICATION CLASS III DRAINFIELD REQUIRED PER TABLE VIII 25 lf. OF 3' WIDE TRENCH

PIPES:

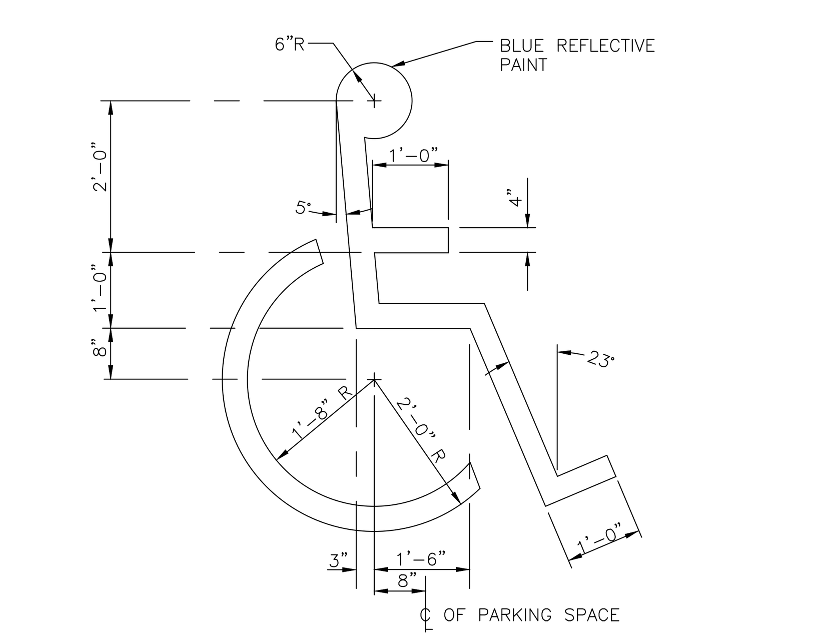
(A) CONNECTIONS AND HEADER SHALL BE 4" PVC SCH. 40

(B) LATERAL SHALL BE 4" PERFORATED SDR. 35

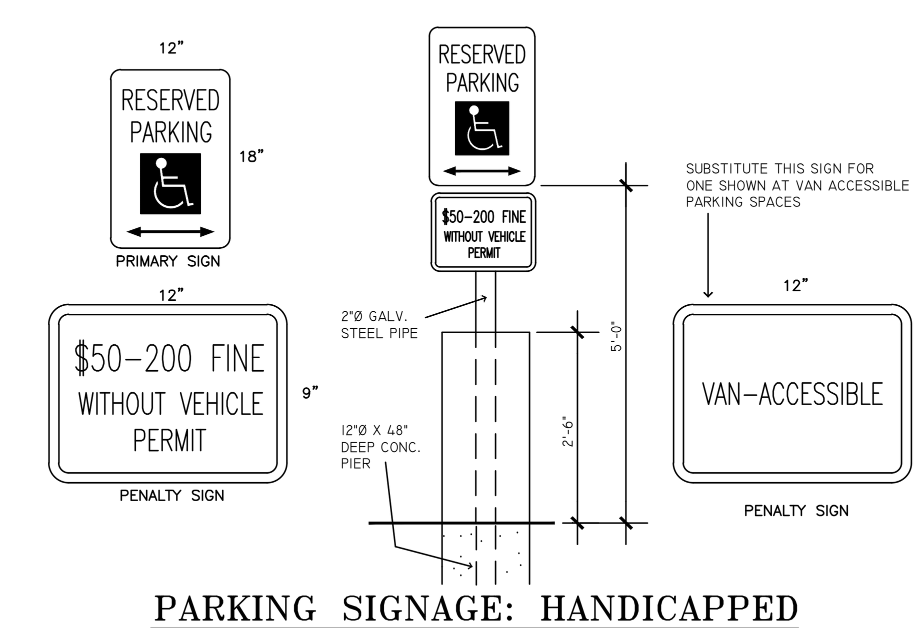
* NO VISIBLE WATER WELLS WITHIN 150 FEET OF THIS SEPTIC TANK SYSTEM.



TYP. SEPTIC TANK TIE DOWN DETAIL



TYPICAL PAINTED HANDICAP SYMBOL



PARKING SIGNAGE: HANDICAPPED

FINAL LAYOUT 08-01-14

JOB No. 14062.00

REVISION | DATE | BY

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DRAWING DATE: JULY 2014
DRAWN BY:
CHECKED BY:
DESIGNED BY:
RELEASE DATE: 08–01–14
T–, PG.
SCALE: 1" = 1'

MELDEN & HUNT, INC.
TEXAS REGISTRATION F–1435

STATE OF TEXAS
FRED L. KURTH
54151
LICENSED
PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY FRED L. KURTH, P.E. 54151

ALTERATION OF A SEALED DOCUMENT WITHOUT PROPER NOTIFICATION TO THE RESPONSIBLE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE LAW

EDINBURG All–America City 1968 1995 2000

THE CITY OF EDINBURG

WATER AND SANITARY DETAILS

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File Name: SITE PLAN

SHEET C3 OF 3

GENERAL NOTES

GENERAL

1. THE CONTRACT STRUCTURAL DRAWINGS AND SPECIFICATIONS REPRESENT THE FINISHED STRUCTURE. UNLESS OTHERWISE INDICATED, THEY DO NOT INDICATE THE METHOD OF CONSTRUCTION. THE CONTRACTOR SHALL PROVIDE ALL MEASURES NECESSARY TO PROTECT THE STRUCTURE, WORKMEN, AND OTHER PERSONS DURING CONSTRUCTION. SUCH MEASURES SHALL INCLUDE, BUT NOT BE LIMITED TO BRACING, SHORING FOR CONSTRUCTION EQUIPMENT, SHORING FOR THE BUILDING, SHORING FOR THE EARTH BANKS, FORMS, SCAFFOLDING, PLANNING, SAFETY NETS, SUPPORT AND BRACING FOR CRANES, GIN POLES, ETC. THE CONTRACTOR SHALL SUPERVISE AND DIRECT THE WORK, AND HE SHALL BE SOLELY RESPONSIBLE FOR ALL CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES, AND PROCEDURES. OBSERVATION VISITS TO THE SITE BY THE ARCHITECT OR THE ENGINEER SHALL NOT INCLUDE INSPECTION OF THE ABOVE ITEMS.

2. IT IS SOLELY THE CONTRACTOR'S RESPONSIBILITY TO FOLLOW ALL APPLICABLE SAFETY CODES AND REGULATIONS DURING ALL PHASES OF CONSTRUCTION.

3. EQUIPMENT FRAMING LOADS, OPENINGS AND STRUCTURE IN ANY WAY RELATED TO HVAC, PLUMBING, OR ELECTRICAL REQUIREMENTS ARE SHOWN FOR BIDDING PURPOSES ONLY. EXACT WEIGHTS AND LOCATIONS OF MECHANICAL EQUIPMENT SHALL BE COORDINATED BY CONTRACTOR. IF THE FINAL LOCATION VARIES FROM THAT SHOWN ON THE PLANS, CONTRACTOR TO NOTIFY ARCHITECT AND ENGINEER FOR APPROVAL BEFORE INSTALLATION.

4. SHOULD ANY OF THE DETAILED INSTRUCTIONS SHOWN ON THE PLANS CONFLICT WITH THESE STRUCTURAL NOTES, THE SPECIFICATIONS, OR WITH EACH OTHER, THE STRICTEST PROVISION SHALL GOVERN.

5. THE GENERAL CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS AT THE JOB SITE AND SHALL BE RESPONSIBLE FOR CONDITIONS OF ALL WORK AND MATERIALS.

6. THE CONTRACTOR SHALL REVIEW AND VERIFY ALL DIMENSIONS AND ELEVATIONS. CONTRACTOR SHALL REPORT ANY DISCREPANCIES IN WRITING TO THE ARCHITECT. ANY CONFLICT BETWEEN THE DRAWING AND SPECIFICATIONS OF THE VARIOUS TRADES INVOLVED SHALL BE REPORTED TO THE ARCHITECT AND ENGINEER.

7. DETAILS SHOWN ON DRAWINGS APPLY AT SIMILAR CONDITIONS.

8. ALL WORK SHALL BE DONE IN ACCORDANCE WITH LOCAL STANDARDS AND TO ALL APPLICABLE PROVISIONS OF THE GOVERNING BUILDING CODE.

9. THE ARCHITECT AND ENGINEER SHALL BE NOTIFIED IN WRITING WHEN WORK COMMENCES.

10. CONTRACTOR SUBSTITUTIONS: ANY MATERIALS OR PRODUCTS THAT ARE SUBMITTED FOR APPROVAL THAT ARE DIFFERENT FROM THE MATERIALS OR PRODUCTS SPECIFIED IN THE CONTRACT DOCUMENTS WILL ONLY BE CONSIDERED IF THE FOLLOWING CRITERIA ARE SATISFIED.
    A) A COST SAVING TO THE OWNER IS DOCUMENTED AND SUBMITTED WITH THE REQUEST
    B) THE MATERIAL OR PRODUCT HAS BEEN APPROVED BY THE INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS (ICBO) AND THE ICBO REPORT IS SUBMITTED WITH THE REQUEST.

STRUCTURAL OBSERVATION

1. THE PROFESSIONAL ENGINEER OR HIS/HER AUTHORIZED REPRESENTATIVE SHALL CONDUCT ALL STRUCTURAL OBSERVATIONS. STRUCTURAL OBSERVATIONS SHALL BE FOR THE PURPOSE OF ASCERTAINING GENERAL COMPLIANCE WITH THE CONSTRUCTION DOCUMENTS. HOWEVER, SUCH OBSERVATION VISITS SHALL NOT RELIEVE THE CONTRACTOR FROM HIS OBLIGATIONS AND RESPONSIBILITIES TO THE CONSTRUCTION DOCUMENTS.

2. ITEMS THAT REQUIRE A STRUCTURAL OBSERVATION ARE AS FOLLOWS:
    A. STEEL REINFORCEMENT IN SLAB OR FOUNDATION
    B. FRAMING OF SECOND FLOOR BEFORE DECKING IS INSTALLED
    C. SECOND FLOOR DECKING
    D. FRAMING OF ROOF STRUCTURE BEFORE METAL PANELS ARE INSTALLED
    E. EXTERIOR METAL PANEL INSTALLATION
    F. CMU WALL REINFORCING BEFORE FILLING WITH GROUT

3. NOTIFY ENGINEER IN WRITING 48 HOURS IN ADVANCE WHEN A STRUCTURAL OBSERVATION IS REQUIRED.

4. WORK SHALL NOT CONTINUE AT THESE AREAS UNTIL OBSERVATION AND APPROVAL BY ENGINEER.

5. FAILURE BY THE CONTRACTOR TO PROVIDE PROPER NOTICE FOR AN OBSERVATION VISIT AT THE REQUIRED TIME OR ADDITIONAL WORK PERFORMED WITHOUT AN OBSERVATION VISIT WILL BE DONE AT CONTRACTOR'S RISK AND MAY BE SUBJECT TO COMPLETE OR PARTIAL REMOVAL TO VERIFY COMPLIANCE OF PREVIOUS WORK.

SHOP DRAWINGS & SUBMITTALS

1. SUBMITTAL THAT WILL BE REQUIRED FOR APPROVAL INCLUDE:
    A. CONCRETE MIX DESIGN
    B. CURING COMPOUND FOR CONCRETE
    C. REINFORCING STEEL
    D. STRUCTURAL STEEL
    E. STEEL JOIST
    F. METAL DECKING
    G. PRE-ENGINEERED BUILDING (INCLUDING REACTIONS)
    H. EXTERIOR METAL PANELS

2. ALLOW (2) WEEKS MINIMUM FOR REVIEW OF SHOP DRAWINGS.

3. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DELAYS CAUSED BY REJECTION OF INADEQUATE OR COMPLETE SHOP DRAWINGS.

3. PRIOR TO ISSUING THE SUBMITTALS TO THE ENGINEER, THE CONTRACTOR SHALL REVIEW THE SHOP DRAWINGS. CONTRACTOR MUST VERIFY ALL DIMENSION WITH ARCHITECTURAL PLANS.

4. REVIEW OF SHOP DRAWINGS BY THE ENGINEER IS FOR GENERAL CONFORMANCE TO THE STRUCTURAL DRAWINGS. APPROVAL OF THE SHOP DRAWINGS BY THE ENGINEER DOES NOT RELIEVE THE CONTRACTOR FOR ANY ERRORS OR OMISSIONS IN DIMENSIONS OR MATERIALS INDICATED ON THE SHOP DRAWINGS.

DESIGN CRITERIA

1. DESIGN LOADS, STRUCTURAL ANALYSIS AND PREPARATION OF STRUCTURAL MEMBERS ARE BASED ON THE FOLLOWING CRITERIA:

2. CODE: .... IBC 2012

3. VERTICAL LOADS
    A. DEAD LOAD (MEZZANINE): .... 62.5 PSF
    B. DEAD LOAD (ROOF): .... STRUCTURE SELF WEIGHT
    C. LIVE LOAD (MEZZANINE): .... 125 PSF
    D. LIVE LOAD ROOF (REDUCIBLE): .... PER P.E.B.M.
    E. COLLATERAL LOAD: .... 10 PSF
    F. UPLIFT LOAD .... PER P.E.B.M.

D. MECHANICAL LOAD:
THE GENERAL CONTRACTOR SHALL SUBMIT ACTUAL WEIGHTS AND LOCATIONS OF EQUIPMENT TO BE USED IN THE PROJECT TO THE STRUCTURAL ENGINEER FOR VERIFICATION OF LOADS USED IN THE DESIGN AT LEAST TWO WEEKS PRIOR TO FABRICATION AND CONSTRUCTION OF THE SUPPORTING STRUCTURE.

4. LATERAL LOADS
    A. WIND SPEED (V-ULT): .... 131 MPH
    B. WIND SPEED (V-ASD): .... 101 MPH
    C. EXPOSURE CATEGORY: C
    D. IMPORTANCE FACTOR: 1.0
    E. BUILDING CATEGORY: II
    F. SEISMIC DESIGN CATEGORY: .... A
    G. SITE CLASS: .... E

5. GEOTECHNICAL ENGINEERING REPORT:
PROVIDED BY: PROFESSIONAL SERVICE INDUSTRIES, INC.
PROJECT NUMBER: 328-1219
DATED: 7/23/2014
FOUNDATION DESIGN BASED ON THE FOLLOWING PARAMETERS
    A. EFFECTIVE PI: 18
    B. CLIMATIC RATING (Cw): 15
    C. MINIMUM BEAM DEPTH: .... 24 IN
    D. MINIMUM BEAM WIDTH: .... 12 IN
    E. ALLOWABLE BEARING CAPACITY (BEAMS) .... 2150 PSF
    F. ALLOWABLE BEARING CAPACITY (FOOTING) .... 2500 PSF
    G. EXISTING PVR: .... 1.0 IN
    H. PVR (SEE EXCAVATION NOTES) .... 1.0 INCH

CONCRETE

1. ALL CONCRETE WORK SHALL BE EXECUTED IN ACCORDANCE WITH ACI 318 AND ACI 301 LATEST EDITION.

2. CEMENT SHALL CONFORM TO ASTM CI50 TYPE I AGGREGATE SHALL CONFORM TO ASTM C33.

3. CONCRETE SHALL HAVE A MINIMUM 28 DAYS COMPRESSIVE STRENGTH AS FOLLOWS:

MEMBER TYPE	STRENGTH	SLUMP	MAX AGG.
FOUNDATION AND SLAB	3000 PSI	5"	1.5 IN.
COLUMNS	4000 PSI	5"	I.5 IN.

4. INSTALL 10 MIL VAPOR RETARDER UNDER SLABS ON GRADE AND ALONG SIDE OF TRENCHES IN ACCORDANCE WITH ASTM E1643. LAP JOINTS MINIMUM OF 12 INCHES.

5. PLACE CONCRETE CONTINUOUSLY BETWEEN PRE-DETERMINED EXPANSION AND CONSTRUCTION JOINTS.

6. ALL CONSTRUCTION JOINT LOCATIONS TO BE APPROVED BY ARCHITECT AND STRUCTURAL ENGINEER.

7. HORIZONTAL CONSTRUCTION JOINTS SHALL NOT BE PERMITTED.

8. CURE CONCRETE IN ACCORDANCE WITH ACI 308.1

9. REFER TO ARCHITECTURAL AND MECHANICAL PLANS FOR LOCATIONS OF ALL DEPRESSIONS, OPENINGS, ACCESSORIES, ETC.

10. CONDUIT AND PLUMBING LINES SHALL BE PLACED BELOW SLAB REINFORCING AND SHALL BE NO BIGGER THAN 1 INCH.

11. FLYASH MAY BE USED TO REPLACE A PORTION OF THE PORTLAND CEMENT. THE RATIO OF FLYASH TO THE TOTAL OF THE FLYASH AND CEMENT IN A MIX SHALL NOT EXCEED 20%. FLYASH SHALL CONFORM TO ASTM C618, TYPE C OR F.

12. ALL FLOORS SHALL BE CONSTRUCTED WITH A MINIMUM FLATNESS FF = 35 AND A MINIMUM LEVELNESS OF FL = 25

13. CONTRACTION JOINTS TO BE INSTALLED WITHIN 12 HOURS OF POURING FOUNDATION.

14. TESTING OF CONCRETE SHALL BE DONE AS FOLLOWS:
    1) SETS SHALL CONSIST OF 3 CYLINDERS
       ONE TESTED AT 7 DAYS
       TWO TESTED AT 28 DAYS
    2) ONE SET SHALL BE TAKEN FOR EACH 150 CY AND FOR EVERY 5000 SF OF SURFACE AREA AND AT LEAST ONCE PER DAY OF POURING
    3) A MINIMUM OF 3 SETS SHALL BE TAKEN FOR EACH CLASS OF CONCRETE

15. NO WATER SHALL BE ADDED TO THE CONCRETE AT THE JOBSITE. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO COORDINATE WITH THE CONCRETE SUPPLIER TO ENSURE A PUMPABLE AND WORKABLE MIX WITHOUT THE ADDITION OF WATER AT THE JOBSITE. THE USE OF PLASTICIZERS, RETARDANTS AND OTHER ADDITIVES SHALL BE AT THE OPTION OF THE CONTRACTOR SUBJECT TO THE APPROVAL OF THE STRUCTURAL ENGINEER. FOLLOW THE RECOMMENDATIONS OF THE MANUFACTURER FOR THE PROPER USE OF ADDITIVES. THE USE OF CALCIUM CHLORIDE OR OTHER CHLORIDE BEARING SALTS SHALL NOT BE PERMITTED.

16. PLACE CONCRETE IN A MANNER SO AS TO PREVENT SEGREGATION OF THE MIX. DELAY FLOATING AND TROWELING OPERATIONS UNTIL CONCRETE HAS LOST SURFACE WATER SHEEN OR ALL FREE WATER. DO NOT SPRINKLE FREE CEMENT ON THE SLAB SURFACE. FINISHING OF SLAB SURFACES SHALL COMPLY WITH THE RECOMMENDATIONS OF AC1 302.1 AND 304.

17. UNLESS SPECIFIED, CONCRETE MUST REACH THE FOLLOWING PERCENTAGES OF ITS 28-DAY COMPRESSIVE STRENGTH (F'c), BEFORE FORMS MAY BE REMOVED.

    WALL, COLUMNS, & BEAM SIDES.................... 40%
    JOIST PANS & BEAM BOTTOMS (IF RESHORED).................... 70%
    SHORING FOR FLOOR SYSTEMS (IF NOT RESHORED).................... 85%

18. NO CONCRETE SHALL BE PLACED OUTSIDE OF THESE SPECIFICATIONS WITHOUT THE OWNER'S PRIOR APPROVAL. ANY ITEMS NOT IN COMPLIANCE WITH THE OUTLINED SPECIFICATION SHALL BE REPORTED TO THE OWNER AND STRUCTURAL ENGINEER WITHIN 24 HOURS.

19. CONSTRUCTION VEHICLE LOADS SHALL NOT BE PERMITTED ON ELEVATED SLABS AT ANY TIME.

20. ALL RETAINING WALLS TO BE SHORED UNTIL UPPER SLAB IS IN PLACE AND HAS REACHED 70% OF ITS DESIGN STRENGTH OR THE RETAINING WALL HAS REACHED 100% OF ITS DESIGN STRENGTH. PROVIDE GRANULAR BACKFILL AND PERFORATED DRAIN PIPE CONNECTED TO SITE DRAINAGE, RE: CIVIL PLAN.

STRUCTURAL STEEL

1. STRUCTURAL STEEL SHALL BE DETAILED, FABRICATED, AND ERECTED IN ACCORDANCE TO AISC SPECIFICATIONS.

2. MATERIALS USED SHALL BE AS FOLLOWS=
    A. STRUCTURAL W-SHAPES - ASTM A992 GRADE 50
    B. STRUCTURAL M-SHAPES AND S-SHAPES - ASTM A36
    C. STRUCTURAL T-SHAPES - CUT FROM W-SHAPES
    D. CHANNELS AND ANGLES - ASTM A36
    E. ROUND HOLLOW STRUCTURAL SECTIONS - ASTM A500 GRADE B
    F. SQUARE AND RECTANGULAR HOLLOW STRUCTURAL SECTIONS - ASTM A500 GRADE B
    G. STRUCTURAL PLATES - ASTM A36
    H. STRUCTURAL BARS - ASTM A36
    I. HIGH STRENGTH BOLTS - ASTM A325
    J. ELECTRODES - SERIES E70

3. ALL WELDING SHALL BE DONE BY CERTIFIED WELDERS IN ACCORDANCE WITH THE LATEST EDITION OF THE AMERICAN WELDING SOCIETY SPECIFICATIONS.

4. CONNECTIONS NOT DETAILED AND/OR SCHEDULED ON STRUCTURAL DRAWINGS SHALL BE DETAILED BY FABRICATOR AND MARKED FOR ENGINEERS APPROVAL. CONNECTIONS TO BE DESIGNED TO AISC SPECIFICATIONS AND SHALL BE CAPABLE OF SUPPORTING 55% OF THE MAXIMUM UNIFORM LOAD CAPACITY FOR THE SPAN SPECIFIED, SHOWN IN THE TABLES OF UNIFORM CONSTANTS OF THE AISC MANUAL OF STEEL CONSTRUCTION.

5. REFER TO ARCHITECTURAL PLANS FOR ANY MISCELLANEOUS STEEL. MISCELLANEOUS STEEL AND CONNECTIONS SHALL BE DESIGNED BY STEEL FABRICATOR.

6. HOT DIP GALVANIZE, IN ACCORDANCE WITH ASTM A123 AND ASTM A153, STRUCTURAL STEEL AND FASTENERS PERMANENTLY EXPOSED TO THE WEATHER.

7. STEEL SUPPORTING OR CONNECTED TO HVAC AND OTHER EQUIPMENT AS SHOWN ON THE DRAWINGS IS SHOWN FOR BIDDING PURPOSES ONLY CONTRACTOR SHALL COORDINATE EXACT LOCATION AND SIZE BEFORE COMMENCING WORK.

8. STRUCTURAL STEEL SHALL BE PAINTED WITH ONE COAT OF RUST INHIBITIVE PAINT.

9. STRUCTURAL DRAWINGS SHALL NOT BE REPRODUCED IN WHOLE OR IN PART FOR SHOP DRAWING SUBMITTALS.

10. PROVIDE 4 TONS OF RED IRON ALLOWANCE TO BE USED AS DIRECTED BY STRUCTURAL ENGINEER. INCLUDE LABOR COSTS IN THE ALLOWANCE. ANY UNUSED ALLOWANCE SHALL BE CREDITED BACK TO OWNER AT A COST OF $3500 PER TON.

11. ALL WELDED CONNECTION SHALL BE MADE WITH A 1/4" FILLET WELD U.N.O.

12. PROVIDE 1/2" GAP AT ALL PENETRATIONS THROUGH CMU WALL AND INFILL WITH ELASTOMERIC MATERIAL.

13. STEEL FABRICATOR SHALL BE CERTIFIED BY ONE OF THE FOLLOWING: AISC/ IBC/ IAS-ICC

STEEL JOISTS

1. ALL STEEL JOISTS AND JOIST GIRDERS SHALL BE DETAILED, FABRICATED AND ERECTED PER AISC AND SJI SPECIFICATIONS FOR OPEN-WEB STEEL JOISTS.

2. STEEL JOISTS SHALL BE WELDED TO SUPPORTING MEMBERS UNLESS NOTED OTHERWISE.

3. JOIST BEARING SHALL BE A MINIMUM OF 2 1/2 INCHES WITH A MINIMUM 2 INCH LONG FILLET WELD EACH SIDE OF BEARING.

4. JOISTS AT COLUMN LOCATIONS OR CLOSEST JOIST TO COLUMN SHALL BE BOLTED.

5. PROVIDE BRIDGING IN ACCORDANCE WITH SJI SPECIFICATIONS. BRIDGING SHALL BE CONTINUOUS THROUGH STRUCTURAL STEEL MEMBERS, AND SHALL BE ANCHORED TO SPANDREL MEMBERS OR WALLS. PROVIDE ADDITIONAL BRIDGING WHERE REQUIRED FOR UPLIFT.

6. BOTTOM CHORD EXTENSIONS TO BE PROVIDED AS REQUIRED BY ARCHITECTURAL PLANS.

7. JOISTS SUPPORTING MECHANICAL UNITS TO BE DESIGNED FOR UNIT WEIGHT IN ADDITION TO LOADS SHOWN IN DESIGN CRITERIA.

8. REFER TO MECHANICAL ENGINEERING PLANS FOR EXACT UNIT WEIGHT AND LOCATIONS.

9. MECHANICAL EQUIPMENT SHALL BE SUPPORTED BY TOP CHORD OF JOIST ONLY.

10. PROVIDE SUPPORT ANGLES AROUND ANY OPENINGS IN ROOF DECK.

11. JOISTS AND ACCESSORIES SHALL BE PAINTED WITH ONE COAT OF RUST INHIBITIVE PAINT.

12. JOISTS TO BE DESIGNED PER LOADS SHOWN IN DESIGN CRITERIA AND REQUIREMENTS AS DISCRIBED IN THIS SECTION.

13. DESIGN JOISTS FOR A 500 LB CONCENTRATED LOAD AT MIDSPAN TO ACT CONCURRENTLY WITH OTHER LOADS IN DESIGN CRITERIA.

14. JOIST MANUFACTURER SHALL DESIGN BOTTOM CHORDS OF ALL OPEN WEB JOISTS AND JOIST GIRDERS TO SUPPORT A 50 lb LOAD LOCATED ANYWHERE ALONG THE LENGTH OF THE CHORD.

15. HANGERS FOR MECHANICAL EQUIPMENT WITH REACTIONS IN EXCESS OF 50 lbs MUST BE LOCATED AT THE PANEL POINTS OF THE JOISTS. PROVIDE JOIST REINFORCING IN ACCORDANCE WITH THE TYPICAL DETAILS WHERE HANGERS ARE REQUIRED TO BE LOCATED MORE THAN 4 INCHES FROM THE JOIST PANEL POINTS.

16. PROVIDE FLAT BEARING FOR ALL JOISTS AND JOIST GIRDERS. BEAR JOISTS AND JOIST GIRDERS ON SUPPORTS IN ACCORDANCE WITH SJI SPECIFICATIONS.

17. PROVIDE A MINIMUM 1" GAP ALL AROUND AT ANY PENETRATIONS THROUGH CMU WALLS AND INFILL WITH ELASTOMERIC MATERIAL.

18. PROVIDE A MINIMUM 1" GAP ALL AROUND AT PENETRATIONS THROUGH METAL STUD WALLS AND INFILL WITH ELASTOMERIC MATERIAL.

19. STEEL JOISTS TO BE DESIGNED BY TEXAS REGISTERED PROFESSIONAL ENGINEER.

20. STEEL JOIST SHOP DRAWINGS SHALL BE SEALED BY A TEXAS REGISTERED PROFESSIONAL ENGINEER.

STEEL REINFORCING

1. ALL REINFORCEMENT SHALL BE NEW BILLET STEEL CONFORMING TO ASTM A-615 GRADE 60.

2. REINFORCING STEEL SHALL BE DESIGNED, DETAILED, FABRICATED AND PLACED IN ACCORDANCE WITH THE LATEST ACI DETAILING MANUAL (SP-66) AND CSRI MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE, (ACI #315) LATEST EDITIONS.

3. BARS SCHEDULED OR DETAILED "CONT" SHALL BE SPLICED ONLY WHEN UNAVOIDABLE AT POINTS OF MINIMUM STRESS AND WITH A MINIMUM LAP AS FOLLOWS:
    A. HORIZONTAL BARS w/ MORE THAN 12" OF FRESH CONCRETE CAST BELOW LAPS.
       #6 BARS AND SMALLER - 57 BAR DIAMETERS
       #7 BARS AND BIGGER - 72 BAR DIAMETERS
    B. OTHER BARS
       #6 BARS AND SMALLER - 44 BAR DIAMETERS
       #7 BARS AND BIGGER - 55 BAR DIAMETERS
    C. ALL SPLICES TO BE STAGGERED A MINIMUM OF 4'-0". TOP BAR AND BOTTOM BAR SPLICES TO BE LOCATED AT MID-SPAN AND WITHIN 1/3 SPAN RESPECTIVELY.

4. CORNER REINFORCING BARS SHALL BE USED AT ALL CORNERS AND INTERSECTIONS.

5. EXTEND THE SLAB REINFORCING STEEL PERPENDICULAR TO EXTERIOR GRADE BEAM TO THE TOP OUT SIDE REINFORCING BAR OF BEAM.

6. SPACE REINFORCING BARS WITH MINIMUM CLEAR SPACING IN ACCORDANCE WITH ACI 318 OF ONE BAR DIAMETER, BUT NOT LESS THAN 1 INCH. FOR COMPRESSION MEMBERS, SPACE AT A MINIMUM OF 1.5 INCHES OR 1.5 BAR DIAMETERS, WHICHEVER IS GREATER.

7. WHERE REINFORCING BARS ARE PLACED IN MULTIPLE LAYERS, PLACE UPPER BARS DIRECTLY ABOVE LOWER BARS.

8. MAINTAIN CONCRETE COVER AROUND REINFORCEMENT IN ACCORDANCE WITH ACI 318 AND AS FOLLOWS:
    A. FOOTING AND CONCRETE CAST AGAINST EARTH - 3 INCHES
    B. EXPOSED TO EARTH OR WEATHER
       #6 BARS AND BIGGER - 2 INCHES
       #5 BARS AND SMALLER - 1.5 INCHES
    C. BEAMS AND COLUMNS - 1.5 INCHES
    D. SLABS AND WALLS - 1 INCH

9. REPAIR ANY DAMAGE TO VAPOR RETARDER PER MANUFACTURER SPECIFICATIONS.

10. ADDITIONAL REINFORCING TO BE PROVIDED ON SITE FOR USE AS DIRECTED BY STRUCTURAL ENGINEER.
    #4 BARS - 100 FT.
    #5 BARS - 100 FT.
    #6 BARS - 100 FT.

PRE-ENGINEERED METAL BUILDING AND COMPONENTS

1. REFER TO SCHEMATIC ROOF FRAMING PLAN AND DESIGN CRITERIA FOR DESIGN LOAD REQUIREMENTS AND SPECIFICATIONS FOR THE PRE-ENGINEERED METAL BUILDING.

2. PRE-ENGINEERED METAL BUILDING MANUFACTURER SHALL SUBMIT DESIGN CERTIFICATION SIGNED AND SEALED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF TEXAS FOR THE STRUCTURAL FRAMING AND COVERING PANELS OF THE BUILDING SYSTEM. CERTIFICATION AND DESIGN SHALL MEET REQUIREMENTS OF THE INTERNATIONAL BUILDING CODE (IBC) AND ASCE 7.

3. PRE-ENGINEERED METAL BUILDING MANUFACTURER CERTIFICATION SHALL BE SUBMITTED WITH SEALED SHOP DRAWINGS WHEN SUBMITTED FOR REVIEW.

4. SHOP DRAWINGS AND CALCULATIONS INCLUDING BUILDING REACTIONS, SHALL BE PREPARED AND REVIEWED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF TEXAS. SEALED SHOP DRAWINGS AND CALCULATIONS SHALL BE SUBMITTED FOR REVIEW BY THE DESIGN TEAM.

5. ALL COMPONENTS SHALL BE DESIGNED, FABRICATED AND ERECTED IN ACCORDANCE WITH THE LATEST SPECIFICATIONS AND STANDARDS OF THE AISC. THIS WORK SHALL INCLUDE ALL MEMBERS AND BRACES NECESSARY TO BRACE MASONRY WALLS. LIGHT GAGE STEEL MEMBERS SHALL COMPLY WITH THE LATEST ADDITION OF THE AISI.

6. PURLINS AND EAVE STRUTS SHALL HAVE A MINIMUM YIELD STRESS OF 55 KSI AND SHALL BE PAINTED WITH ONE COAT OF RED OXIDE OR APPROVED SHOP COAT.

7. PURLIN SPACING SHOWN IN STRUCTURAL DRAWINGS ARE FOR SCHEMATIC PURPOSES ONLY. PURLIN SPACING TO BE DETERMINED BY METAL BUILDING MANUFACTURER. PURLINS SHALL HAVE A MAXIMUM TOTAL LOAD DEFLECTION OF L/180.

8. SAG STRAPS SHALL BE LOCATED AS SHOWN ON PLANS AND SHALL BE FABRICATED WITH A MINIMUM YIELD STRENGTH OF 50 KSI.

9. STANDING SEAM METAL ROOF SHALL NOT BE CONSIDERED TO PROVIDE LATERAL BRACING FOR PURLINS. BRIDGING SHALL BE DESIGNED AND SUPPLIED BY THE METAL BUILDING MANUFACTURER TO RESIST BOTH GRAVITY AND UPLIFT LOADS.

10. CROSS BRACING SHALL BE DESIGNED AND SUPPLIED BY THE METAL BUILDING MANUFACTURER TO PROVIDE AN ADEQUATE HORIZONTAL ROOF DIAPHRAGM FOR THE STRUCTURE.

11. PROVIDE PINNED BASE CONNECTION FROM COLUMN TO FOUNDATION.

12. ALL ANCHOR BOLTS SIZES, LENGTH, AND EMBEDMENT SHALL BE DESIGNED BY THE METAL BUILDING MANUFACTURER AND SUPPLIED BY THE CONTRACTOR. ANCHOR BOLT EMBEDMENT DEPTHS SHALL BE DESIGNED TO RESIST CONCRETE CONICAL SHEAR FAILURE.

13. THIS FOUNDATION HAS BEEN DESIGNED USING ASSUMED REACTIONS FROM THE PRE-ENGINEERED METAL BUILDING COMPONENTS AND IS FOR BID PURPOSES ONLY. THE CONTRACTOR SHALL SUBMIT BASE CONNECTION DETAILS (SIZE AND THICKNESS OF BASE PLATE AND DIAMETER AND LENGTH OF ANCHOR BOLTS) AND REACTIONS SO THE DESIGN ASSUMPTIONS CAN BE VERIFIED.

14. ANY ADDITIONAL COST OF FOUNDATION WORK REQUIRED BY REVISIONS OF THE FOUNDATION DESIGN AFTER PRE-ENGINEERED METAL BUILDING REACTIONS ARE SUBMITTED SHALL NOT BE INCURRED BY STRUCTURAL ENGINEER.

15. DRIFT CRITERIA FOR RIGID FRAMES AND METAL GIRTS SHALL HAVE A MAXIMUM DEFLECTION OF H/240 FOR MASONRY FINISHES AND A H/120 FOR METAL SIDING.

METAL FLOOR DECK

1. SHEET STEEL: ASTM A653 GRADE 33 STRUCTURAL QUALITY WITH G90 GALVANIZED COATING CONFORMING TO ASTM A525

2. DECK PROFILE - C
   PROFILE DEPTH - .6 IN.
   GAGE - 28

3. METAL DECK ATTACHMENT SHALL BE:
   AT SUPPORTS: #12 TEK SCREWS AT A 30/4 PATTERN
   AT SIDELAPS: #10 TEK SCREWS, 3 PER SPAN

4. WELDING OF METAL DECKING SHALL NOT BE ALLOWED

5. ALL METAL DECK PANELS SHALL SPAN ACROSS A MINIMUM OF FOUR JOISTS OR BEAMS

6. DECK ENDS SHALL BE LAPPED OVER SUPPORTS

7. CONCRETE TOPPING SHALL BE 3" NORMAL WEIGHT CONCRETE REINFORCED WITH 6x6 W2.1xW2.1 WWF

CONTRACTOR NOTE

THE STRUCTURAL SYSTEM FOR THIS PROJECT SHALL NOT BE CONSTRUCTED BY USING THE STRUCTURAL DRAWINGS ALONE. THESE DRAWINGS WERE DEVELOPED FROM DATA DERIVED PRIMARILY FROM THE ARCHITECTURAL DRAWINGS AND SECONDARILY FROM MEP, CIVIL AND OTHER DISCIPLINES' DOCUMENTS. IT IS INTENDED THAT CONSTRUCTION PROCEED BY UTILIZING ALL OF THE INFORMATION CONTAINED IN THE ENTIRE SET OF CONSTRUCTION DOCUMENTS TAKEN AS A WHOLE; FAILURE TO DO SO WILL RESULT IN ERRORS WHICH SHALL BE CORRECTED AT THE CONTRACTOR'S EXPENSE.

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STATE OF TEXAS
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LICENSED PROFESSIONAL ENGINEER
8-1-14

NO.	DATE	DESCRIPTION

MAINTENANCE HANGAR FOR SOUTH TEXAS INTERNATIONAL AIRPORT AT EDINBURG
CITY OF EDINBURG
EDINBURG, TEXAS

PROJECT NO:	14111
DATE:	8/1/2014 4:49:43 PM
STARTING DATE:	Issue Date
CK BY: M.C.	DWN BY:E.F.S.

GENERAL NOTES

S1.0

GENERAL NOTES

STRUCTURAL TESTS AND SPECIAL INSPECTION

1. THE OWNER SHALL EMPLOY A SPECIAL INSPECTOR TO PROVIDE INSPECTIONS DURING CONSTRUCTION ON THE TYPES OF WORK LISTED IN THIS SECTION.

2. THE FOLLOWING TERMS AND PHRASES SHALL HAVE THE MEANINGS SHOWN BELOW AS IT PERTAINS TO THIS SECTION.
   A. APPROVED AGENCY- AN ESTABLISHED AND RECOGNIZED AGENCY REGULARLY ENGAGED IN CONDUCTING AND FURNISHING SPECIAL INSPECTION SERVICES.
   B. APPROVED FABRICATOR - AN ESTABLISHED AND QUALIFIED FIRM APPROVED BY BUILDING OFFICIAL. SPECIAL INSPECTIONS ARE NOT REQUIRED WHEN WORK IS PERFORMED ON THE PREMISES OF AN APPROVED FABRICATOR.
   C. SPECIAL INSPECTION, CONTINUOUS- THE FULL TIME OBSERVATION OF WORK REQUIRING SPECIAL INSPECTION.
   D. SPECIAL INSPECTION, PERIODIC - THE PART TIME OR INTERMITTENT OBSERVATION OF WORK REQUIRING SPECIAL INSPECTION.

3. SPECIAL INSPECTORS SHALL KEEP RECORDS OF ALL INSPECTIONS AND SHALL FURNISH REPORTS TO THE BUILDING OFFICIAL AND TO THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE. DISCREPANCIES SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE CONTRACTOR FOR CORRECTION. IF THE DISCREPANCIES ARE NOT CORRECTED THEY SHALL BE BROUGHT TO THE ATTENTION OF THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE.

4. THE FOLLOWING ITEMS REQUIRE SPECIAL INSPECTION.

TABLE 1704.3
REQUIRED VERIFICATION AND INSPECTION OF STEEL CONSTRUCTION

VERIFICATION AND INSPECTION	CONTINUOUS	PERIODIC	REFERENCED STANDARD[a]	IBC REFERENCE
1. MATERIAL VERIFICATION OF HIGH-STRENGTH BOLTS, NUTS AND WASHERS:				
a. IDENTIFICATION MARKINGS TO CONFORM TO ASTM STANDARDS SPECIFIED IN THE APPROVED CONSTRUCTION DOCUMENTS.	—	X	APPLICABLE ASTM MATERIAL SPECIFICATIONS; AISC 360, SECTION A3.3	—
b. MANUFACTURER'S CERTIFICATE OF COMPLIANCE REQUIRED.	—	X	—	—
2. INSPECTION OF HIGH-STRENGTH BOLTING:				
a. BEARING-TYPE CONNECTIONS.	—	X	AISC 360, SECTION M2.5	1704.3.3
b. SLIP-CRITICAL CONNECTIONS.	X	X		
3. MATERIAL VERIFICATION OF STRUCTURAL STEEL:				
a. IDENTIFICATION MARKINGS TO CONFORM TO ASTM STANDARDS SPECIFIED IN THE APPROVED CONSTRUCTION DOCUMENTS.	—	—	AISC 360, SECTION M2.5	1708.4
b. MANUFACTURERS' CERTIFIED MILL TEST REPORTS.	—	—	ASTM A 6 OR ASTM A568	
4. MATERIAL VERIFICATION OF WELD FILLER MATERIALS:				
a. IDENTIFICATION MARKINGS TO CONFORM TO AWS SPECIFICATION IN THE APPROVED CONSTRUCTION DOCUMENTS.	—	—	AISC 360, SECTION A3.5	—
b. MANUFACTURER'S CERTIFICATE OF COMPLIANCE REQUIRED.	—	—	—	—
5. INSPECTION OF WELDING:				
a. STRUCTURAL STEEL:	—	—		
1) COMPLETE AND PARTIAL PENETRATION GROOVE WELDS.	X	—	AWS D1.1	1704.3.1
2) MULTIPASS FILLET WELDS.	X	—		
3) SINGLE-PASS FILLET WELDS > 5/16"	X	—		
4) SINGLE-PASS FILLET WELDS ≤ 5/16"	—	X		
5) FLOOR AND ROOF DECK WELDS.	—		AWS D1.3	—
a. REINFORCING STEEL:	—	—	AWS D1.4 ACI 318: 3.5.2	—
1) VERIFICATION OF WELDABILITY OF REINFORCING STEEL OTHER THAN ASTM A 706.	—	X		
2) REINFORCING STEEL-RESISTING FLEXURAL AND AXIAL FORCES IN INTERMEDIATE AND SPECIAL MOMENT FRAMES, AND BOUNDARY ELEMENTS OF SPECIAL REINFORCED CONCRETE SHEAR WALLS AND SHEAR REINFORCEMENT.				
3) SHEAR REINFORCEMENT.	X	—		
4) OTHER REINFORCING STEEL.	—	X		
6. INSPECTION OF STEEL FRAME JOINT DETAILS FOR COMPLIANCE WITH APPROVED CONSTRUCTION DOCUMENTS: a. DETAILS SUCH AS BRACING AND STIFFENING. b. MEMBER LOCATIONS. c. APPLICATION OF JOINT DETAILS AT EACH CONNECTION.	— — —	X — —	—	1704.3.2

TABLE 1704.4
REQUIRED VERIFICATION AND INSPECTION OF CONCRETE CONSTRUCTION

VERIFICATION AND INSPECTION	CONTINUOUS	PERIODIC	REFERENCED STANDARD[a]	IBC REFERENCE
1. INSPECTION OF REINFORCING STEEL, INCLUDING PRESTRESSING TENDONS, AND PLACEMENT.	—	X	ACI 318: 3.5, 7.1-7.7	1913.4
2. INSPECTION OF REINFORCING STEEL WELDING IN ACCORDANCE WITH TABLE 1704.3, ITEM 5b.	—	—	AWS D1.4 ACI 318: 3.5.2	—
3. INSPECT BOLTS TO BE INSTALLED IN CONCRETE PRIOR TO AND DURING PLACEMENT OF CONCRETE WHERE ALLOWABLE LOADS HAVE BEEN INCREASED.	X	—	—	1911.5
4. VERIFYING USE OF REQUIRED DESIGN MIX.	—	X	ACI 318: Ch. 4, 5.2-5.4	1904.2.2, 1913.2, 1913.3
5. AT THE TIME FRESH CONCRETE IS SAMPLED TO FABRICATE SPECIMENS FOR STRENGTH TESTS, PERFORM SLUMP AND AIR CONTENT TESTS, AND DETERMINE THE TEMPERATURE OF THE CONCRETE.	X	—	ASTM C 172 ASTM C 31 ACI 318: 5.6,5.8	1913.10
6. INSPECTION OF CONCRETE AND SHOTCRETE PLACEMENT FOR PROPER APPLICATION TECHNIQUES.	X	—	ACI 318: 5.9, 5.10	1913.6, 1913.7, 1913.8
7. INSPECTION FOR MAINTENANCE OF SPECIFIED CURING TEMPERATURE AND TECHNIQUES.	—	X	ACI 318: 5.11, 5.13	1913.9
8. INSPECTION OF PRESTRESSED CONCRETE: a. APPLICATION OF PRESTRESSING FORCES. b. GROUTING OF BONDED PRESTRESSING TENDONS IN THE SEISMIC-FORCE-RESISTING SYSTEM.	 X X	—	ACI 318: 18.20 ACI 318: 18.18.4	—
9. ERECTION OF PRECAST CONCRETE MEMBERS.	—	X	ACI 318: Ch. 16	—
10. VERIFICATION OF IN-SITU CONCRETE STRENGTH, PRIOR TO STRESSING OF TENDONS IN POST-TENSIONED CONCRETE AND PRIOR TO REMOVAL OF SHORES AND FORMS FROM BEAMS AND STRUCTURAL SLABS.	—	X	ACI 318: 6.2	—
11. INSPECT FORMWORK FOR SHAPE, LOCATION AND DIMENSIONS OF THE CONCRETE MEMBER BEING FORMED.	—	X	ACI 318: 6.1.1	—

TABLE 1704.7
REQUIRED VERIFICATION AND INSPECTION OF SOILS

VERIFICATION AND INSPECTION TASK	CONTINUOUS DURING TASK LISTED	PERIODICALLY DURING TASK LISTED
1. VERIFY MATERIALS BELOW FOOTINGS ARE ADEQUATE TO ACHIEVE THE DESIGN BEARING CAPACITY.	—	X
2. VERIFY EXCAVATIONS ARE EXTENDED TO PROPER DEPTH AND HAVE REACHED PROPER MATERIAL.	—	X
3. PERFORM CLASSIFICATION AND TESTING OF CONTROLLED FILL MATERIALS.	—	X
4. VERIFY USE OF PROPER MATERIALS, DENSITIES AND LIFT THICKNESSES DURING PLACEMENT AND COMPACTION OF CONTROLLED FILL.	X	—
5. PRIOR TO PLACEMENT OF CONTROLLED FILL, OBSERVE SUBGRADE AND VERIFY THAT SITE HAS BEEN PREPARED PROPERLY.	—	X

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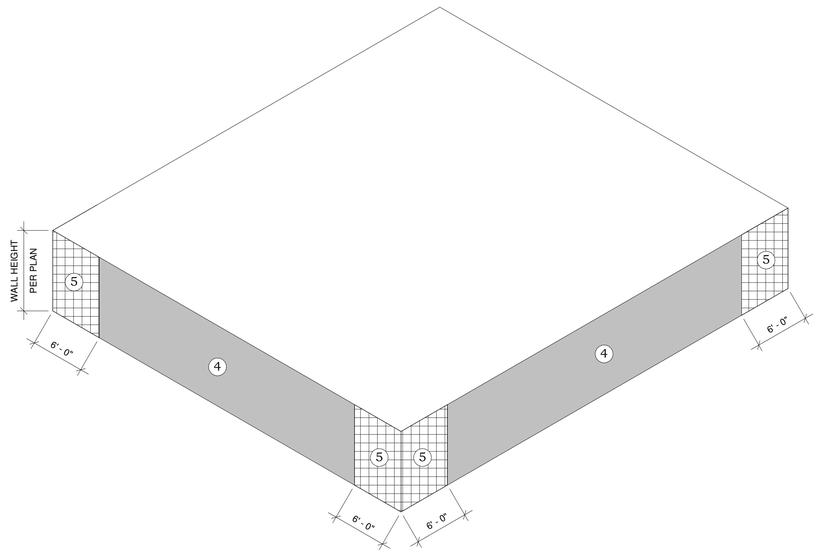
GENERAL NOTES

S1.1



EFFECTIVE WIND AREA	ZONE	MAX PRESSURE
10	4	27.9 psf
20	4	26.7 psf
50	4	25.2 psf
10	5	34.5 psf
20	5	32.2 psf
50	5	29.0 psf

COMPONENTS AND CLADDING 2

1/8" = 1'-0"

UPLIFT PER PRE-ENGINEERED BUILDING MANUFACTURER

NOTE: ROOFING AND SUPPORT MEMBERS SHALL MEET IBC 2012 REQUIRMENT REFER TO WINDSTORM NOTES FOR MORE INFORMATION.

ROOF UPLIFT PLAN 1

1/8" = 1'-0"

N

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EDINBURG, TEXAS

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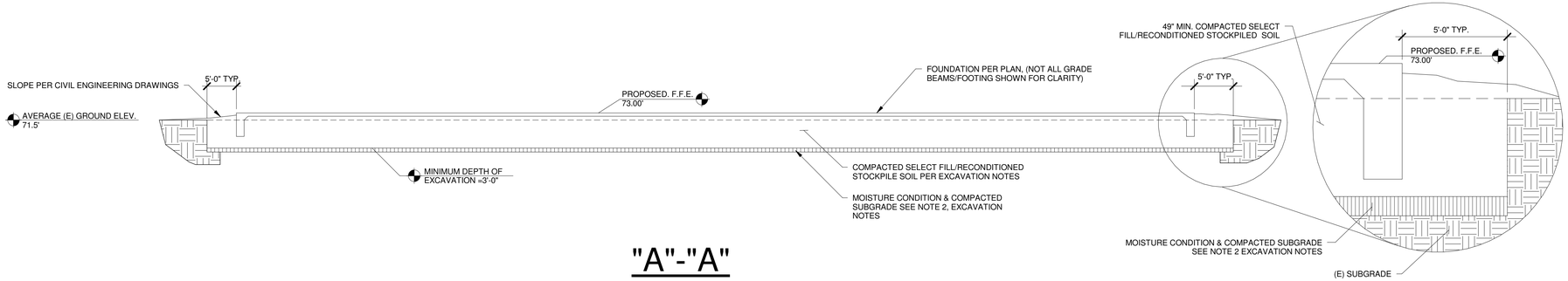
CK BY: M.C. DWN BY:E.F.S.
COMPONENTS AND CLADDING/ROOF UPLIFT PLAN

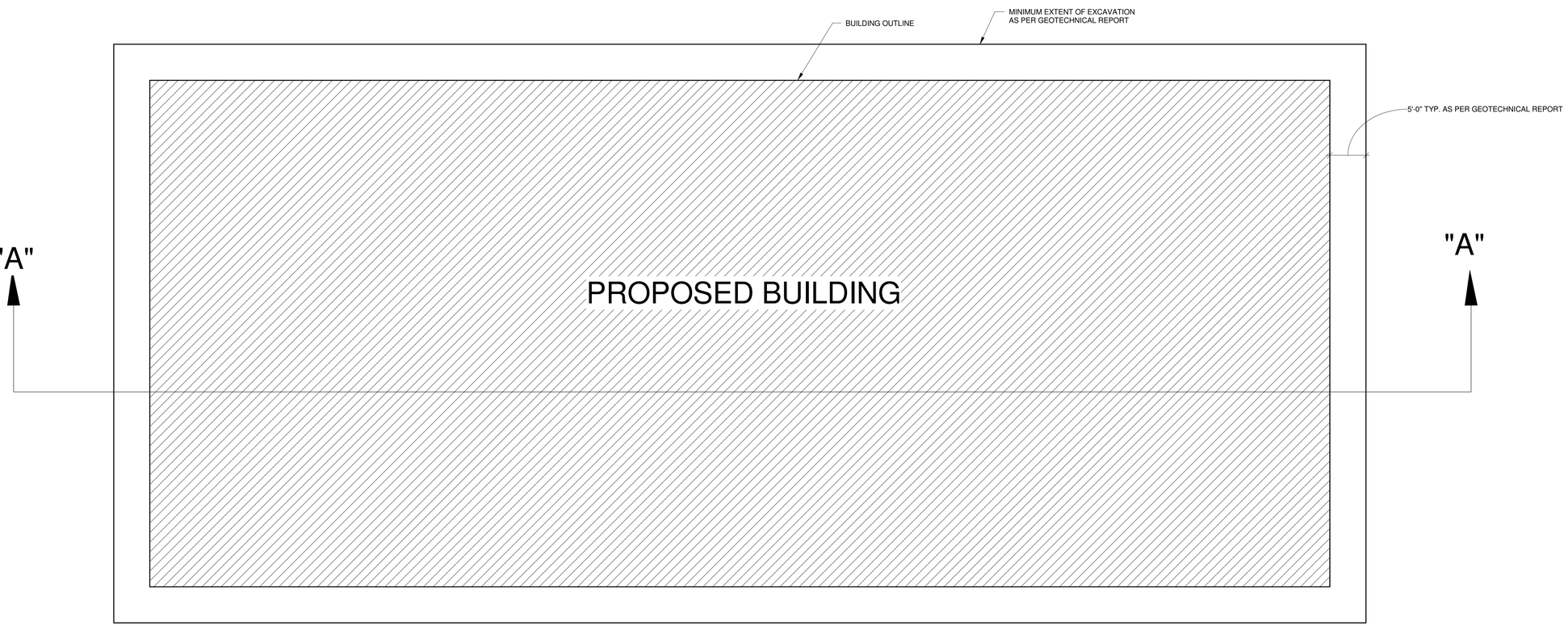
S1.2



"A"-"A"

PROFILE 2

1 1/2" = 1'-0"



EXCAVATION NOTES:

1. CONSTRUCTION AREAS AT LEAST 6 INCHES OF TOP SOIL, VEGETATION, DEBRIS, ETC., REMOVE FROM THE PROPOSED BUILDING AREA TO A DISTANCE OF 5 '-0" OUTSIDE THE PROPOSED BUILDING LINE. FURTHUR MORE, REMOVE AN ADDITIONAL 30" AND STOCKPILE ON SITE. EXCAVATED STOCKPILED SOILS SHALL BE RECONDITIONED AND PLACED BACK IN A CONTROLLED MANNER (MOISTURE CONDITIONED AND COMPACTED).

2. EXPOSED SUBGRADE SHOULD BE THOROUGHLY PROOF ROLLED IN ORDER TO LOCATE AND DENSITY ANY WEAK, COMPRESSIBLE ZONE. WEAK OR SOFT AREAS IDENTIFIED DURING PROOF ROLLING SHOULD BE REMOVED AND REPLACED WITH A SUITABLE, COMPACTED SELECT FILL IN ACCORDANCE WITH THE REQUIREMENTS BELOW. PRIOR TO FILL PLACEMENT, THE EXPOSED SUBGRADE SHOULD BE MOISTURE CONDITIONED BY SCARIFYING TO A MINIMUM DEPTH OF 6" AND RECOMPACTING TO A MINIMUM OF 95% OF THE MAXIMUM DRY DENSITY AS DETERMINED FROM THE ASTM D698 COMPACTION TEST. THE MOISTURE CONTENT SHOULD BE MAINTAINED WITHIN THE OPTIMUM TO 4% ABOVE.

3. FILL BACK TO REQUIRED GRADE (A MINIMUM OF 49" OF SELECT FILL/RECONDITIONED STOCKPILED) SOIL IS REQUIRED. REFER TO CIVIL PLANS FOR FINISHED FLOOR ELEVATION TO DETERMINE ADDITIONAL AMOUNT OF SELECT FILL NEEDED) WITH MATERIAL SELECTED AND COMPACTED IN ACCORDANCE WITH THE REQUIREMENTS BELOW.

4. SELECT FILL, WHEN PROPERLY SLAKED AND TESTED BY STANDARD LABORATORY METHODS, SHALL MEET THE FOLLOWING REQUIREMENTS:
   A. MEET THE TxDOT 2004 STANDARD SPECIFICATION FOR CONSTRUCTION AND MAINTENANCE OF HIGHWAYS, STREETS, AND BRIDGES, ITEM 247 FLEXIBLE BASE, TYPE A, TYPE B, OR TYPE C, GRADES 1 THROUGH 3.

ALTERNATIVELY

   B. THE FOLLOWING SOILS, AS CLASSIFIED ACCORDING TO THE USCS, MAY BE CONSIDERED SATISFACTORY FOR USE AS SELECT FILL MATERIALS AT THIS SITE: SC, GC, AND COMBINATIONS OF THESE SOILS. IN ADDITION TO THE USCS CLASSIFICATION, ALTERNATIVE SELECT FILL MATERIALS SHALL HAVE A MAXIMUM LIQUID LIMIT OF 35 PERCENT, A PLASTICITY INDEX BETWEEN 7 AND17 PERCENT, AND A MAXIMUM PARTICLE SIZE NOT EXCEEDING 2 INCHES OR ONE HALF THE LOOSE LIFT THICKNESS, WHICHEVER IS SMALLER.

5. SAMPLES OF PROPOSED SELECT FILL SHALL BE FURNISHED TO THE TESTING LABORATORY 7 DAYS PRIOR TO INSTALLATION TO PERMIT TIME FOR SPECIFICATION COMPLIANCE INSPECTION AND APPROVAL.

6. SELECT FILL UNDER ALL FLOORS AND WALKS SHALL BE COMPACTED IN THE FIELD IN LIFTS NOT TO EXCEED 8" TO 95% OF THE MAXIMUM DENSITY, 1% BELOW TO 3% ABOVE THE OPTIMUM MOISTURE CONTENT, AS DETERMINED BY TEST METHOD ASTM D-698

7. SITE PREPARATION TESTING SHALL BE AS FOLLOWS:
   A. ATTERBERG LIMITS OF SELECT FILL MATERIAL:
      (1) ONE TEST PER 5,000 CY
   B. COMPACTION TEST:
      TO BE PERFORMED PER LIFT ON TEST PER 3,000 SF MINIMUM OF (4) FOUR TEST PER LIFT

8. FINAL SITE GRADING TO SLOPE AWAY FROM THE STRUCTURE AND SHALL PREVENT WATER FROM PONDING IN THE AREAS ADJACENT TO THE STRUCTURE FOR A MINIMUM DISTANCE OF 10'-0". ANY PONDING CLOSE TO THE STRUCTURE MAY CREATE VOLUMETRIC CHANGES IN THE SOIL AND MAY LEAD TO LESS THAN OPTIMUM PERFORMANCE OF THE BUILDING FOUNDATION.

9. IT IS ALSO IMPORTANT TO MINIMIZE CHANGES IN MOISTURE CONTENT CREATED BY ROOF DRAINAGE, PLUMBING LEAKS, LANDSCAPING / IRRIGATION, AND DOWNSPOUT OUTFALLS. ANY PLUMBING LEAKS SHALL BE REPAIRED AS SOON AS POSSIBLE AND PROPER DRAINAGE PROVIDED AWAY FROM THE BUILDING. LARGE BUSHES AND TREES SHALL NOT BE PLACED IN AREAS DIRECTLY ADJACENT TO THE FOUNDATION AS THEIR ROOT SYSTEM MAY CREATE SUBSTANTIAL MOISTURE DIFFERENTIALS THAT MAY LEAD TO VOLUME CHANGES IN THE SOIL. LARGE BUSHES AND TREES SHOULD BE LOCATED AT A REASONABLE DISTANCE FROM THE FOUNDATION.

10. GEOTECHNICAL REPORT SHALL BE CONSIDERED A PART OF THE CONSTRUCTION DOCUMENTS. CONTRACTOR TO REVIEW AND COMPLY WITH ALL EARTHWORK AND GRADING REQUIREMENT IN GEOTECHNICAL REPORT.

EXCAVATION PLAN 1

1/8" = 1'-0"

N

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EXCAVATION PLAN

S1.3

NOT USED 17

NOT USED 18

NOT USED 19

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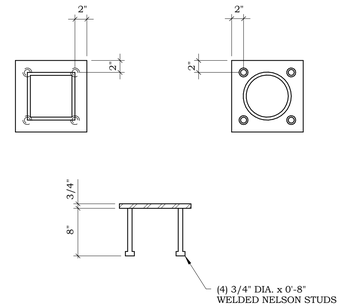
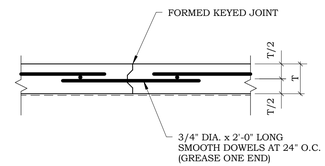


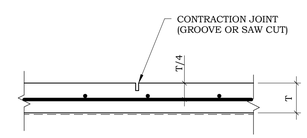
NOTE: DIMENSION FROM EDGE OF PLATE TO FACE OF COLUMN

BASE PLATE DETAIL 9



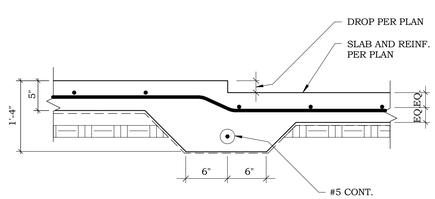
1. CONTRACTOR TO SUBMIT ANY PROPOSED LOCATIONS OF CONSTRUCTION JOINTS TO STRUCTURAL ENGINEER BEFORE COMMENCING WORK.
2. GRADE BEAM REINFORCING SHALL BE CONTINUOUS THRU JOINT

CONSTRUCTION JOINT DETAIL 10

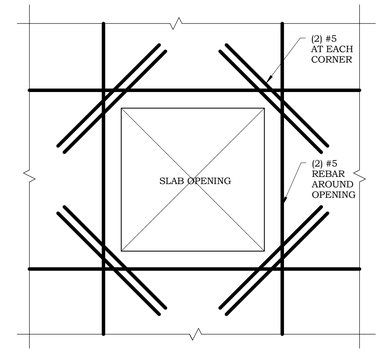


1. JOINT PATTERN SHALL BE NEARLY SQUARE
2. JOINT SPACING SHALL NOT EXCEED 15'-0"

CONTRATION JOINT DETAIL 11



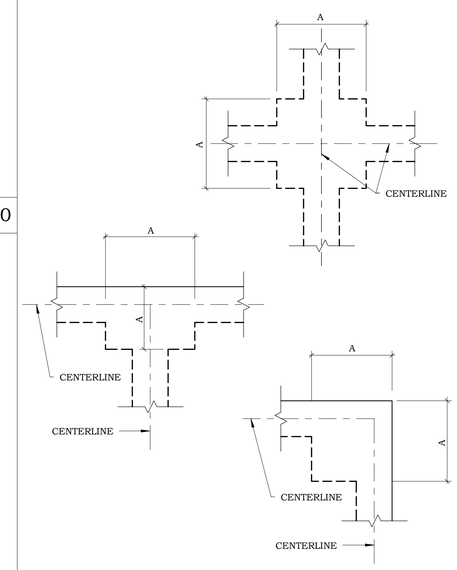
DROP AT SLAB ON GRADE 12



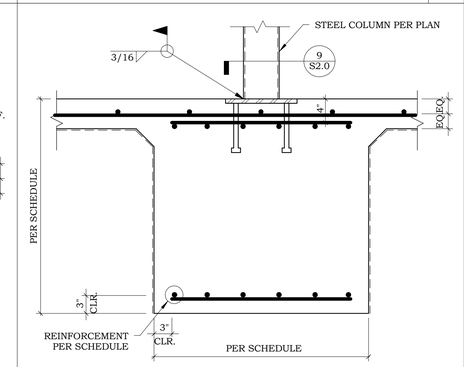
OPENINGS IN SLAB 5

FOOTING SCHEDULE AT STEEL COLUMNS

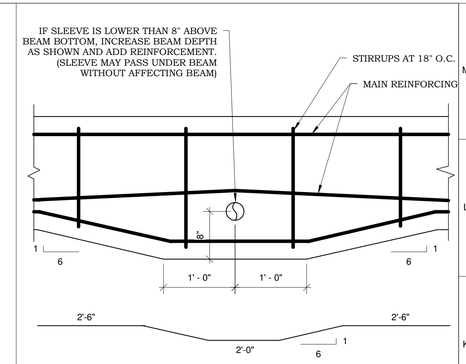
TYPE	A	DEPTH	REBAR REINFORCEMENT
S2	2'-6"	3'-0"	#5'S AT 12" O.C. E.W. TOP & BOTTOM
S3	3'-6"	3'-0"	#5'S AT 12" O.C. E.W. TOP & BOTTOM
S4	4'-6"	3'-0"	#5'S AT 12" O.C. E.W. TOP & BOTTOM
S5	5'-6"	3'-0"	#5'S AT 12" O.C. E.W. TOP & BOTTOM
S6	6'-6"	3'-0"	#5'S AT 8" O.C. E.W. TOP & BOTTOM
S7	7'-6"	3'-0"	#5'S AT 8" O.C. E.W. TOP & BOTTOM



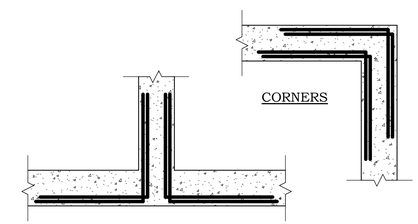
FOOTING SCHEDULE 7



FOOTING AT STEEL COLUMN 8

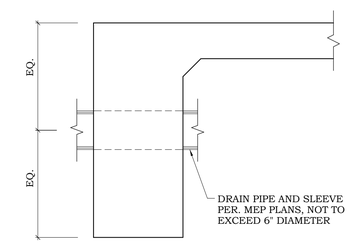


TYPICAL SLEEVE IN GRADE BEAM 1

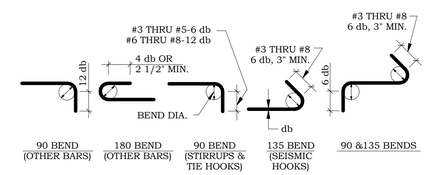


NOTE:
PROVIDE (4) #6 x 6'-0" CORNER BARS
(2-TOP & 2-BOTTOM) AS SHOWN
IN DETAILS ABOVE

TYPICAL CORNER BARS 2



PIPE EXTERIOR FOOTING 3



DIAMETER OF BENDS	
STIRRUPS AND TIES	4 db FOR #3 THRU #5 BARS
	6 db FOR #6 THRU #8 BARS
ALL OTHERS	6 db FOR #3 THRU #8 BARS
	8 db FOR #9 THRU #11 BARS
	10 db FOR #14 THRU #18 BARS

STANDARD HOOKS 4

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STATE OF TEXAS
MICHAEL CHANIN
93127
LICENSED
PROFESSIONAL ENGINEER
8-1-14

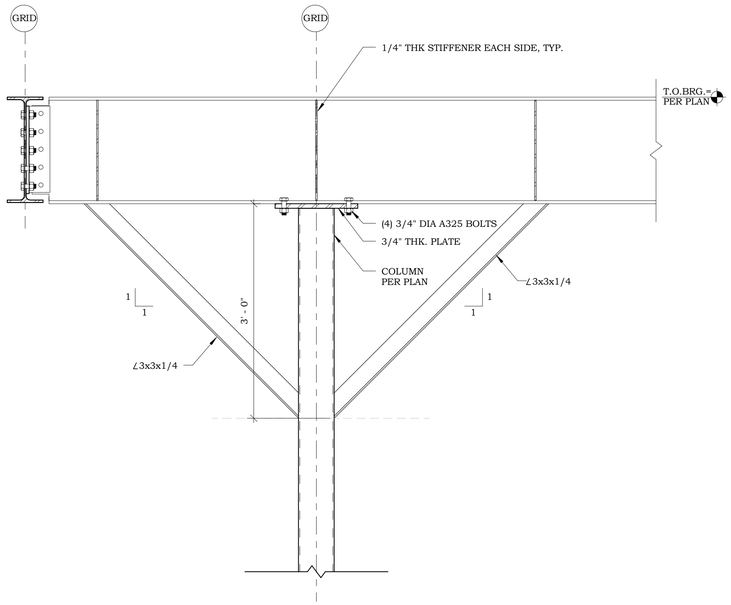
NO.	DATE	DESCRIPTION

MAINTENANCE HANGAR FOR
SOUTH TEXAS INTERNATIONAL
AIRPORT AT EDINBURG
CITY OF EDINBURG
EDINBURG, TEXAS

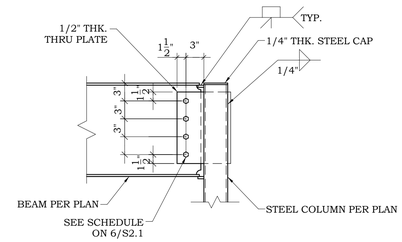
PROJECT NO: 14111
DATE: 8/1/2014 4:49:45 PM
STARTING DATE: Issue Date
CK BY: M.C. DWN BY:E.F.S.

FOUNDATION
TYPICAL DETAILS

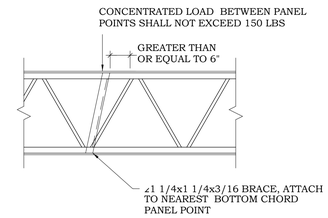
S2.0



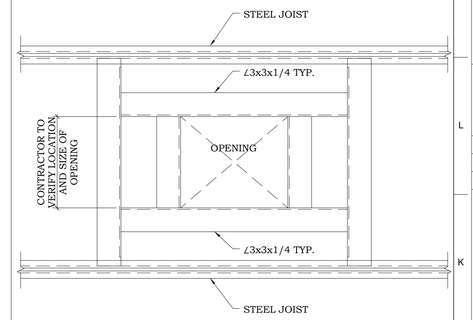
STEEL BEAM TO STEEL COLUMN | 14



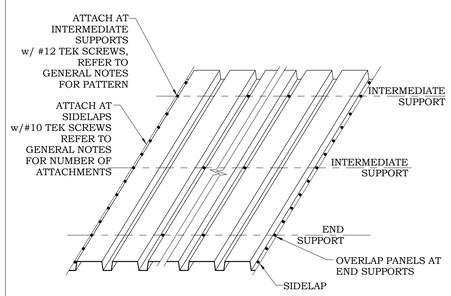
MOMENT CONNECTION | 9



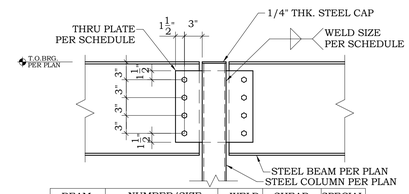
JOIST BRACING AT CONCENTRATED LOAD | 5



SUPPORT FOR FLOOR OPENING | 1

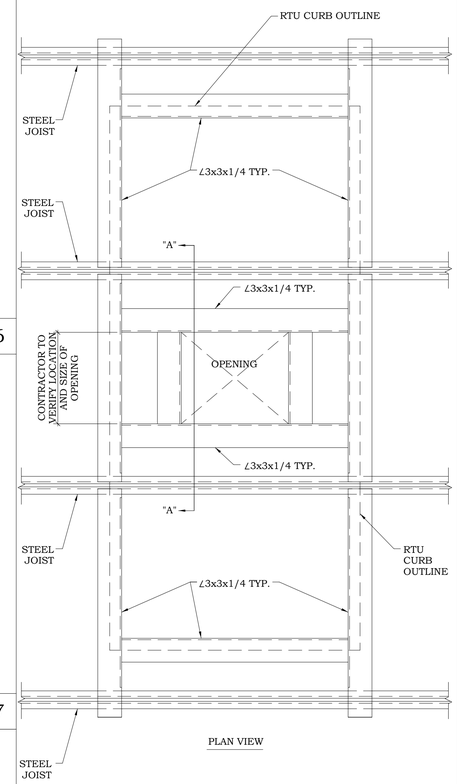


TYPICAL METAL DECK ATTACHMENT | 10

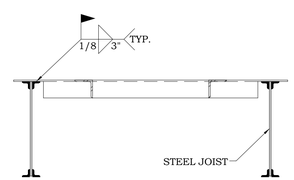


BEAM SIZE	NUMBER/SIZE OF BOLTS	WELD SIZE	SHEAR PLATE	SPECIAL NOTES
W8, W10	(2) 3/4" DIA. A325	1/4"	1/2" THK.	-
W12, W14	(3) 3/4" DIA. A325	1/4"	1/2" THK.	-
W16	(4) 3/4" DIA. A325	1/4"	1/2" THK.	-
W18	(5) 3/4" DIA. A325	1/4"	1/2" THK.	-
W21	(6) 3/4" DIA. A325	1/4"	1/2" THK.	-
W24	(7) 3/4" DIA. A325	1/4"	1/2" THK.	-
W27	(8) 3/4" DIA. A325	1/4"	1/2" THK.	-
W30	(9) 3/4" DIA. A325	1/4"	1/2" THK.	-

STEEL COLUMN TO STEEL BEAM CONNECTION | 6



PLAN VIEW

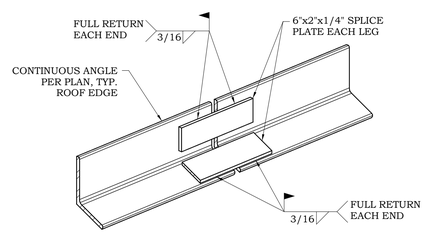


SECTION "A"-"A"

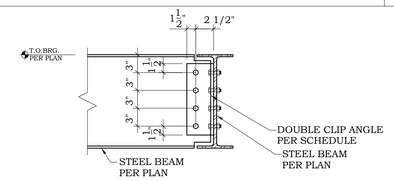
SUPPORT FOR MECHANICAL UNIT | 4

NOT USED | 19

NOT USED | 15



TYPICAL FLOOR EDGE ANGLE SPLICE DETAIL | 11



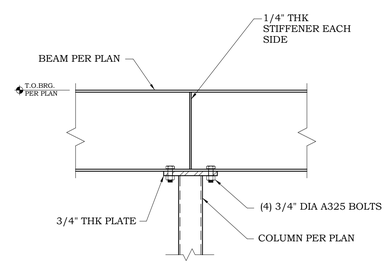
BEAM SIZE	NUMBER OF ROWS/ SIZE OF BOLTS	CLIP ANGLE
W8, W10	(2) 3/4" DIA. A325	∠∠4x3 1/2 x1/4
W12, W14	(3) 3/4" DIA. A325	∠∠4x3 1/2 x1/4
W16	(4) 3/4" DIA. A325	∠∠4x3 1/2 x1/4
W18	(5) 3/4" DIA. A325	∠∠4x3 1/2 x1/4
W21	(6) 3/4" DIA. A325	∠∠4x3 1/2 x1/4
W24	(7) 3/4" DIA. A325	∠∠4x3 1/2 x1/4
W27	(8) 3/4" DIA. A325	∠∠4x3 1/2 x1/4
W30	(9) 3/4" DIA. A325	∠∠4x3 1/2 x1/4

STEEL BEAM TO STEEL BEAM CONNECTION | 7

NOT USED | 20

NOT USED | 16

NOT USED | 12



COLUMN TO STEEL BEAM | 8

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MICHAEL CHANIN
93127
LICENSED
PROFESSIONAL ENGINEER
8-1-14

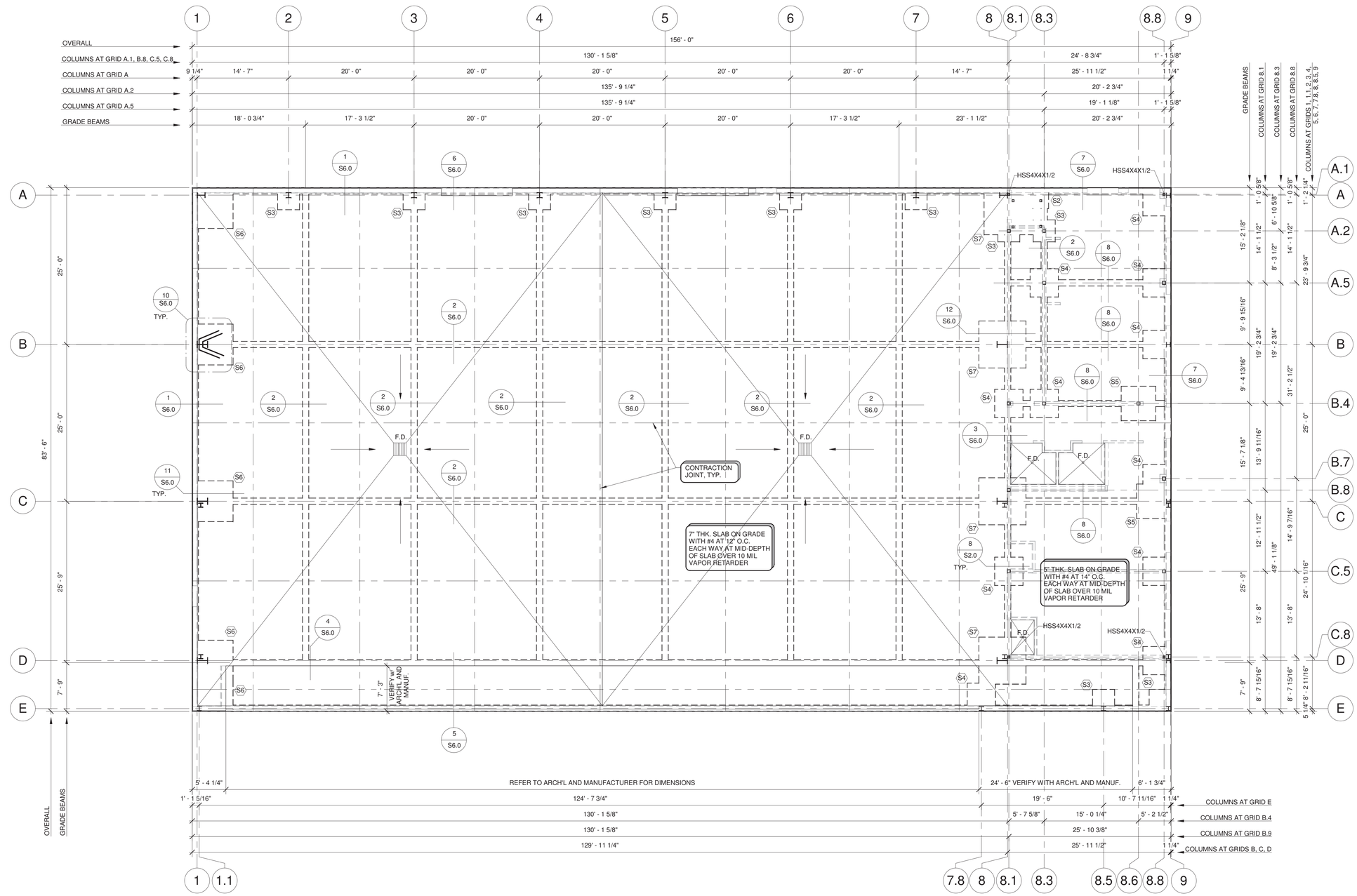
NO.	DATE	DESCRIPTION

MAINTENANCE HANGAR FOR SOUTH TEXAS INTERNATIONAL AIRPORT AT EDINBURG
CITY OF EDINBURG
EDINBURG, TEXAS

PROJECT NO:	14111
DATE:	8/1/2014 4:49:46 PM
STARTING DATE:	Issue Date
CK BY: M.C.	DWN BY:E.F.S.

STEEL TYPICAL DETAILS

S2.1



FOUNDATION NOTES:

1. CONTRACTOR TO VERIFY ALL DIMENSIONS WITH ARCHITECTURAL PLANS BEFORE COMMENCING WORK.
2. CONTRACTOR TO VERIFY LOCATION OF ANY/ALL DROPS AND DRAINS IN SLAB WITH ARCHITECTURAL DRAWINGS.
3. CONTRACTOR TO VERIFY REQUIRED F.F.E. WITH CIVIL ENGINEERING DRAWINGS.
4. ALL COLUMNS TO BE HSS 6x6x1/4, U.N.O.
5. REFER TO FOOTING SCHEDULE FOR FOOTING SIZE AND REINFORCEMENT, SEE DETAIL 7/S2.0.

FOUNDATION PLAN

1

1/8" = 1'-0"

N

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8-1-14

NO.	DATE	DESCRIPTION

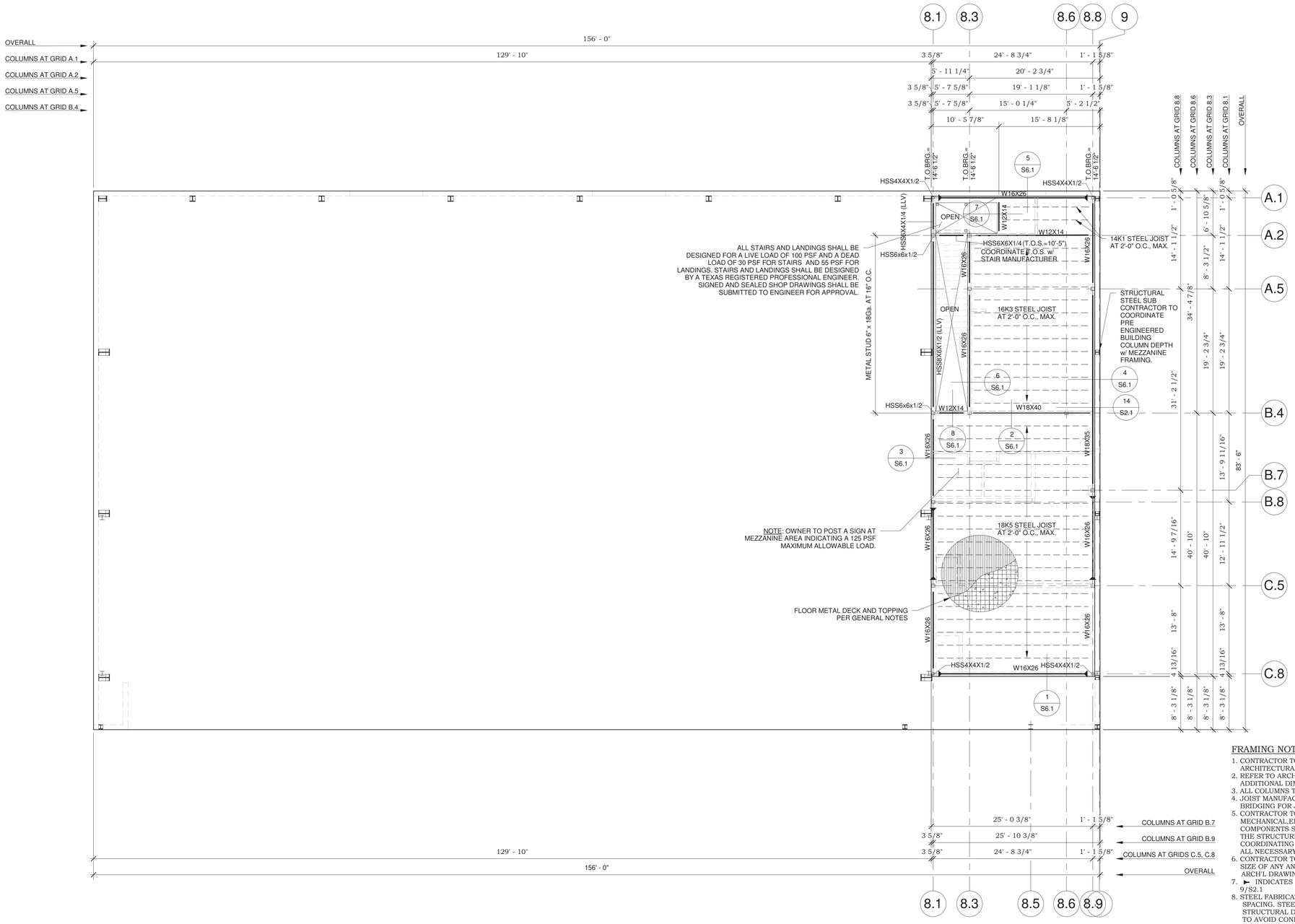
MAINTENANCE HANGAR FOR SOUTH TEXAS INTERNATIONAL AIRPORT AT EDINBURG CITY OF EDINBURG

EDINBURG, TEXAS

PROJECT NO:	14111
DATE:	8/1/14 4:49:43 PM
STARTING DATE:	Issue Date
CK BY: M.C.	DWN BY: J.P.

FOUNDATION PLAN

S3.0



FRAMING NOTES:

1. CONTRACTOR TO VERIFY ALL DIMENSIONS WITH ARCHITECTURAL PLANS BEFORE COMMENCING WORK.
2. REFER TO ARCHITECTURAL DRAWINGS FOR ANY ADDITIONAL DIMENSIONS.
3. ALL COLUMNS TO BE HSS 6x6x1/4, U.N.O.
4. JOIST MANUFACTURER TO PROVIDE ADEQUATE BRIDGING FOR JOISTS AS REQUIRED BY S.J.I.
5. CONTRACTOR TO COORDINATE ALL MECHANICAL,ELECTRICAL AND PLUMBING COMPONENTS SUPPORTED BY THE STRUCTURE WITH THE STRUCTURE MANUFACTURER. THIS INCLUDES COORDINATING EXACT WEIGHT AND LOCATION, AND ALL NECESSARY ATTACHMENTS.
6. CONTRACTOR TO COORDINATE EXACT LOCATION AND SIZE OF ANY AND ALL OPENINGS IN SECOND FLOOR WITH ARCH'L DRAWINGS.
7. ► INDICATES MOMENT CONNECTION, SEE DETAIL 9/S2.1
8. STEEL FABRICATOR TO COORDINATE EXACT JOIST SPACING. STEEL JOIST LOCATIONS SHOWN ON STRUCTURAL DRAWINGS MAY BE ADJUSTED IN ORDER TO AVOID CONFLICTING STRUCTURAL MEMBERS AND CONDITIONS (SUCH AS STUB COLUMNS OR CONNECTIONS) AND IN ORDER TO ACHIEVE PROPER BEARING. ADD JOISTS AS NEEDED TO NOT EXCEED MAXIMUM SPACING SHOWN ON DRAWINGS.

SECOND FLOOR FRAMING PLAN

1/8" = 1'-0"

1

N

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8-1-14

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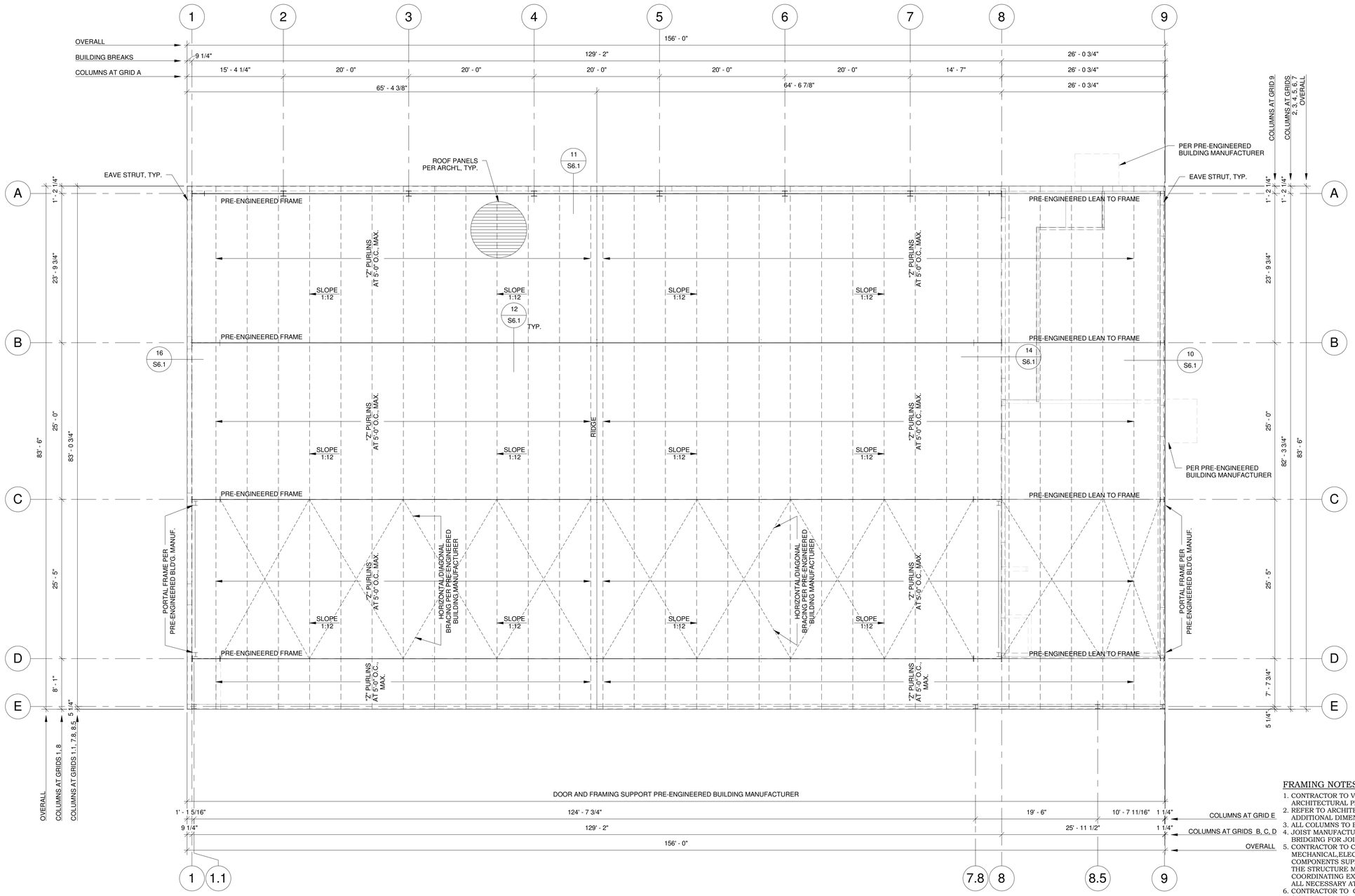
CITY OF EDINBURG
EDINBURG, TEXAS

PROJECT NO:	14111
DATE:	8/1/14 4:49:43 PM
STARTING DATE:	Issue Date
CK BY: M.C.	DWN BY:E.F.S.

SECOND FLOOR FRAMING PLAN

S4.0



FRAMING NOTES:

1. CONTRACTOR TO VERIFY ALL DIMENSIONS WITH ARCHITECTURAL PLANS BEFORE COMMENCING WORK.
2. REFER TO ARCHITECTURAL DRAWINGS FOR ANY ADDITIONAL DIMENSIONS.
3. ALL COLUMNS TO BE HSS 6x6x1/4, U.N.O.
4. JOIST MANUFACTURER TO PROVIDE ADEQUATE BRIDGING FOR JOISTS AS REQUIRED BY S.J.I.
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7. ► INDICATES MOMENT CONNECTION, SEE DETAIL 9/S2.1
8. STEEL FABRICATOR TO COORDINATE EXACT JOIST SPACING. STEEL JOIST LOCATIONS SHOWN ON STRUCTURAL DRAWINGS MAY BE ADJUSTED IN ORDER TO AVOID CONFLICTING STRUCTURAL MEMBERS AND CONDITIONS (SUCH AS STUB COLUMNS OR CONNECTIONS) AND IN ORDER TO ACHIEVE PROPER BEARING. ADD JOISTS AS NEEDED TO NOT EXCEED MAXIMUM SPACING SHOWN ON DRAWINGS.

ROOF FRAMING PLAN

1/8" = 1'-0"

1

N

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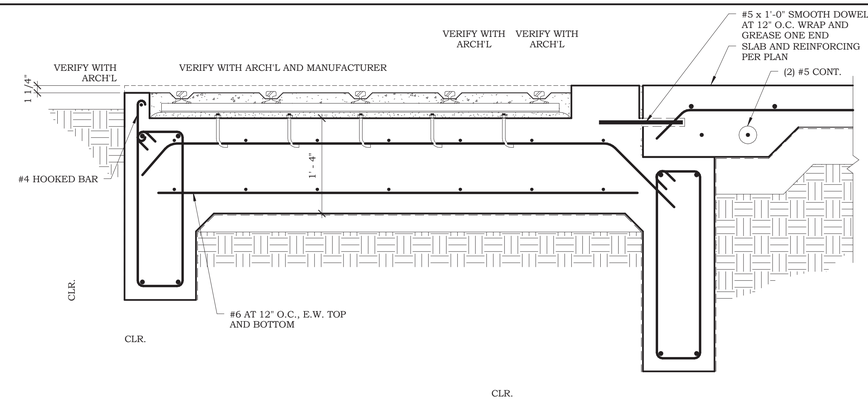
NO.	DATE	DESCRIPTION

MAINTENANCE HANGAR FOR SOUTH TEXAS INTERNATIONAL AIRPORT AT EDINBURG
CITY OF EDINBURG
EDINBURG, TEXAS

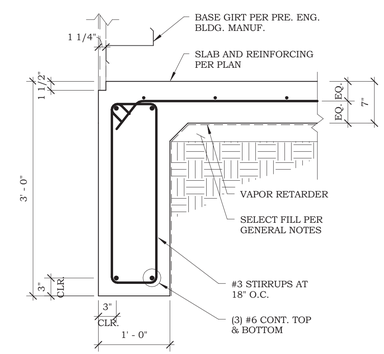
PROJECT NO:	14111
DATE:	8/1/2014 4:49:47 PM
STARTING DATE:	Issue Date
CK BY: M.C.	DWN BY:E.F.S.

ROOF FRAMING PLAN

S5.0



FOUNDATION AT RAILING BASE 5



EXTERIOR FOOTING 1

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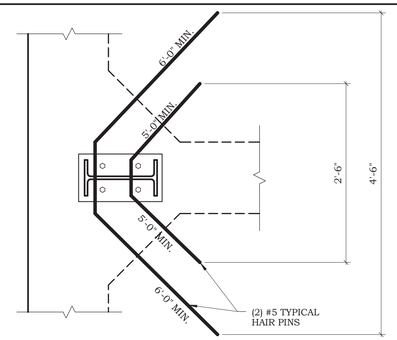
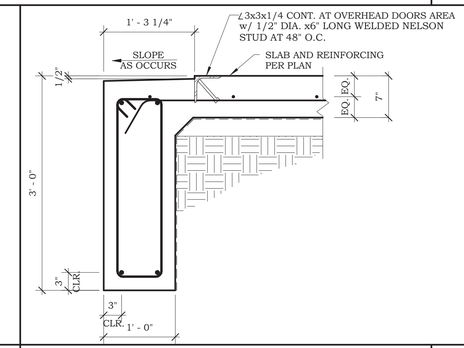
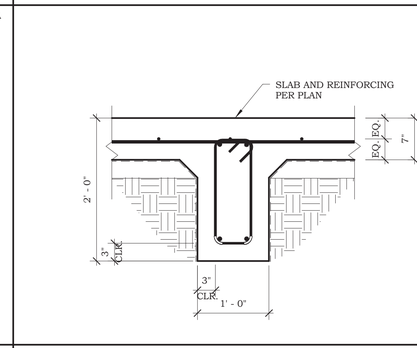
NOT USED 13



TYPICAL HAIR PINS 10



EXTERIOR FOOTING 6



INTERIOR FOOTING 2

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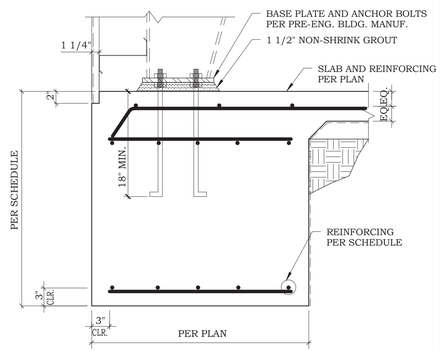
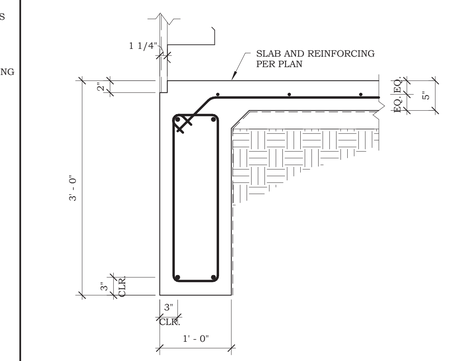
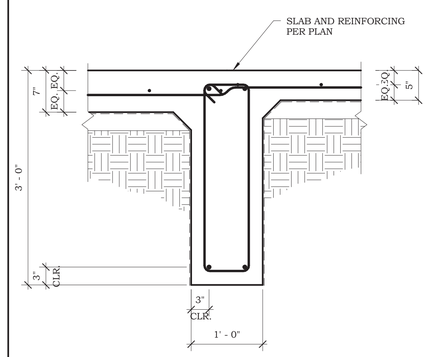
NOT USED 14



FOOTING AT PRE-ENG. COLUMN 11



EXTERIOR FOOTING 7



INTERIOR FOOTING 3

NOT USED 19

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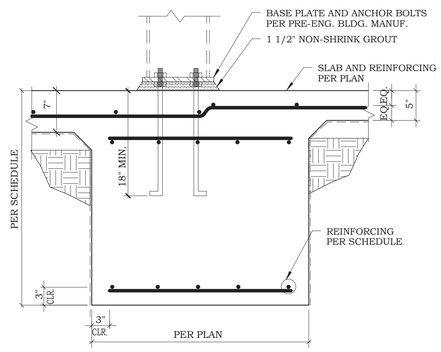
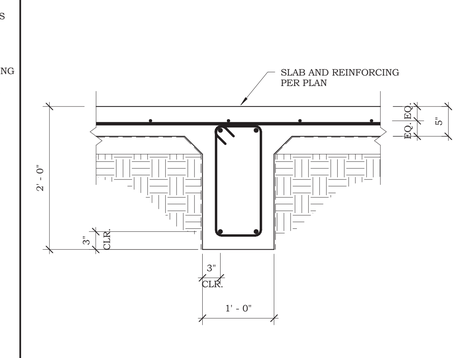
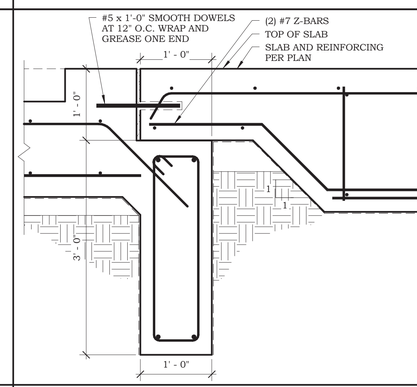


FOOTING AT PRE-ENG. COLUMN 12



INTERIOR FOOTING 8



GRADE BEAM TRANSITION DETAIL 4

NOT USED 20

NOT USED 16

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STATE OF TEXAS
MICHAEL CHANIN
93127
LICENSED
PROFESSIONAL ENGINEER
8-1-14

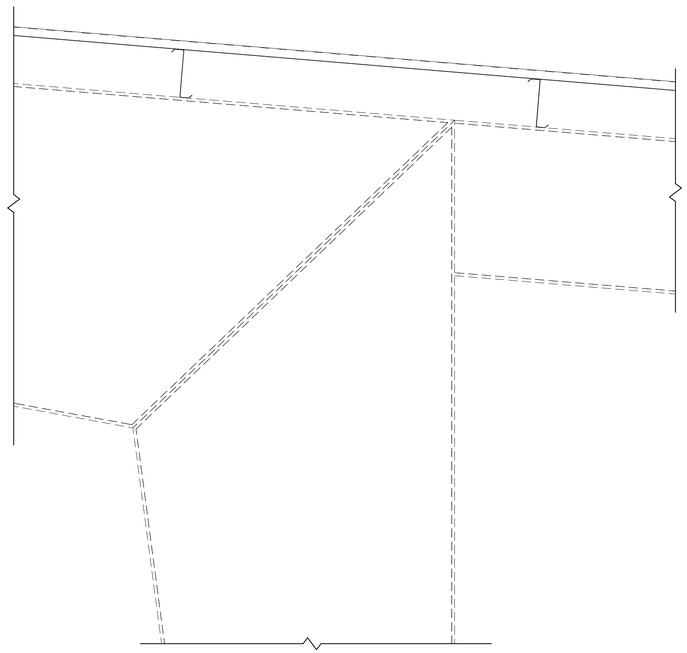
NO.	DATE	DESCRIPTION

MAINTENANCE HANGAR FOR
SOUTH TEXAS INTERNATIONAL
AIRPORT AT EDINBURG
CITY OF EDINBURG
EDINBURG, TEXAS

PROJECT NO:	14111
DATE:	8/1/14 4:49:43 PM
STARTING DATE:	Issue Date
CK BY: M.C.	DWN BY:E.F.S.

DETAILS

S6.0



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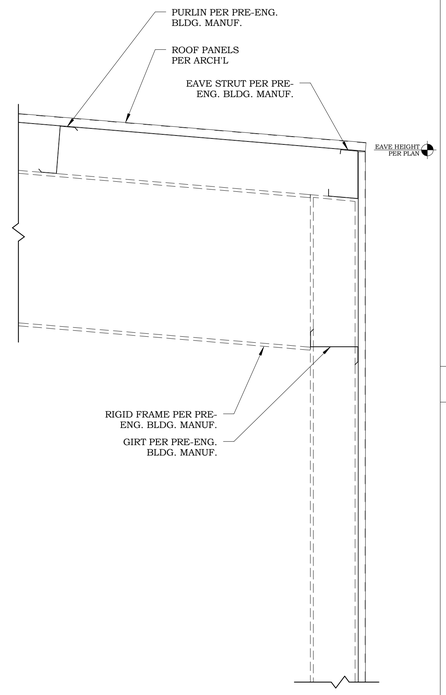

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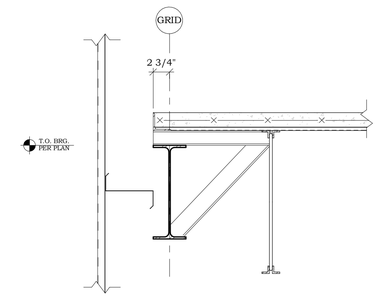

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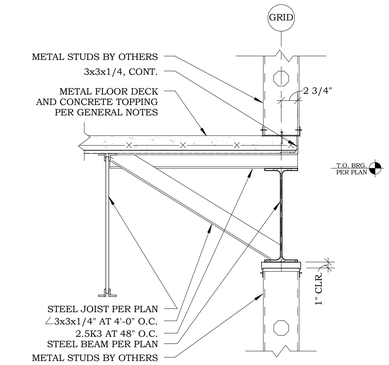

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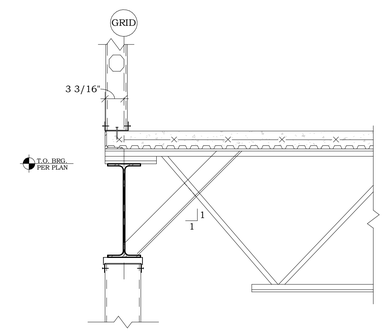

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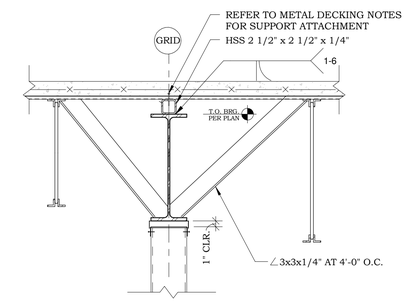

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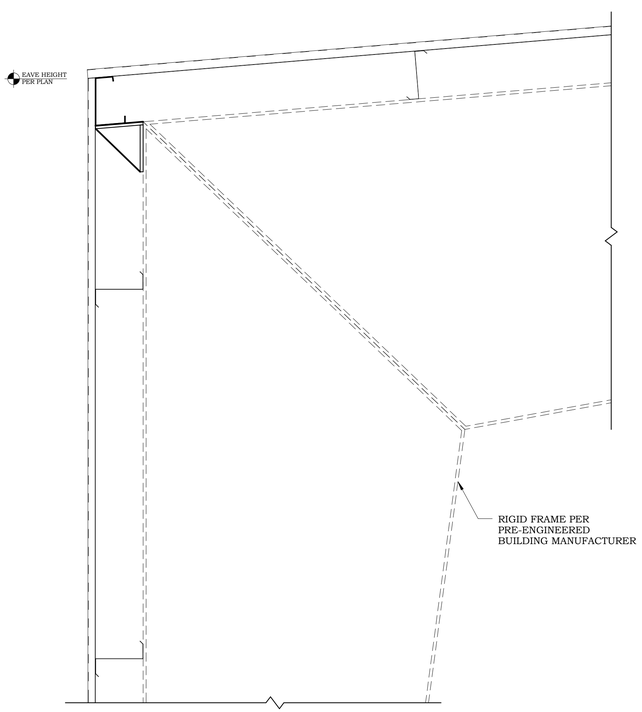

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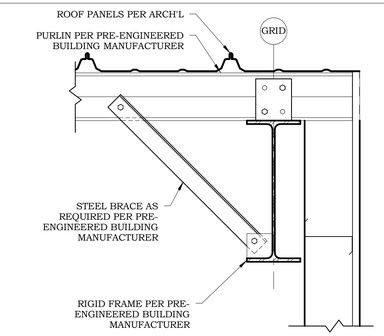

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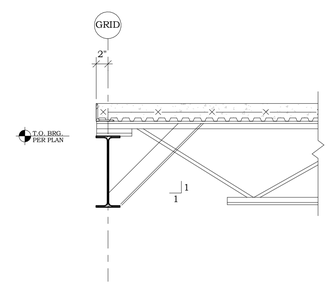

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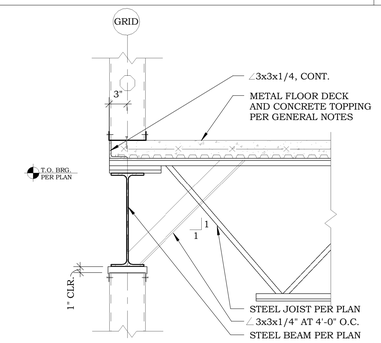

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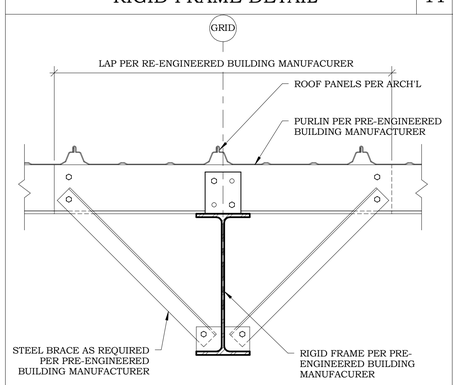

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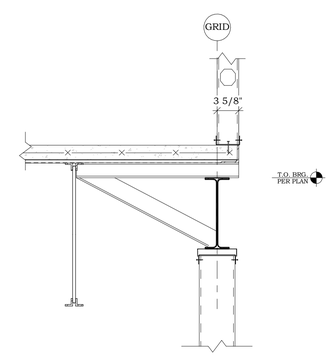

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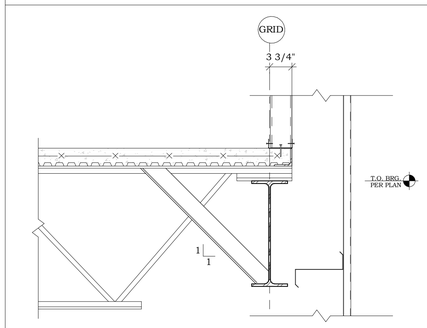

STEEL JOIST TO STEEL BEAM 4

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TBPE FIRM REG. NUMBER F-9369

STATE OF TEXAS
MICHAEL CHANIN
93127
LICENSED PROFESSIONAL ENGINEER
8-1-14

NO.	DATE	DESCRIPTION

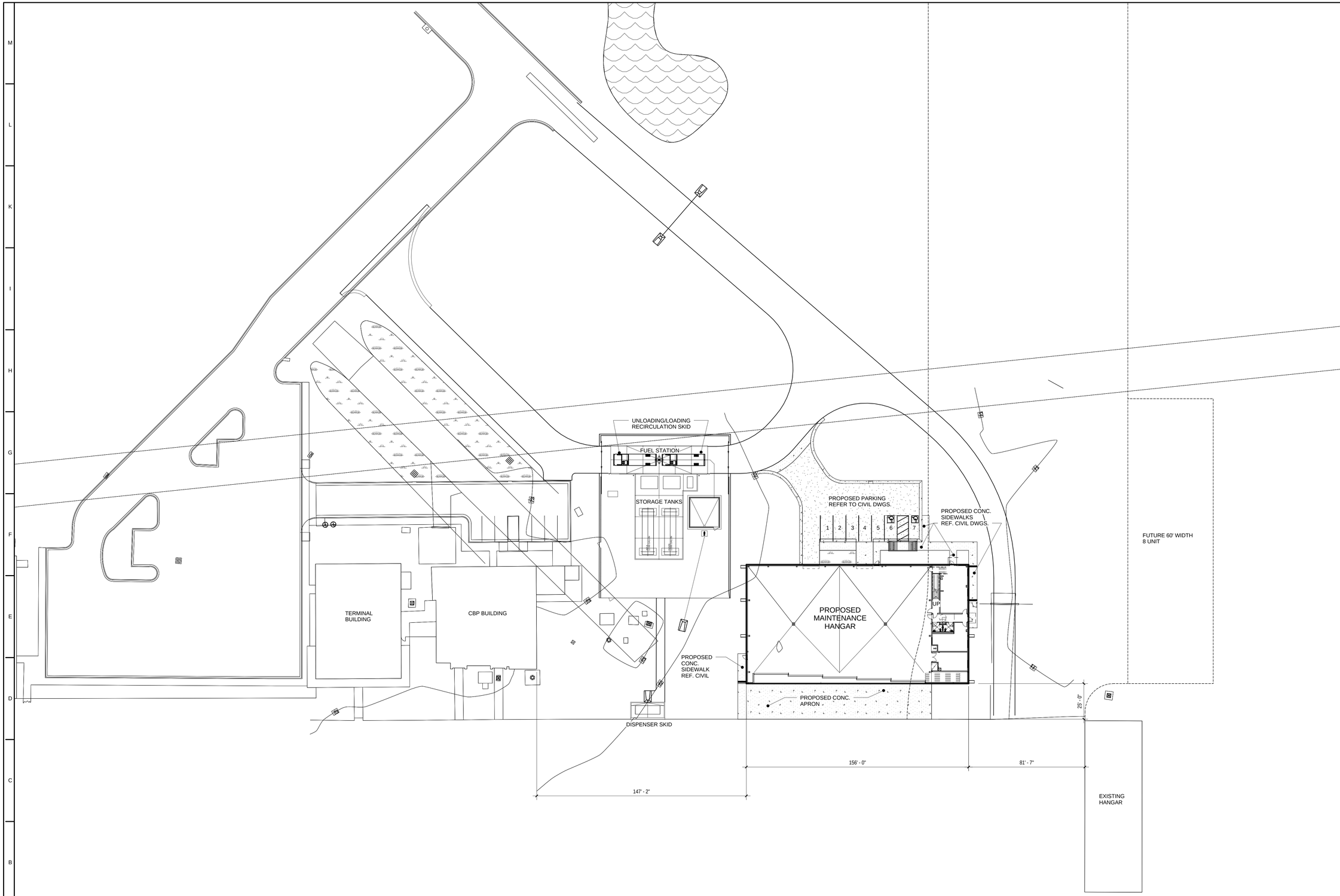
MAINTENANCE HANGAR FOR SOUTH TEXAS INTERNATIONAL AIRPORT AT EDINBURG CITY OF EDINBURG

EDINBURG, TEXAS

PROJECT NO: 14111
DATE: 8/1/2014 4:49:52 PM
STARTING DATE: Issue Date
CK BY: M.C. DWN BY:E.F.S.

DETAILS

S6.1



OVERALL SITE PLAN

1

1" = 30'-0"

N

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CONSULTANTS:

REGISTERED ARCHITECT
JULIO A. FIGUEROA
12858
STATE OF TEXAS

08.01.2014

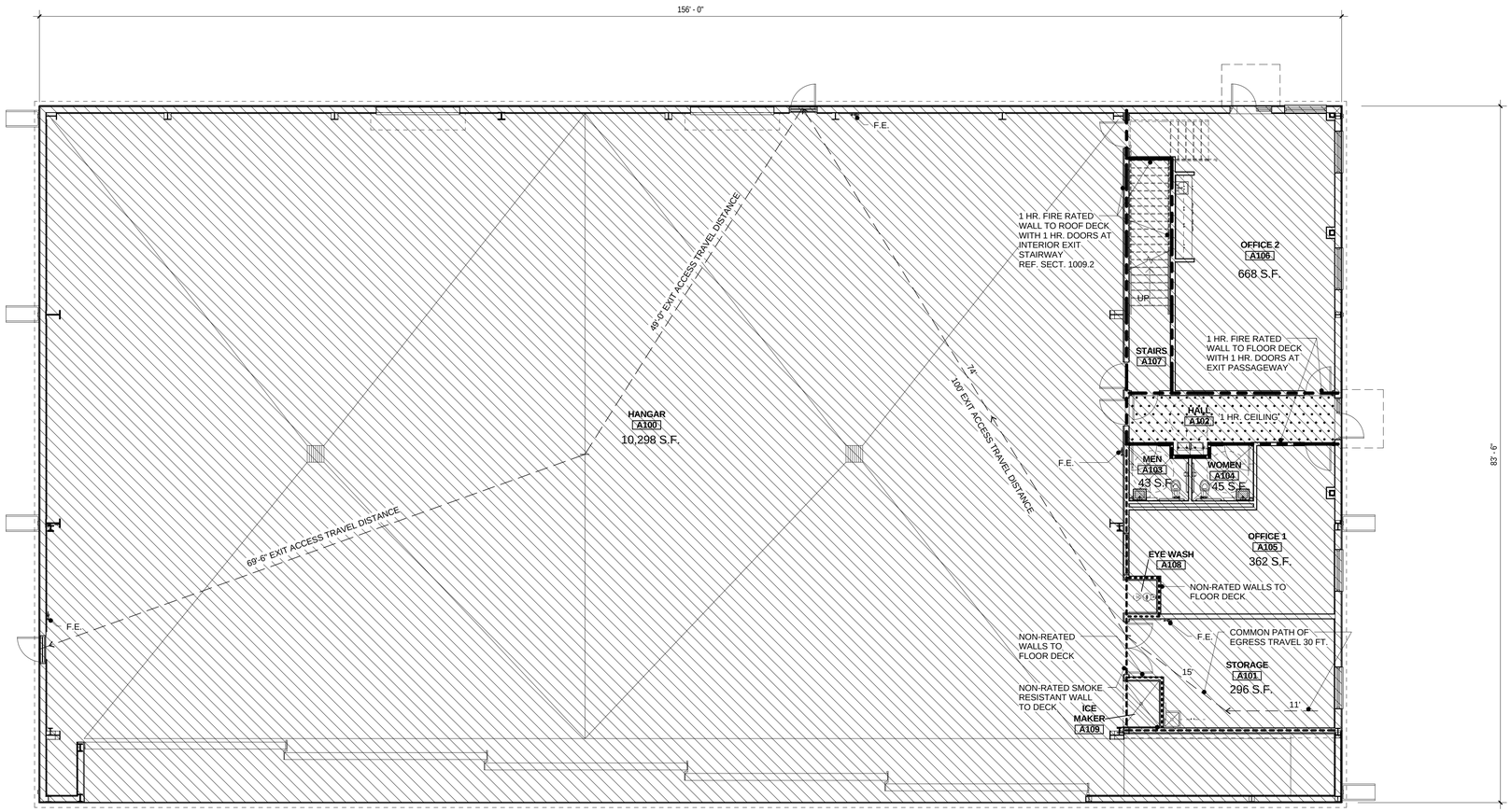
NO.	DATE	DESCRIPTION

MAINTENANCE HANGAR FOR SOUTH TEXAS INTERNATIONAL AIRPORT AT EDINBURG
CITY OF EDINBURG
EDINBURG, TEXAS

PROJECT NO:	201320
DATE:	8/5/2014 9:58:21 AM
STARTING DATE:	01.01.2013
CK BY:Checker	DWN BY: VDV

OVERALL SITE PLAN

AS1.1



FIRE PROTECTION 1st FLOOR PLAN

1/8" = 1'-0"

1

N

FIRE RATE WALL LEGEND

- 1 HR. FIRE RATED METAL STUD WALL TO BOTTOM OF ROOF DECK, SEAL TOP OF DECK - 1 HR. FIRE RATED DOORS WITH 60 MINUTE GLAZING - UL DESIGN NO. U432
- SMOKE RESISTANT NON-RATED METAL STUD WALL TO BOTTOM OF ROOF DECK, SEAL AIRTIGHT - SMOKE RESISTANT DOORS WITH SMOKE SEALS
- NON-RATED METAL STUD WALL TO BOTTOM OF FLOOR DECK, SEAL AIRTIGHT
- 1 HR. FIRE RATED SUSPENDED ACOUSTAL CEILING SYSTEM
- F.E. FIRE EXTINGUISHER WITH MOUNTING BRACKET

NOTE: ALL OTHER INTERIOR WALLS SHALL EXTEND 4" MINIMUM ABOVE CEILING UNLESS NOTED OTHERWISE.
ALL WALL AND FLOOR PENETRATIONS SHALL BE SEALED WITH SEALANT. FIRE RATED SEALANT SHALL BE ACCORDING WITH RESPECTIVE FIRE RATING. SEAL TOP OF WALLS ACCORDINGLY.

TYPE II (B) CONSTRUCTION (UNPROTECTED - SPRINKLERED)

INTERNATIONAL BUILDING CODE 2012

(NOTE: ENTIRE BUILDING SHALL BE SPRINKLERED WITH A SUPERVISED AUTOMATIC SPRINKLER SYSTEM) REQUIRED PER TABLE 903.2

FIRST STORY — GROUP S-1 AIRCRAFT HANGAR
MIXED OCCUPANCY — GROUP "B" BUIISINESS
NO SEPARATION REQUIRED PER TABLE 508.4

SECOND STORY — GROUP S-1 STORAGE

1st. STORY — 13,026 S.F.

2nd. STORY — 1,969 S.F.

TABLE 503
ALLOWABLE BUILDING HEIGHTS AND AREAS

S-1 ALLOWABLE AREA — 17,500 SQ. FT.

ALLOWABLE STORIES — (2) STORIES

TABLE 601
FIRE RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS (HOURS)

STRUCTURAL FRAME — UNPROTECTED - NONCOMUSTIBLE

ROOF CONSTRUCTION — UNPROTECTED - NONCOMUSTIBLE

NONBEARING WALL INTERIOR — UNPROTECTED - NONCOMUSTIBLE

TABLE 602
FIRE RESISTANCE RATING REQUIREMENTS FOR EXTERIOR WALLS BASED ON FIRE SEPARATION DISTANCE.

NONBEARING WALL EXTERIOR — UNPROTECTED - NONCOMUSTIBLE

SECTION 1009.2 INTERIOR EXIT STAIRWAY

INTERIOR EXIT STAIRWAYS SHALL LEAD DIRECTLY TO THE EXTERIOR OF THE BUILDING OR SHALL BE EXTENDED TO THE EXTERIOR OF THE BUILDING WITH AN EXIT PASSAGEWAY CONFORMING TO THE REQUIREMENTS OF SECTION 1023, EXCEPT AS PERMITTED IN SECTION 1027.1.

TABLE 1014.3 COMMON PATH OF EGRESS TRAVEL

B, S — 100 FT. - WITH AUTOMATIC SPRINKLER SYSTEM

TABLE 1016.2
EXIT ACCESS TRAVEL DISTANCE

OCCUPANCY	WITHOUT SPRINKLER SYSTEM	WITH SPRINKLER SYSTEM
A,E,F-1,M,R,S-1	200 FT.	250 FT.
B	200 FT.	300 FT.

TABLE 1004.1.2
MAXIMUM FLOOR AREA ALLOWANCES PER OCCUPANT

FUNCTION OF SPACE	FLOOR AREA IN SQ.FT. PER OCCUPANT
AIRCRAFT HANGAR	500 GROSS
BUSSINESS AREAS	100 GROSS
STORAGE	300 GROSS

OCCUPANT LOAD

AIRCRAFT HANGAR	21
BUSSINESS AREAS	17
STORAGE	2
TOTAL OCCUPANTS	40

FIRST FLOOR GROSS SQUARE FEET : 13,026
SECOND FLOOR GROSS SQUARE FEET : 1,969

TOTAL 14,995

2012 TEXAS ACCESSIBILITY STANDARDS (TAS)

SECTION 206.2.3 MULTI-STORY BUILDINGS AND FACILITIES:
AT LEAST ONE ACCESSIBLE ROUTE SHALL CONNECT EACH STORY AND MEZZANINE IN MULTI-STORY BUILDINGS AND FACILITIES.

EXCEPTION 2:
WHERE A TWO STORY PUBLIC BUILDING OR FACILITY HAS ONE STORY WITH AN OCCUPANT LOAD OF FIVE OR FEWER PERSONS THAT DOES NOT CONTAIN PUBLIC USE SPACE, THAT STORY SHALL NOT BE REQUIRED TO BE CONNECTED TO THE STORY ABOVE OR BELOW.

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CONSULTANTS:

REGISTERED ARCHITECT — JULIO A. FIGUEROA — 12858 — STATE OF TEXAS
08.01.2014

NO.	DATE	DESCRIPTION

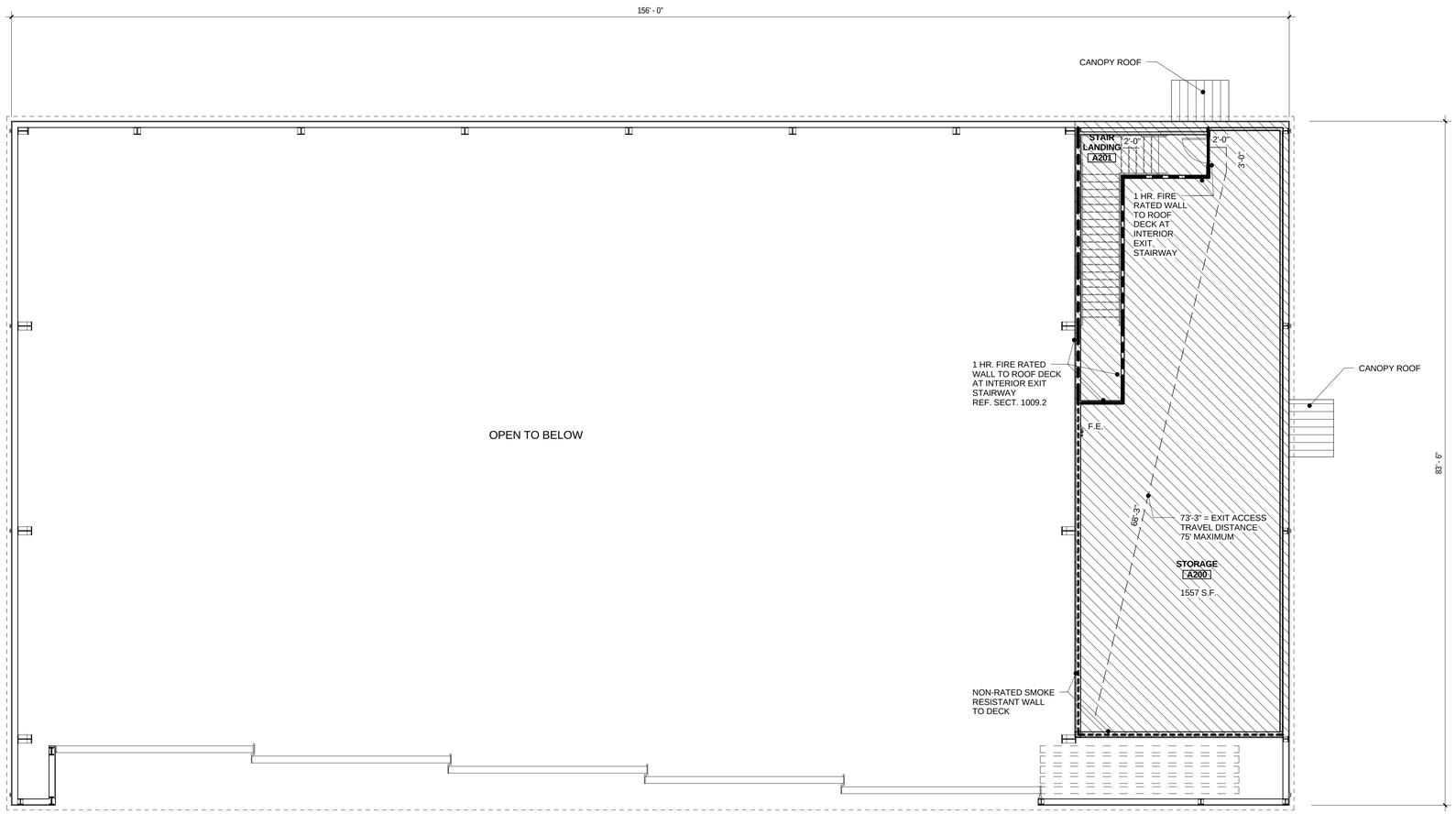
MAINTENANCE HANGAR FOR SOUTH TEXAS INTERNATIONAL AIRPORT AT EDINBURG CITY OF EDINBURG

EDINBURG, TEXAS

PROJECT NO:	201320
DATE:	8/5/2014 9:57:09 AM
STARTING DATE:	01.01.2013
CK BY:Checker	DWN BY: VDV

FIRE PROTECTION 1st FLOOR PLAN

A1.1



FIRE PROTECTION 2nd FLOOR PLAN

1 — 1/8" = 1'-0"

N

FIRE RATE WALL LEGEND

1 HR. FIRE RATED METAL STUD WALL TO BOTTOM OF ROOF DECK, SEAL TOP OF DECK - 1 HR. FIRE RATED DOORS WITH 60 MINUTE GLAZING - UL DESIGN NO. U432

SMOKE RESISTANT NON-RATED METAL STUD WALL TO BOTTOM OF ROOF DECK, SEAL AIRTIGHT - SMOKE RESISTANT DOORS WITH SMOKE SEALS

F.E. FIRE EXTINGUISHER WITH MOUNTING BRACKET

NOTE: ALL OTHER INTERIOR WALLS SHALL EXTEND 4" MINIMUM ABOVE CEILING UNLESS NOTED OTHERWISE.
ALL WALL AND FLOOR PENETRATIONS SHALL BE SEALED WITH SEALANT. FIRE RATED SEALANT SHALL BE ACCORDING WITH RESPECTIVE FIRE RATING. SEAL TOP OF WALLS ACCORDINGLY.

TYPE II (B) CONSTRUCTION (UNPROTECTED - SPRINKLERED)

INTERNATIONAL BUILDING CODE 2012

(NOTE: ENTIRE BUILDING SHALL BE SPRINKLERED WITH A SUPERVISED AUTOMATIC SPRINKLER SYSTEM) REQUIRED PER TABLE 903.2

FIRST STORY — GROUP S-1 AIRCRAFT HANGAR
MIXED OCCUPANCY — GROUP "B" BUSHINESS
NO SEPARATION REQUIRED PER TABLE 508.4

SECOND STORY — GROUP S-1 STORAGE

1st. STORY — 13,360 S.F.
2nd. STORY — 1,969 S.F.

TABLE 503

ALLOWABLE BUILDING HEIGHTS AND AREAS

S-1 ALLOWABLE AREA — 17,500 SQ. FT.

ALLOWABLE STORIES — (2) STORIES

TABLE 601

FIRE RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS (HOURS)

STRUCTURAL FRAME — UNPROTECTED - NONCOMBUSTIBLE

ROOF CONSTRUCTION — UNPROTECTED - NONCOMBUSTIBLE

NONBEARING WALL INTERIOR — UNPROTECTED - NONCOMBUSTIBLE

TABLE 602

FIRE RESISTANCE RATING REQUIREMENTS FOR EXTERIOR WALLS BASED ON FIRE SEPARATION DISTANCE.

NONBEARING WALL EXTERIOR — UNPROTECTED - NONCOMBUSTIBLE

SECTION 1009.2 INTERIOR EXIT STAIRWAY

INTERIOR EXIT STAIRWAYS SHALL LEAD DIRECTLY TO THE EXTERIOR OF THE BUILDING OR SHALL BE EXTENDED TO THE EXTERIOR OF THE BUILDING WITH AN EXIT PASSAGEWAY CONFORMING TO THE REQUIREMENTS OF SECTION 1023, EXCEPT AS PERMITTED IN SECTION 1027.1.

TABLE 1021.2(2) STORIES WITH ONE EXIT OR ACCESS TO ONE EXIT FOR OTHER OCCUPANCIES

2ND STORY	MAXIMUM OCCUPANTS PER STORY	MAXIMUM EXIT ACCESS TRAVEL DISTANCE
OCCUPANCY B, F, M, S	29 OCCUPANTS	75 FT.

TABLE 1004.1.2

MAXIMUM FLOOR AREA ALLOWANCES PER OCCUPANT

FUNCTION OF SPACE	FLOOR AREA IN SQ. FT. PER OCCUPANT
STORAGE	300 GROSS

OCCUPANT LOAD

STORAGE	5
TOTAL OCCUPANTS	5

FIRST FLOOR GROSS SQUARE FEET : 13,026
SECOND FLOOR GROSS SQUARE FEET : 1,969

TOTAL 14,995

2012 TEXAS ACCESSIBILITY STANDARDS (TAS)

SECTION 206.2.3 MULTI-STORY BUILDINGS AND FACILITIES:
AT LEAST ONE ACCESSIBLE ROUTE SHALL CONNECT EACH STORY AND MEZZANINE IN MULTI-STORY BUILDINGS AND FACILITIES.

EXCEPTION 2:
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CONSULTANTS:

REGISTERED ARCHITECT JULIO A. FIGUEROA 12858 STATE OF TEXAS
08-01-2014

NO.	DATE	DESCRIPTION

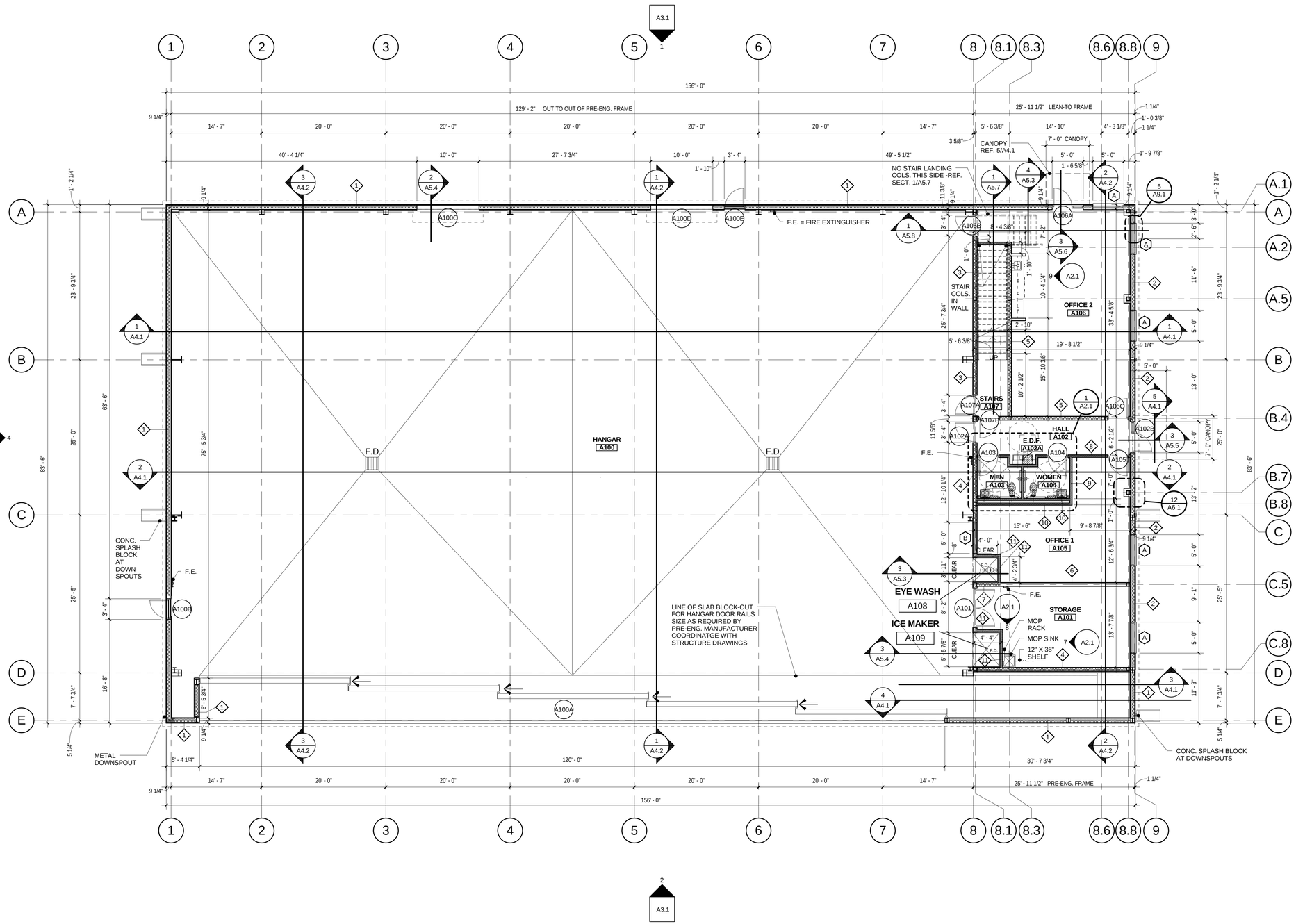
MAINTENANCE HANGAR FOR SOUTH TEXAS INTERNATIONAL AIRPORT AT EDINBURG CITY OF EDINBURG

EDINBURG, TEXAS

PROJECT NO:	201320
DATE:	8/5/2014 9:57:10 AM
STARTING DATE:	01.01.2013
CK BY:Checker	DWN BY: VDV

FIRE PROTECTION 2nd FLOOR PLAN

A1.2



WALL TYPE LEGEND

1. EXTERIOR WALL: 8" GIRTS WITH EXTERIOR "R" PANELS INTERIOR "R" PANEL 8 FT. HIGH WAINSCOT R-16 VINYL FACE BATT INSULATION
2. EXTERIOR WALL: 8" GIRTS WITH EXTERIOR "R" PANELS INTERIOR 5/8" GYPSUM BOARD ON 3 5/8" METAL STUDS R-16 VINYL FACE BATT INSULATION
3. INTERIOR WALL: 6" METAL STUDS AT 16" O.C. WITH 5/8" TYPE "X" GYPSUM BOARD EACH SIDE WITH "R" WALL PANELS AT HANGAR SIDE WITH UNFACED R-19 BATT INSULATION (1HR. FIRE RATED WALL)
4. INTERIOR WALL: 6" METAL STUDS AT 16" O.C. WITH 5/8" GYPSUM BOARD EACH SIDE WITH "R" WALL PANELS AT HANGAR SIDE WITH UNFACED R-19 BATT INSULATION
5. INTERIOR WALL: 6" METAL STUDS AT 16" O.C. WITH 5/8" TYPE "X" GYPSUM BOARD EACH SIDE WITH UNFACED R-19 BATT INSULATION (1 HR. FIRE RATED WALL)
6. INTERIOR WALL: 6" METAL STUDS AT 16" O.C. WITH 5/8" GYPSUM BOARD EACH SIDE
7. INTERIOR WALL: 6" METAL STUDS AT 16" O.C. WITH 5/8" GYPSUM BOARD EACH SIDE WITH R-19 BATT INSULATION
8. INTERIOR WALL: 3 5/8" METAL STUDS AT 16" O.C. WITH 5/8" TYPE "X" GYPSUM BOARD EACH SIDE WITH UNFACED R-13 BATT INSULATION (1 HR. FIRE RATED WALL)
9. INTERIOR WALL: 3 5/8" METAL STUDS AT 16" O.C. WITH 5/8" GYPSUM BOARD EACH SIDE WITH UNFACED R-13 BATT INSULATION
10. INTERIOR WALL: 3 5/8" METAL STUDS AT 16" O.C. WITH 5/8" GYPSUM BOARD ON ONE SIDE WITH UNFACED R-13 BATT INSULATION
11. INTERIOR WALL: 3 5/8" METAL STUDS AT 16" O.C. WITH 5/8" GYPSUM BOARD EACH SIDE WITH UNFACED R-13 BATT INSULATION "R" WALL PANELS AT HANGAR SIDE

GENERAL NOTES

1. REFER TO FIRE PROTECTION PLAN AND BUILDING SECTIONS FOR LOCATION OF FIRE RATED WALLS.
2. PROVIDE PAINT, CAULK AND SEAL AT ALL DISSIMILAR MATERIALS.
3. UNLESS OTHERWISE NOTED INTERIOR DIMENSIONS SHOWN ARE TO METAL STUDS.
4. REFER TO ROOM FINISH SCHEDULE FOR FINISHES.

FLOOR PLAN 1

1/8" = 1'-0"

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08.01.2014

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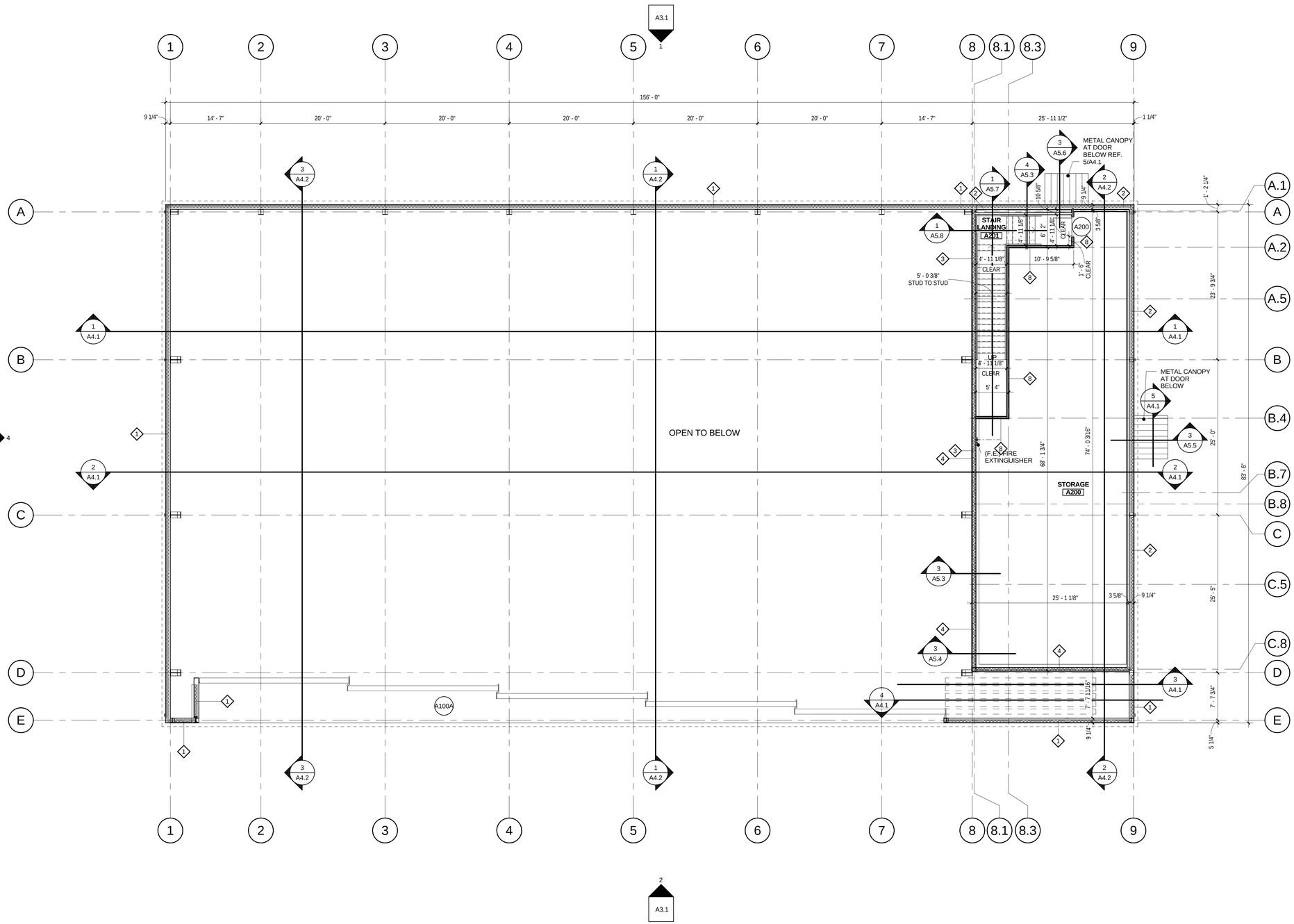
CITY OF EDINBURG
EDINBURG, TEXAS

PROJECT NO:	201320
DATE:	8/5/2014 9:57:15 AM
STARTING DATE:	01.01.2013
CK BY:Checker	DWN BY: VDV.

1st FLOOR PLAN

A1.3



WALL TYPE LEGEND

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5. INTERIOR WALL: 6" METAL STUDS AT 16" O.C. WITH 5/8" TYPE "X" GYPSUM BOARD EACH SIDE WITH UNFACED R-19 BATT INSULATION (1 HR. FIRE RATED WALL)
6. INTERIOR WALL: 6" METAL STUDS AT 16" O.C. WITH 5/8" GYPSUM BOARD EACH SIDE
7. INTERIOR WALL: 6" METAL STUDS AT 16" O.C. WITH 5/8" GYPSUM BOARD EACH SIDE WITH R-19 BATT INSULATION
8. INTERIOR WALL: 3 5/8" METAL STUDS AT 16" O.C. WITH 5/8" TYPE "X" GYPSUM BOARD EACH SIDE WITH UNFACED R-13 BATT INSULATION (1 HR. FIRE RATED WALL)
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11. INTERIOR WALL: 3 5/8" METAL STUDS AT 16" O.C. WITH 5/8" GYPSUM BOARD EACH SIDE WITH UNFACED R-13 BATT INSULATION "R" WALL PANELS AT HANGAR SIDE

GENERAL NOTES

1. REFER TO FIRE PROTECTION PLAN AND BUILDING SECTIONS FOR LOCATION OF FIRE RATED WALLS.
2. PROVIDE PAINT, CAULK AND SEAL AT ALL DISSIMILAR MATERIALS.
3. UNLESS OTHERWISE NOTED INTERIOR DIMENSIONS SHOWN ARE TO METAL STUDS.
4. REFER TO ROOM FINISH SCHEDULE FOR FINISHES.

SECOND FLOOR PLAN 1

1/8" = 1'-0"

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08.01.2014

NO.	DATE	DESCRIPTION

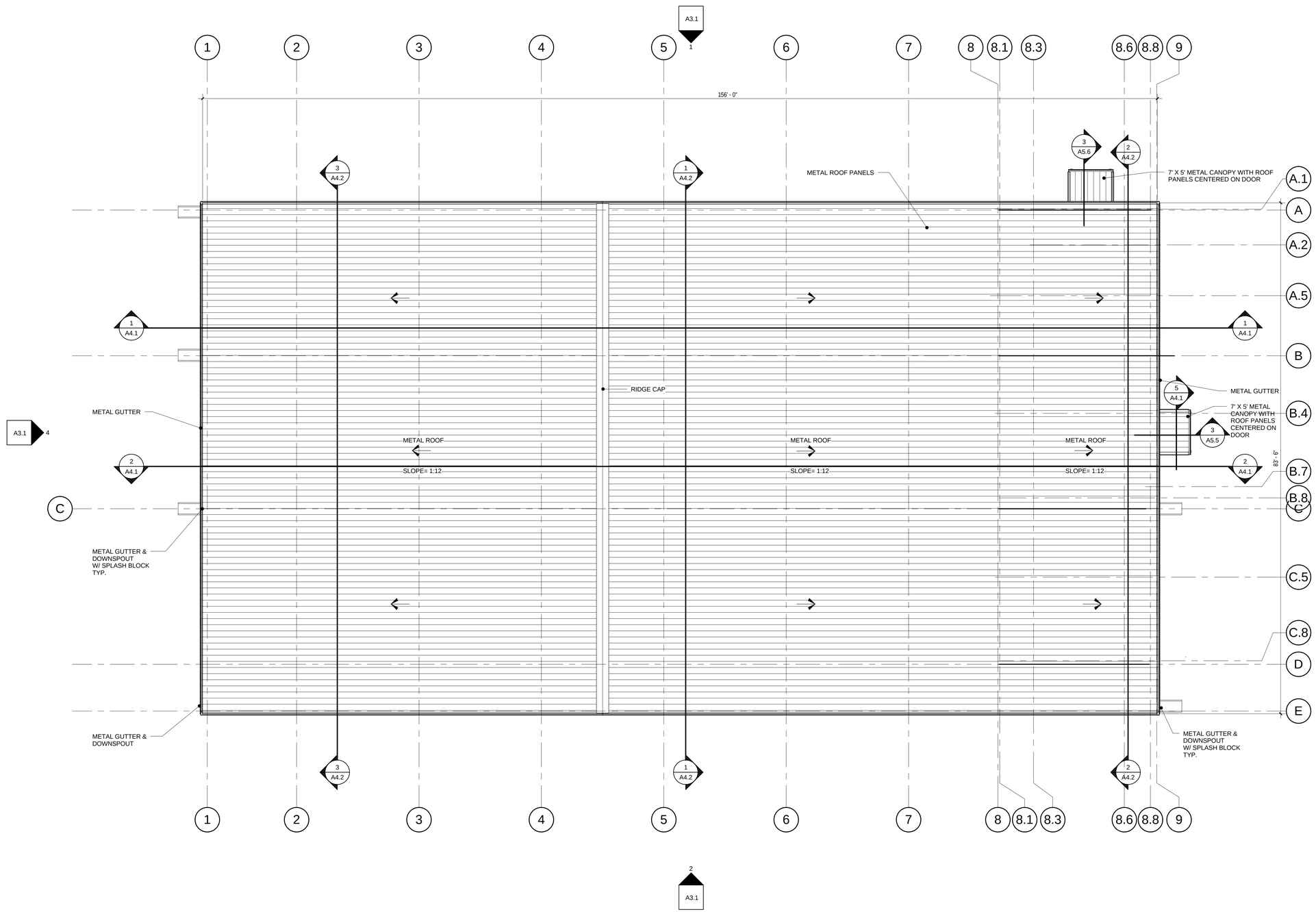
MAINTENANCE HANGAR FOR SOUTH TEXAS INTERNATIONAL AIRPORT AT EDINBURG CITY OF EDINBURG

EDINBURG, TEXAS

PROJECT NO:	201320
DATE:	8/5/2014 9:57:18 AM
STARTING DATE:	01.01.2013
CK BY:Checker	DWN BY: VDV

2nd FLOOR PLAN

A1.4



ROOF PLAN

1/8" = 1'-0"

1

N

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REGISTERED ARCHITECT JULIO A. FIGUEROA 12858 STATE OF TEXAS

08-01-2014

NO.	DATE	DESCRIPTION

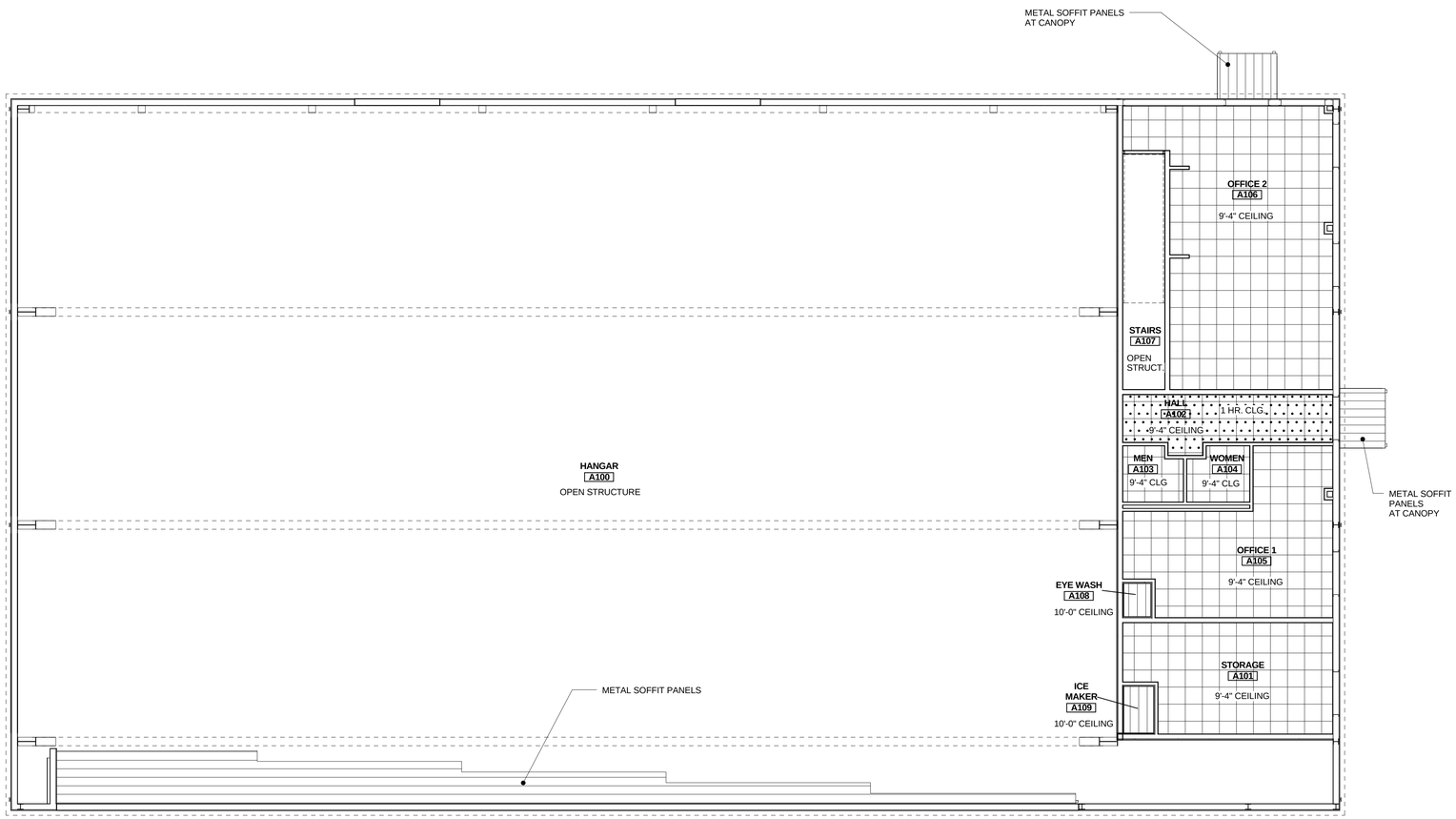
MAINTENANCE HANGAR FOR SOUTH TEXAS INTERNATIONAL AIRPORT AT EDINBURG CITY OF EDINBURG

EDINBURG, TEXAS

PROJECT NO:	201320
DATE:	8/5/2014 9:57:18 AM
STARTING DATE:	01.01.2013
CK BY:Checker	DWN BY: VDV.

ROOF PLAN

A1.5



REFLECTED CEILING PLAN - 1st. FLOOR

1/8" = 1'-0"

1

N

CEILING NOTES

1.- GENERAL CONTRACTOR TO VERIFY FIXTURE LOCATIONS, TYPES AND QUANTITES WITH MEP DRAWINGS.

2.- COMMON CEILING HEIGHT TO BE 9'-4" UNLESS OTHERWISE NOTED.

3.- GENERAL CONTRACTOR TO REVIEW ALL CEILING HEIGHTS AND CEILING MATERIALS WITH ALL DRAWINGS AND SPECS. SHOULD A CONFLICT ARISE CONSULT ARCHITECT BEFORE COMMENCING.

4.- REFER TO ENGINEER DRAWINGS FOR EMERGENCY LIGHTING AND EXIT LIGHT LOCATIONS.

5.- REFER TO ENGINEER DRAWINGS FOR LIGHTING SPECIFICATIONS, CIRCUITING AND SWITCHING CONTROLS.

REFLECTED CEILING PLAN LEGEND

SUSPENDED ACOUSTICAL CEILINGS
ACOUSTICAL UNITS & SUSPENSION SYSTEM(S)
2'-0" X 2'-0" SUSPENDED ACOUSTICAL CEILING SYSTEM

SUSPENDED ACOUSTICAL CEILINGS (1 HR.)
1 HR. FIRE RATED ACOUSTICAL UNITS & SUSPENSION SYSTEM
1 HR. FIRE RATED 2'-0" X 2'-0" SUSPENDED ACOUSTICAL CEILING SYSTEM

GYPSUM BOARD ASSEMBLIES
5/8" GYPSUM BOARD, (TAPE, FLOAT, TEXTURE & PAINT) ON DRYWALL GRID SYSTEM SUSPENDED FROM STRUCTURE

OPEN STRUCTURE ABOVE
OPEN STRUCTURE AT STAIRS A107 & LANDING A201
OPEN STRUCTURE AT HANGAR A100
OPEN STRUCTURE AT STORAGE A200

METAL SOFFIT PANELS
METAL SOFFIT PANELS AT HANGAR SLIDING DOOR SUPPORT STRUCTURE

METAL CEILING PANELS
METAL CEILING PANELS AT EYE WASH A108 AND ICE MAKER A109

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08.01.2014

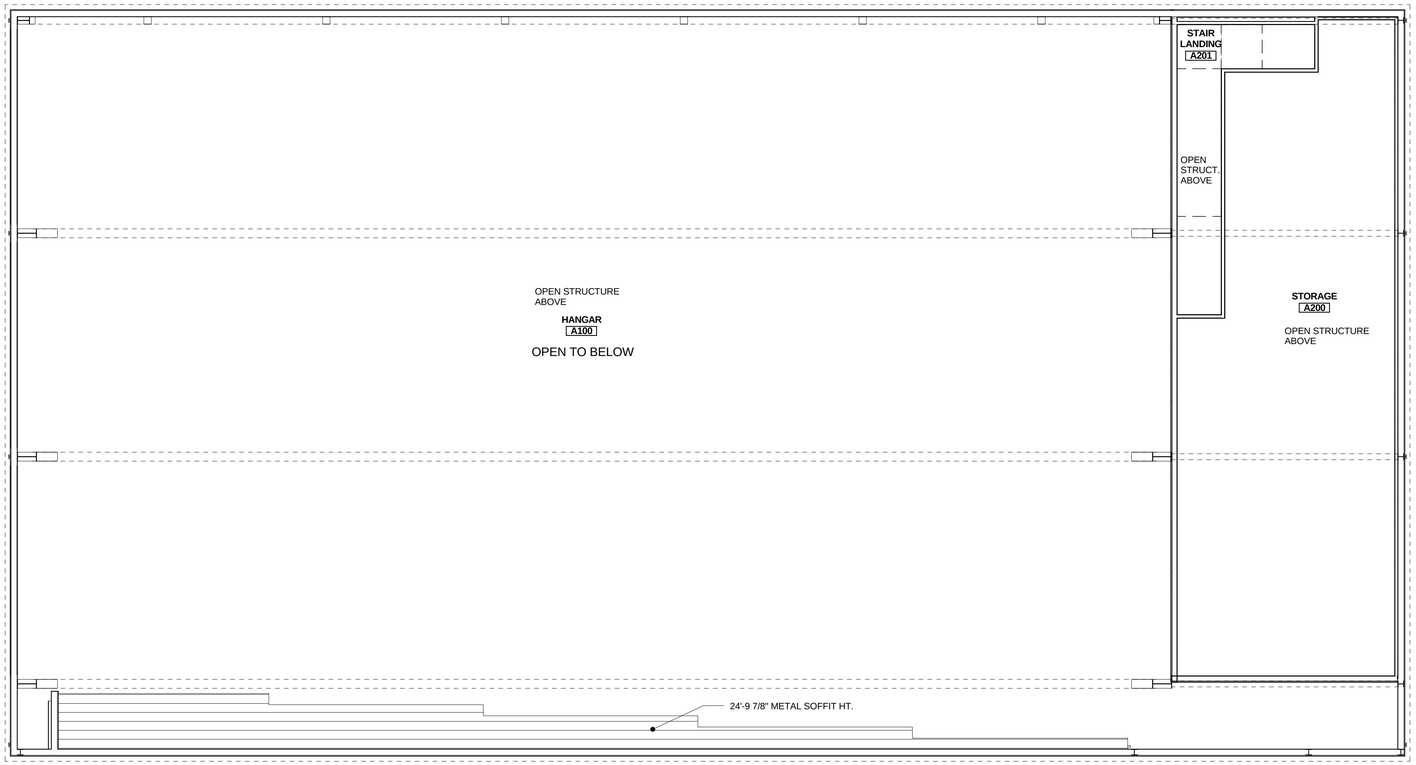
NO.	DATE	DESCRIPTION

MAINTENANCE HANGAR FOR SOUTH TEXAS INTERNATIONAL AIRPORT AT EDINBURG
CITY OF EDINBURG
EDINBURG, TEXAS

PROJECT NO:	201320
DATE:	8/5/2014 9:57:19 AM
STARTING DATE:	01.01.2013
CK BY:Checker	DWN BYDV/CA

REFLECTED CEILING PLAN - 1st. FLOOR

A1.6



REFLECTED CEILING PLAN - 2nd. FLOOR

1/8" = 1'-0"

1

N

CEILING NOTES

1.- GENERAL CONTRACTOR TO VERIFY FIXTURE LOCATIONS, TYPES AND QUANTITES WITH MEP DRAWINGS.

2.- COMMON CEILING HEIGHT TO BE 9'-4" UNLESS OTHERWISE NOTED.

3.- GENERAL CONTRACTOR TO REVIEW ALL CEILING HEIGHTS AND CEILING MATERIALS WITH ALL DRAWINGS AND SPECS. SHOULD A CONFLICT ARISE CONSULT ARCHITECT BEFORE COMMENCING.

4.- REFER TO ENGINEER DRAWINGS FOR EMERGENCY LIGHTING AND EXIT LIGHT LOCATIONS.

5.- REFER TO ENGINEER DRAWINGS FOR LIGHTING SPECIFICATIONS, CIRCUITING AND SWITCHING CONTROLS.

REFLECTED CEILING PLAN LEGEND

SUSPENDED ACOUSTICAL CEILINGS
ACOUSTICAL UNITS & SUSPENSION SYSTEM(S)
2'-0" X 2'-0" SUSPENDED ACOUSTICAL CEILING SYSTEM

SUSPENDED ACOUSTICAL CEILINGS (1 HR.)
1 HR. FIRE RATED ACOUSTICAL UNITS & SUSPENSION SYSTEM
1 HR. FIRE RATED 2'-0" X 2'-0" SUSPENDED ACOUSTICAL CEILING SYSTEM

GYPSUM BOARD ASSEMBLIES
5/8" GYPSUM BOARD, (TAPE, FLOAT, TEXTURE & PAINT) ON DRYWALL GRID SYSTEM SUSPENDED FROM STRUCTURE

OPEN STRUCTURE ABOVE
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OPEN STRUCTURE AT STORAGE A200

METAL SOFFIT PANELS
METAL SOFFIT PANELS AT HANGAR SLIDING DOOR SUPPORT STRUCTURE

METAL CEILING PANELS
METAL CEILING PANELS AT EYE WASH A108 AND ICE MAKER A109

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08-01-2014

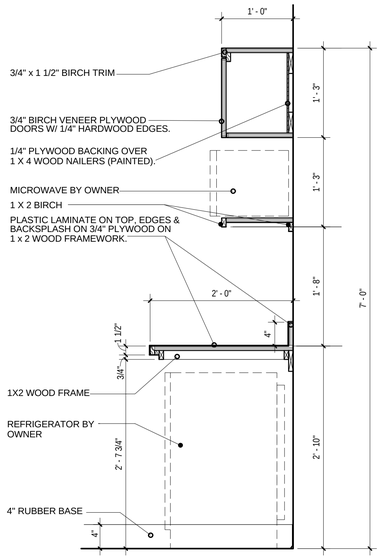
NO.	DATE	DESCRIPTION

MAINTENANCE HANGAR FOR
SOUTH TEXAS INTERNATIONAL
AIRPORT AT EDINBURG
CITY OF EDINBURG
EDINBURG, TEXAS

PROJECT NO:	201320
DATE:	8/5/2014 9:57:20 AM
STARTING DATE:	01.01.2013
CK BY:Checker	DWN BYDV/CA

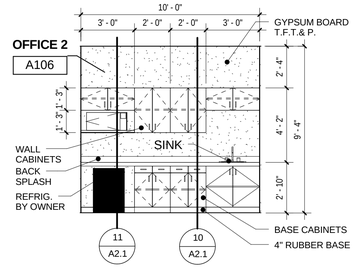
REFLECTED CEILING PLAN - 2nd. FLOOR

A1.7



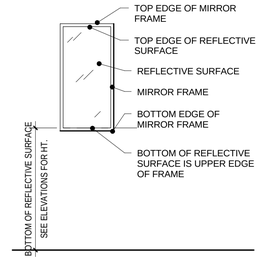
CABINET DETAIL 11

1" = 1'-0"



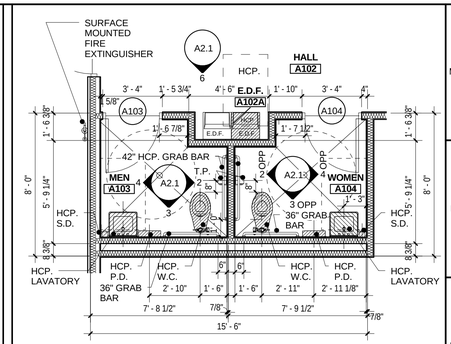
INTERIOR ELEVATION KITCHEN 9

1/4" = 1'-0"



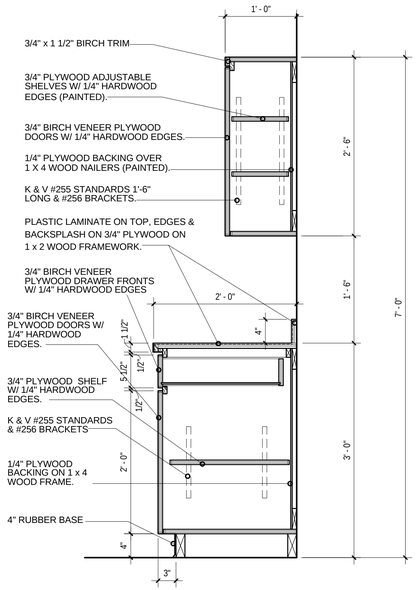
MIRROR MTG. HGT. DTL. 5

1/2" = 1'-0"



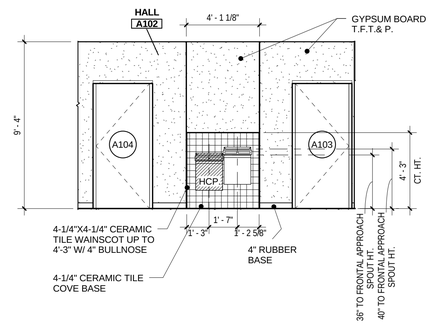
ENLARGED PLAN R.R. 1

1/4" = 1'-0"



BASE & WALL CABINET DETAIL 10

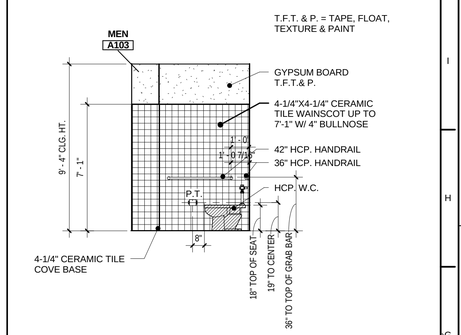
1" = 1'-0"



INTERIOR ELEVATION 6

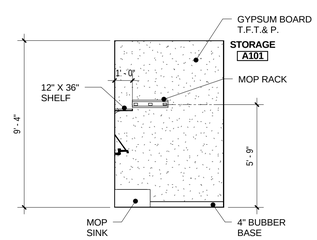
ELECTRIC DRINKING FOUNTAINS - A105

1/4" = 1'-0"



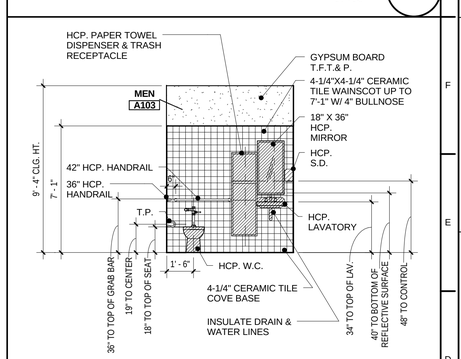
INTERIOR ELEVATION 2

1/4" = 1'-0"



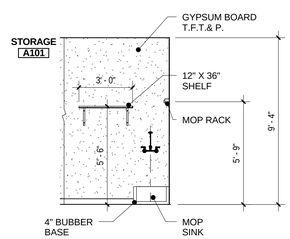
MOP SINK ELEVATION 7

1/4" = 1'-0"



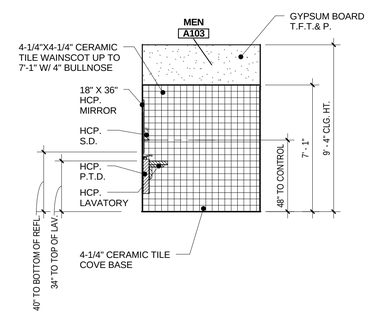
INTERIOR ELEVATION 3

1/4" = 1'-0"



MOP SINK & MILLWORK ELEVATION 8

1/4" = 1'-0"



ELEVATION INTERIOR 4

1/4" = 1'-0"

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08.01.2014

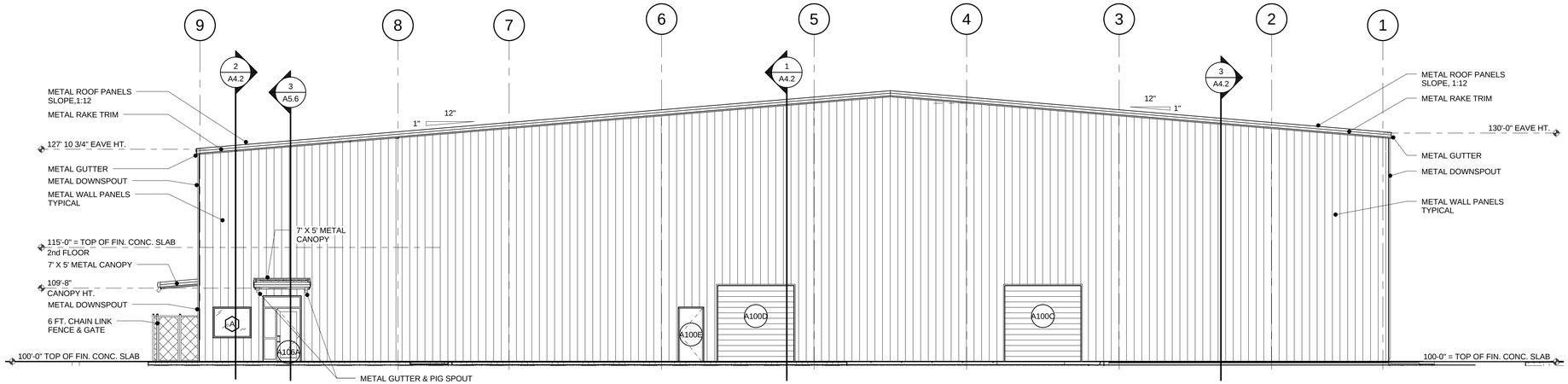
NO.	DATE	DESCRIPTION

MAINTENANCE HANGAR FOR SOUTH TEXAS INTERNATIONAL AIRPORT AT EDINBURG
CITY OF EDINBURG
EDINBURG, TEXAS

PROJECT NO:	201320
DATE:	8/5/2014 9:57:27 AM
STARTING DATE:	01.01.2013
CK BY:Checker	DWN BY: VDV.

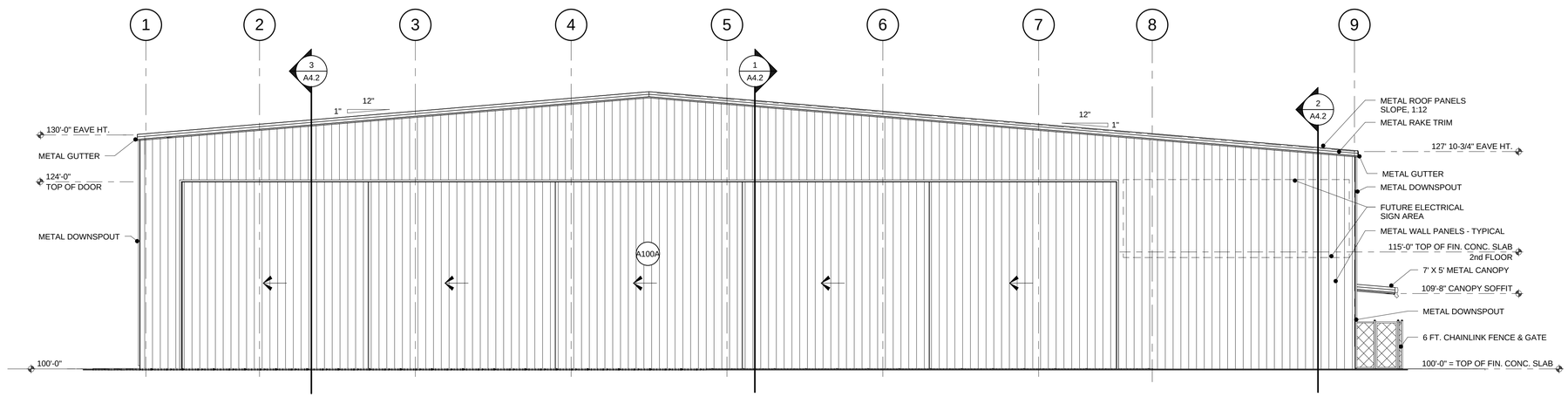
ENLARGED PLAN & INT. ELEVATIONS

A2.1



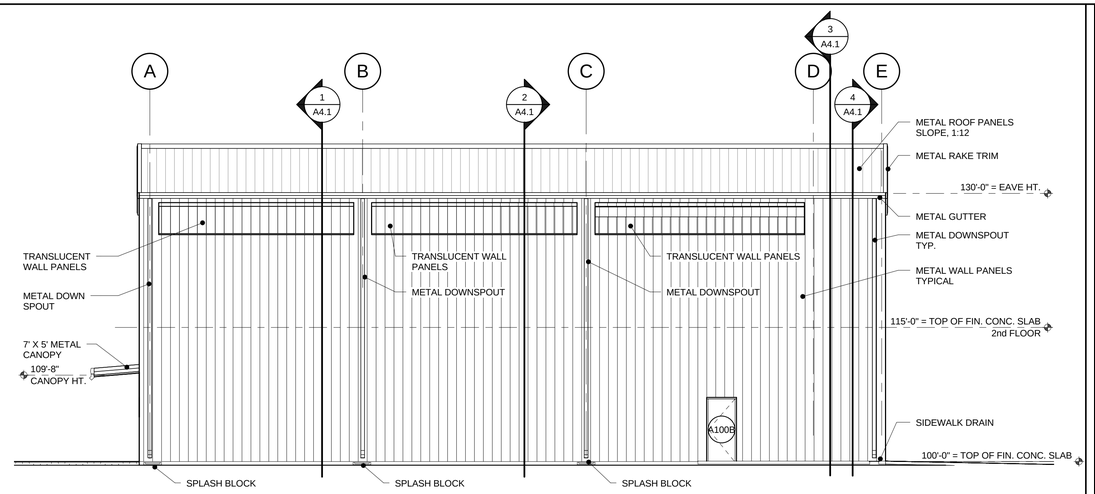
OVERALL NORTH ELEVATION 1

1/8" = 1'-0"



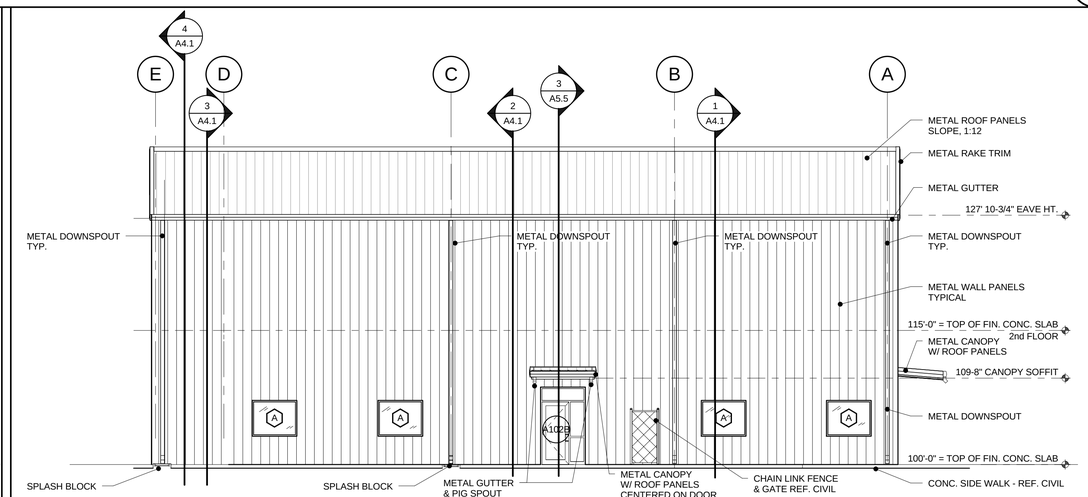
OVERALL SOUTH ELEVATION 2

1/8" = 1'-0"



OVERALL WEST ELEVATION 4

1/8" = 1'-0"



OVERALL EAST ELEVATION 3

1/8" = 1'-0"

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08-01-2014

NO.	DATE	DESCRIPTION

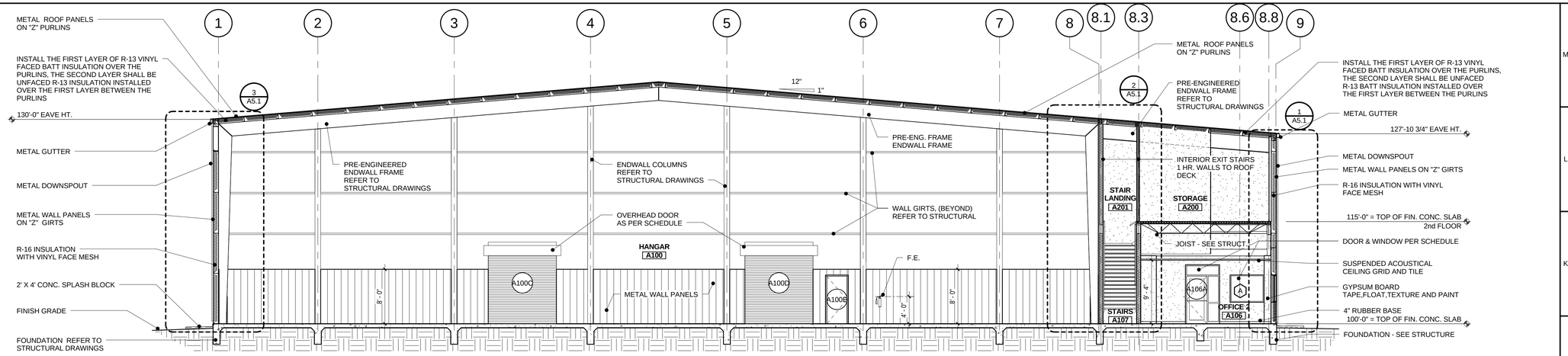
MAINTENANCE HANGAR FOR SOUTH TEXAS INTERNATIONAL AIRPORT AT EDINBURG CITY OF EDINBURG

EDINBURG, TEXAS

PROJECT NO:	201320
DATE:	8/5/2014 9:57:31 AM
STARTING DATE:	01.01.2013
CK BY:Checker	DWN BY: VDV.

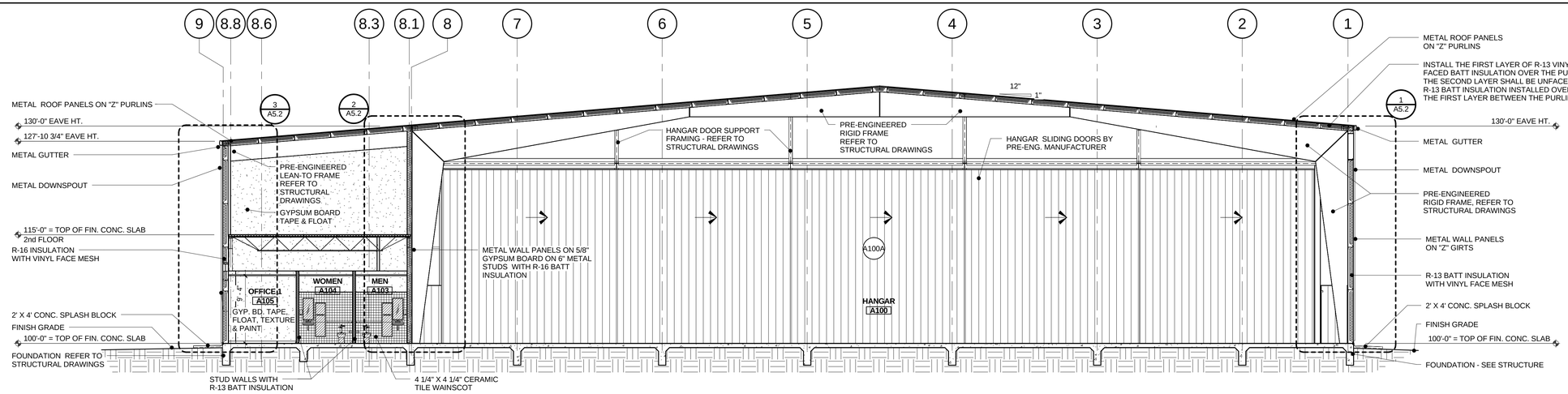
EXTERIOR ELEVATIONS

A3.1



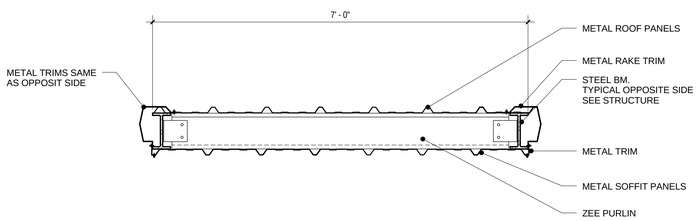
BUILDING SECTION 1

1/8" = 1'-0"



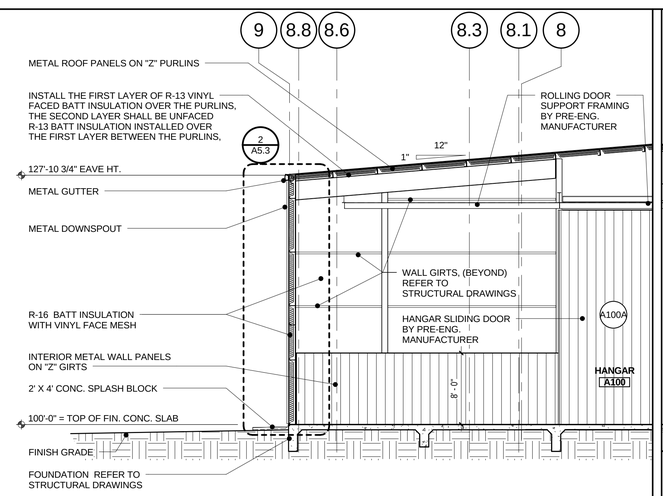
BUILDING SECTION 2

1/8" = 1'-0"



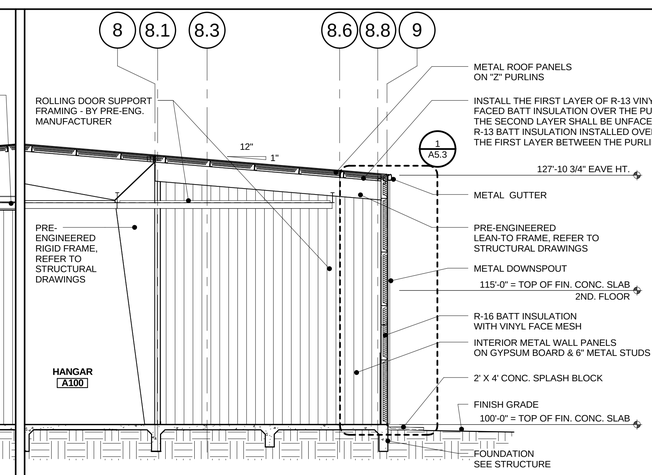
SECTION THROUGH CANOPY 5

3/4" = 1'-0"



PARTIAL BUILDING SECTION 4

1/8" = 1'-0"



PARTIAL BUILDING SECTION 3

1/8" = 1'-0"

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REGISTERED ARCHITECT JULIO A. FIGUEROA 12858 STATE OF TEXAS
08.01.2014

NO.	DATE	DESCRIPTION

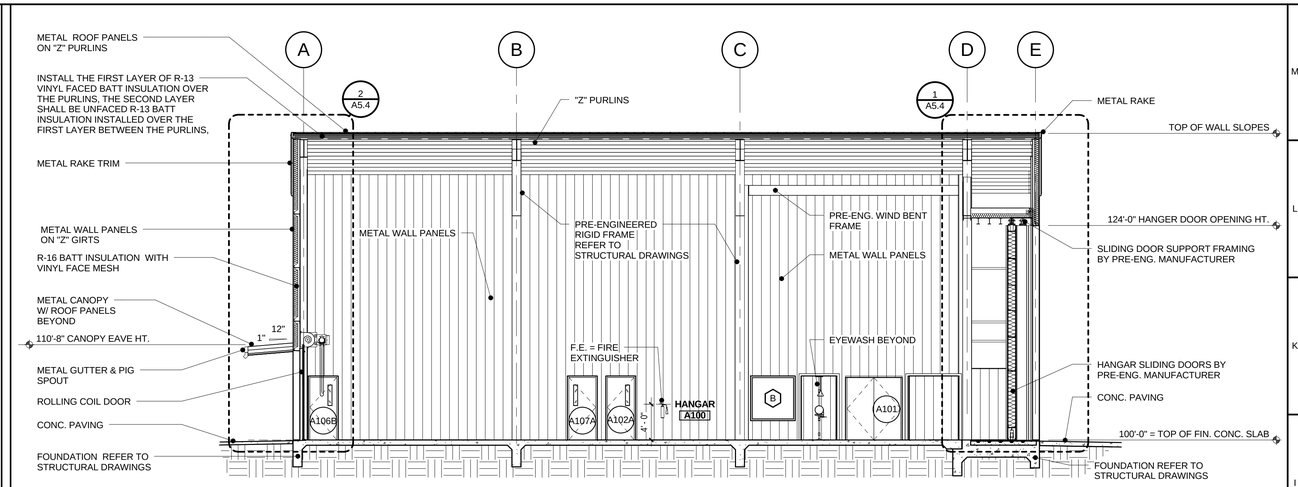
MAINTENANCE HANGAR FOR SOUTH TEXAS INTERNATIONAL AIRPORT AT EDINBURG CITY OF EDINBURG

EDINBURG, TEXAS

PROJECT NO:	201320
DATE:	8/5/2014 9:57:40 AM
STARTING DATE:	01.01.2013
CK BY:Checker	DWN BY: CA.

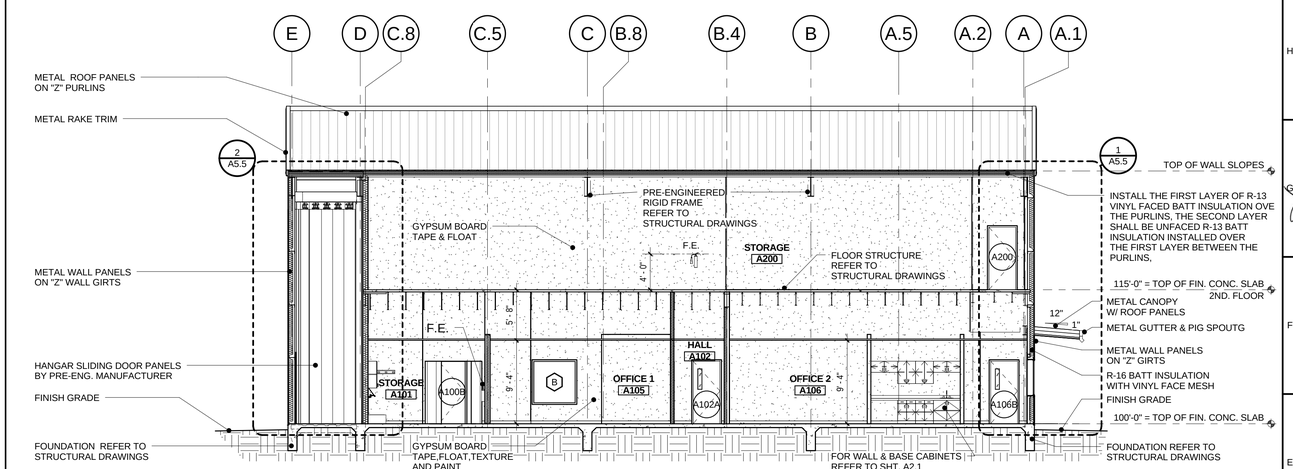
BUILDING SECTIONS

A4.1



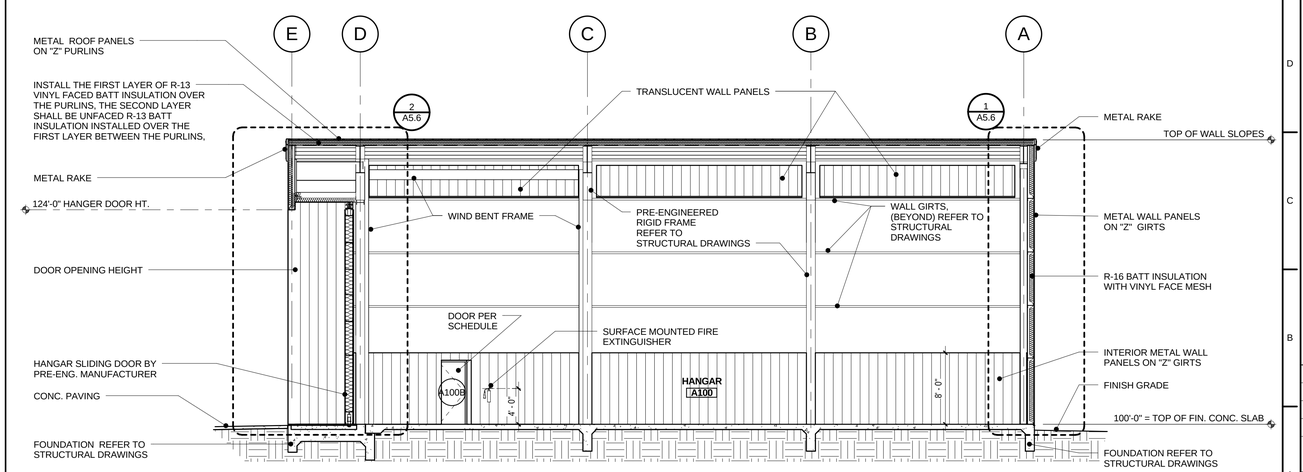
BUILDING SECTION 1

1/8" = 1'-0"



BUILDING SECTION 2

1/8" = 1'-0"



BUILDING SECTION 3

1/8" = 1'-0"

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08-01-2014

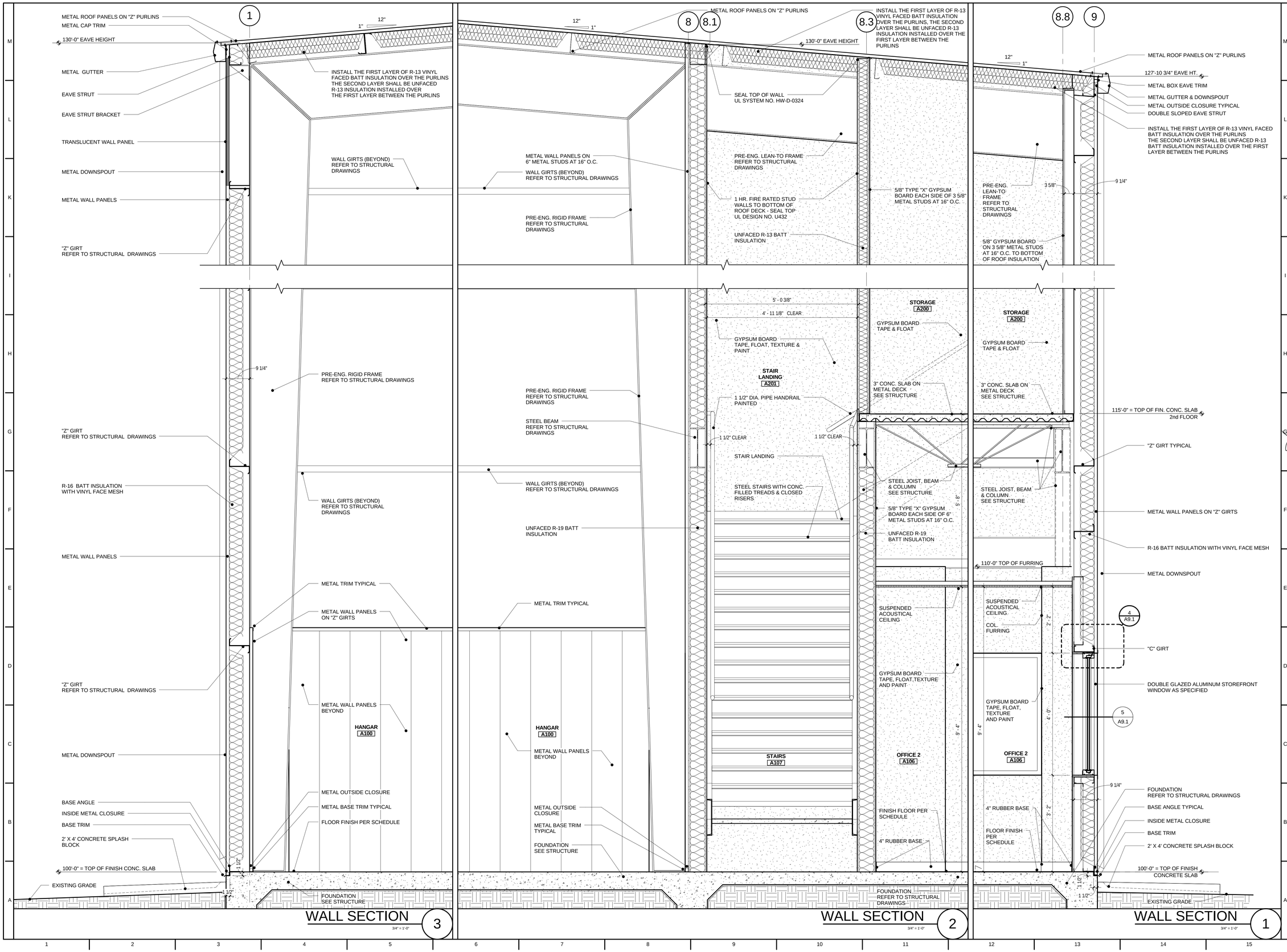
NO.	DATE	DESCRIPTION

MAINTENANCE HANGAR FOR
SOUTH TEXAS INTERNATIONAL
AIRPORT AT EDINBURG
CITY OF EDINBURG
EDINBURG, TEXAS

PROJECT NO:	201320
DATE:	8/5/2014 9:57:46 AM
STARTING DATE:	01.01.2013
CK BY:Checker	DWN BY: CA

BUILDING SECTIONS

A4.2



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08.01.2014

NO.	DATE	DESCRIPTION

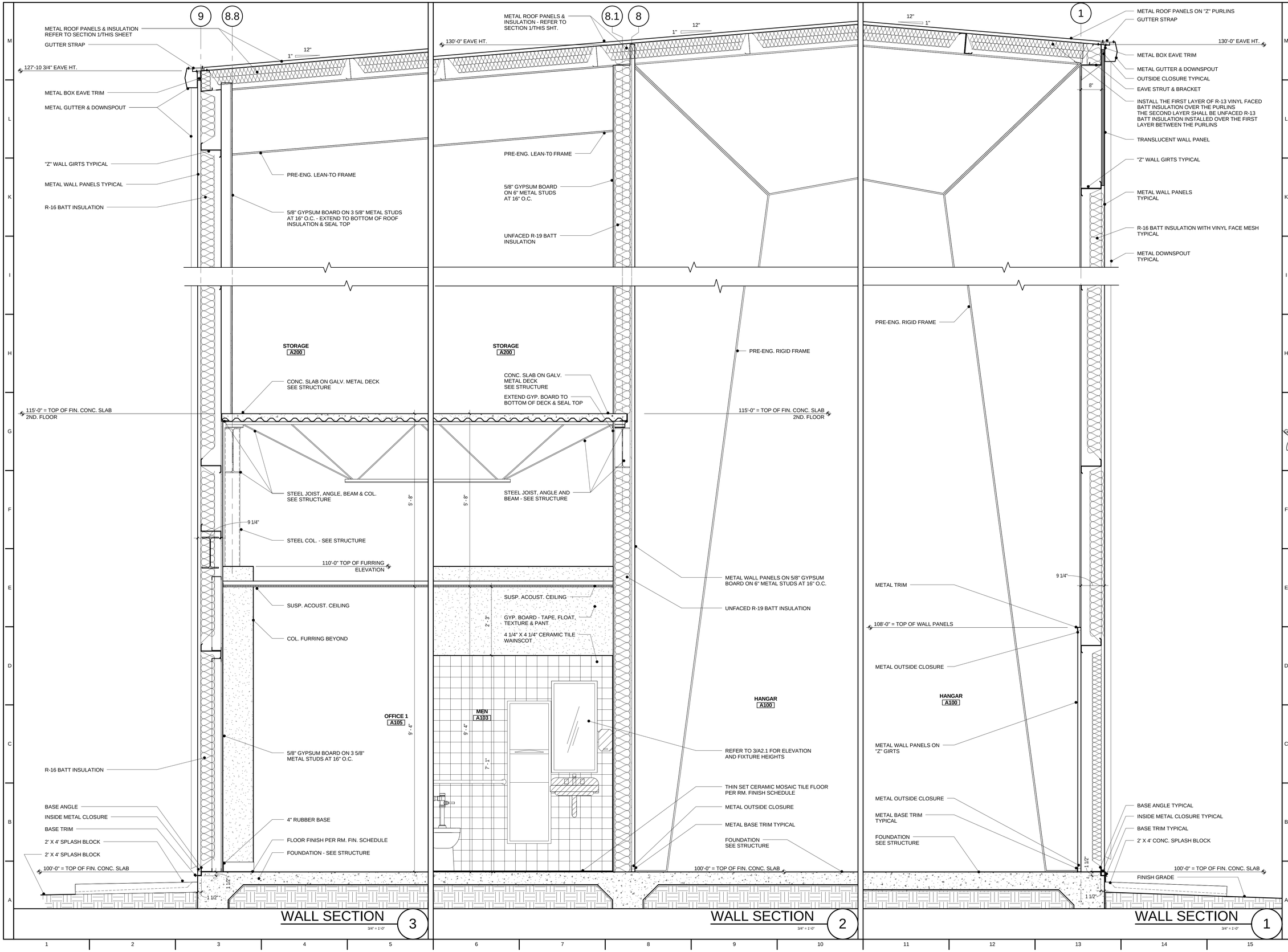
MAINTENANCE HANGAR FOR SOUTH TEXAS INTERNATIONAL AIRPORT AT EDINBURG CITY OF EDINBURG

EDINBURG, TEXAS

PROJECT NO:	201320
DATE:	8/5/2014 9:57:48 AM
STARTING DATE:	01.01.2013
CK BY:Checker	DWN BY: CA

WALL SECTIONS

A5.1



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08.01.2014

NO.	DATE	DESCRIPTION

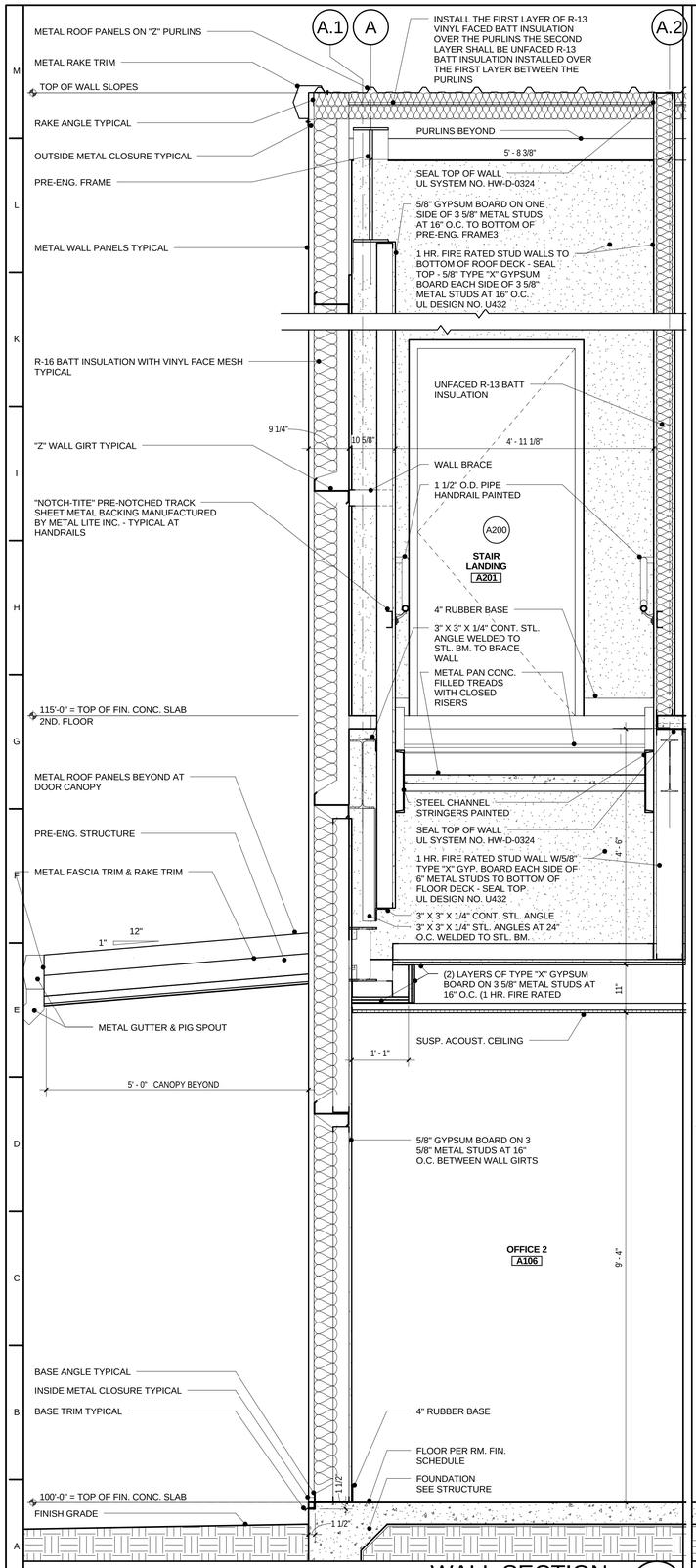
MAINTENANCE HANGAR FOR SOUTH TEXAS INTERNATIONAL AIRPORT AT EDINBURG CITY OF EDINBURG

EDINBURG, TEXAS

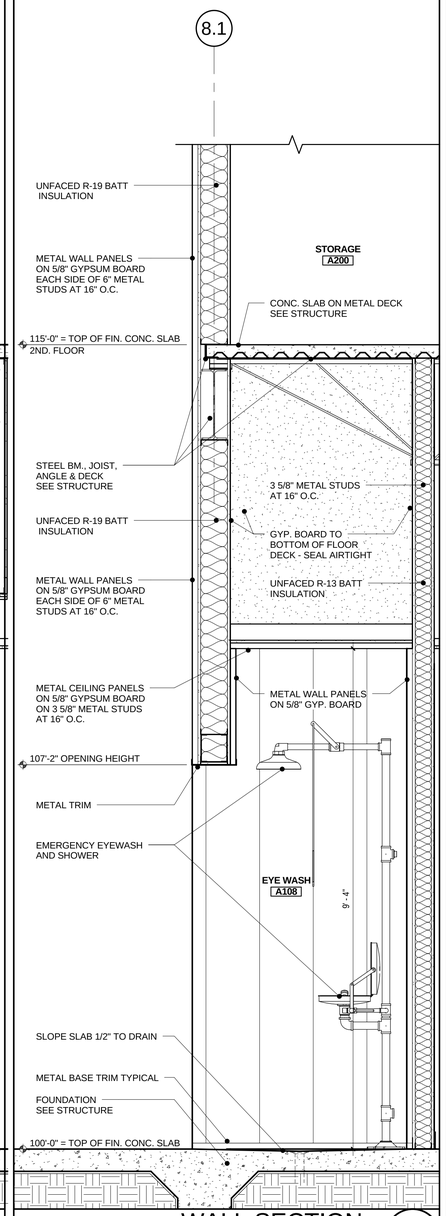
PROJECT NO:	201320
DATE:	8/5/2014 9:57:49 AM
STARTING DATE:	01.01.2013
CK BY:Checker	DWN BY: Author

WALL SECTIONS

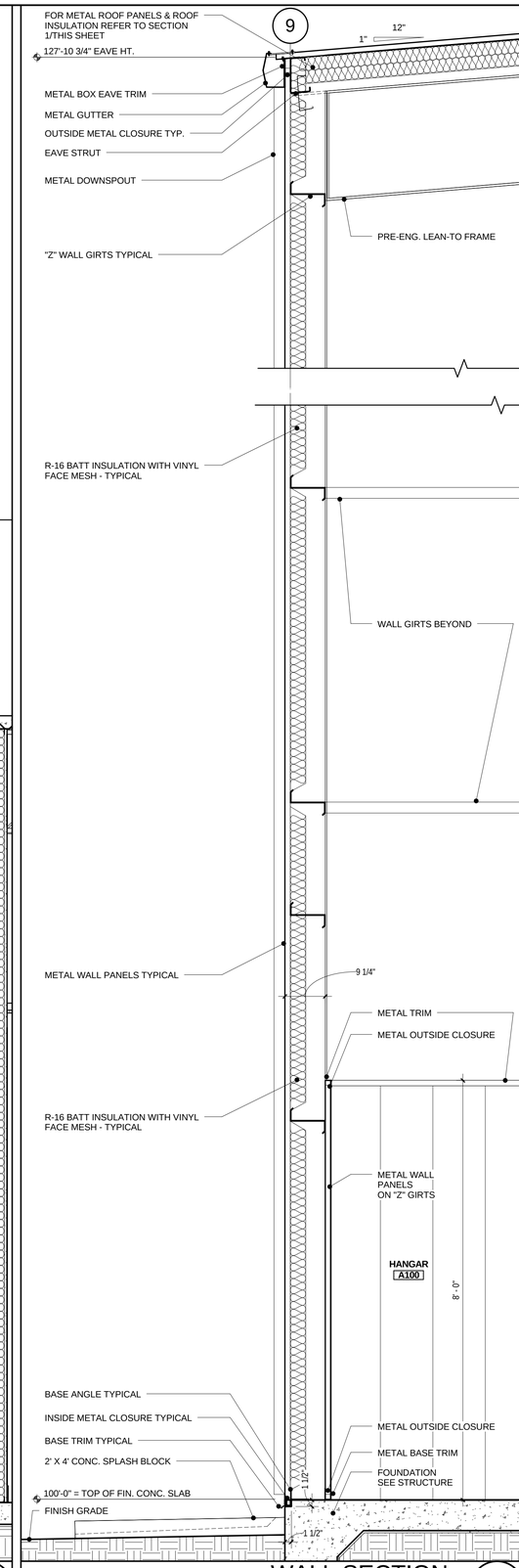
A5.2



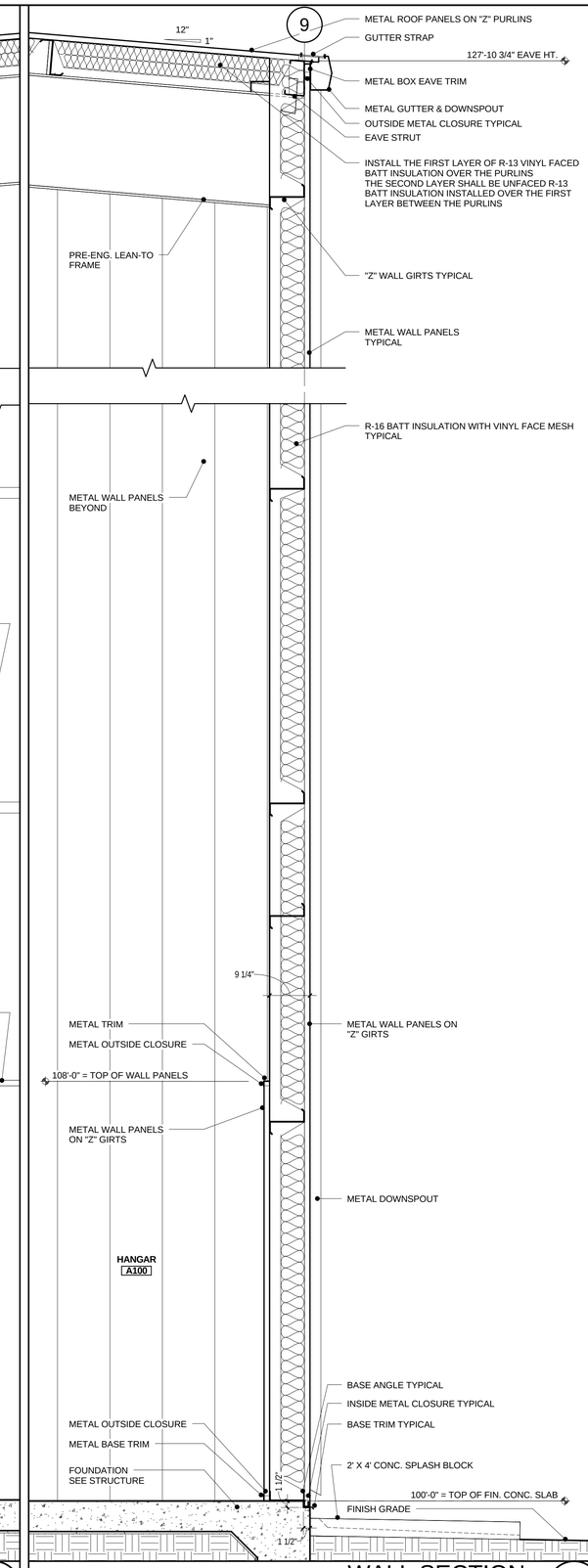
WALL SECTION 4
3/4" = 1'-0"



WALL SECTION 3
3/4" = 1'-0"



WALL SECTION 2
3/4" = 1'-0"



WALL SECTION 1
3/4" = 1'-0"

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08.01.2014

NO.	DATE	DESCRIPTION

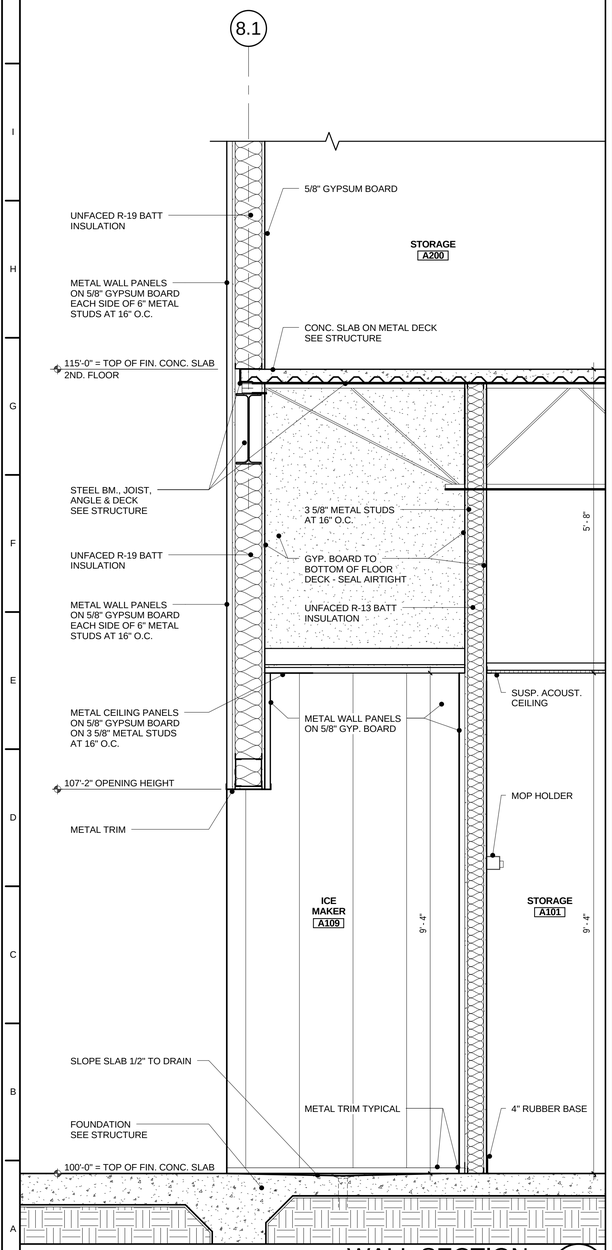
MAINTENANCE HANGAR FOR SOUTH TEXAS INTERNATIONAL AIRPORT AT EDINBURG CITY OF EDINBURG

EDINBURG, TEXAS

PROJECT NO:	201320
DATE:	8/5/2014 9:57:52 AM
STARTING DATE:	01.01.2013
CK BY:Checker	DWN BY: Author

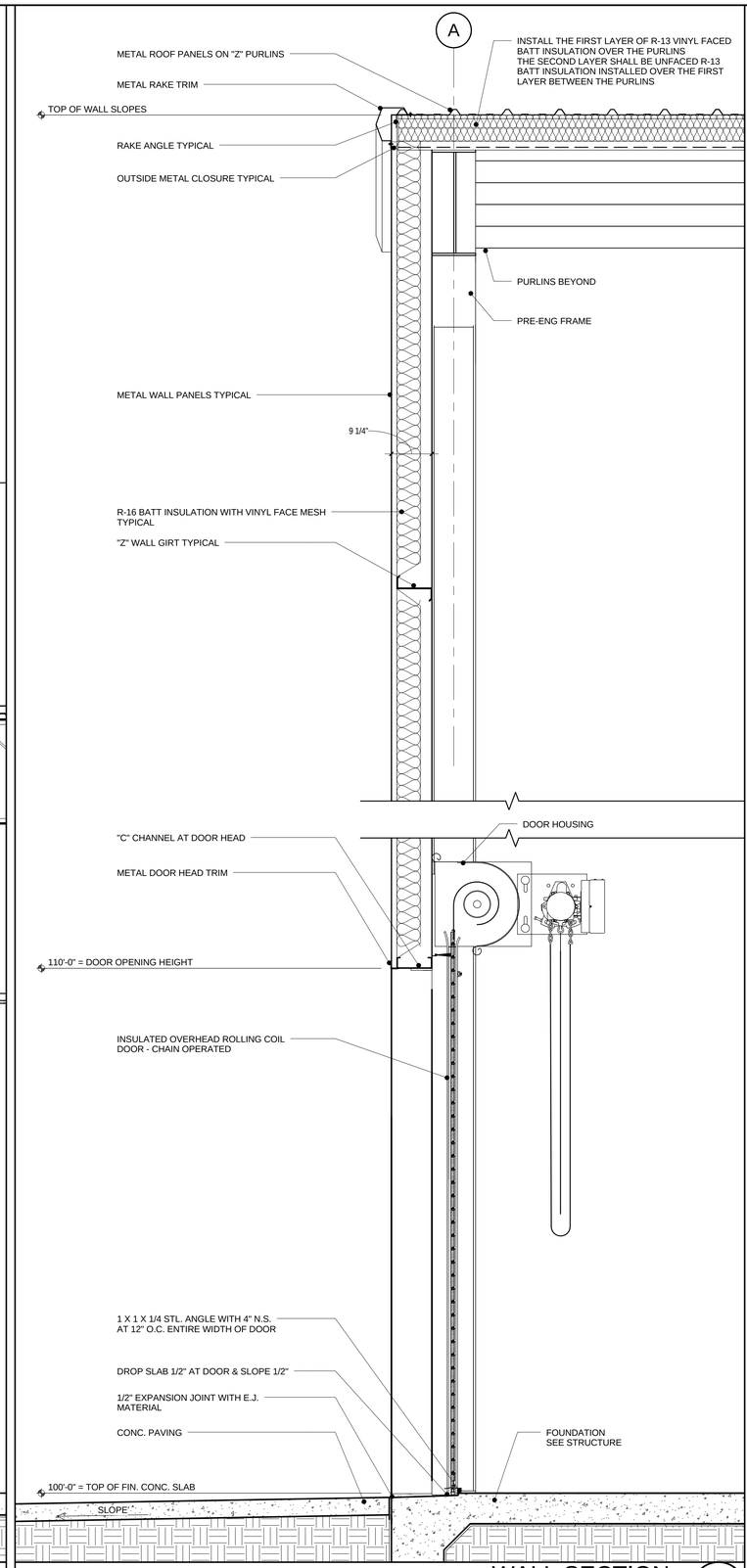
WALL SECTIONS

A5.3



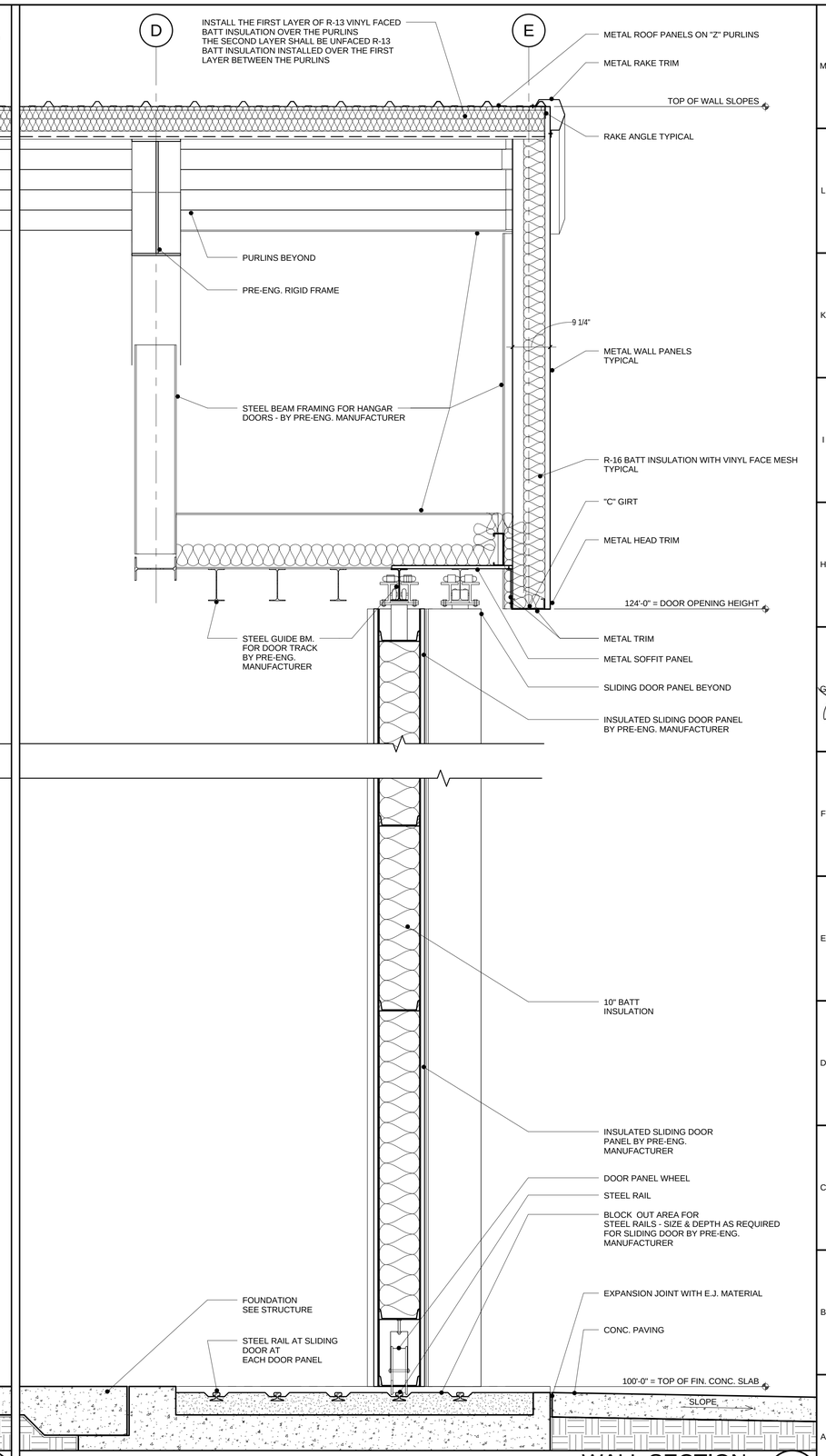
WALL SECTION 3

3/4" = 1'-0"



WALL SECTION 2

3/4" = 1'-0"



WALL SECTION 1

3/4" = 1'-0"

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CONSULTANTS:

REGISTERED ARCHITECT JULIO A. FIGUEROA 12858 STATE OF TEXAS

08.01.2014

NO.	DATE	DESCRIPTION

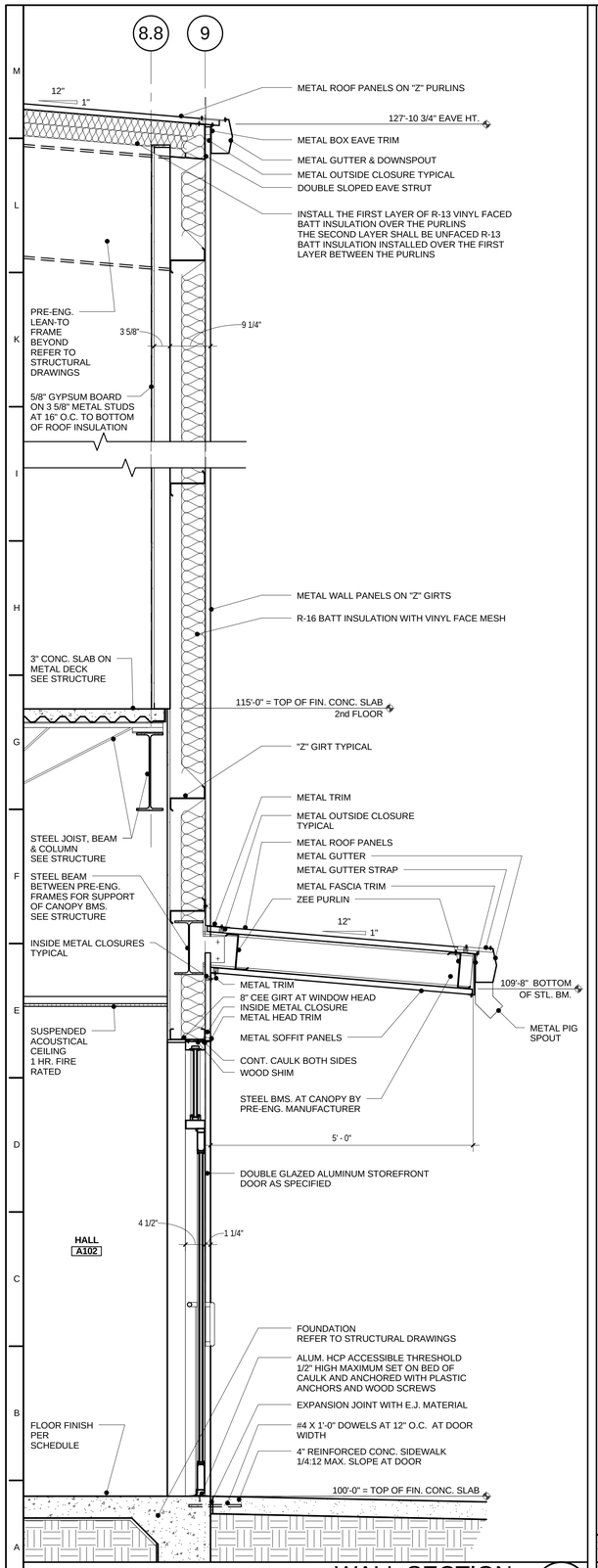
MAINTENANCE HANGAR FOR SOUTH TEXAS INTERNATIONAL AIRPORT AT EDINBURG CITY OF EDINBURG

EDINBURG, TEXAS

PROJECT NO:	201320
DATE:	8/5/2014 9:57:53 AM
STARTING DATE:	01.01.2013
CK BY:Checker	DWN BY: Author

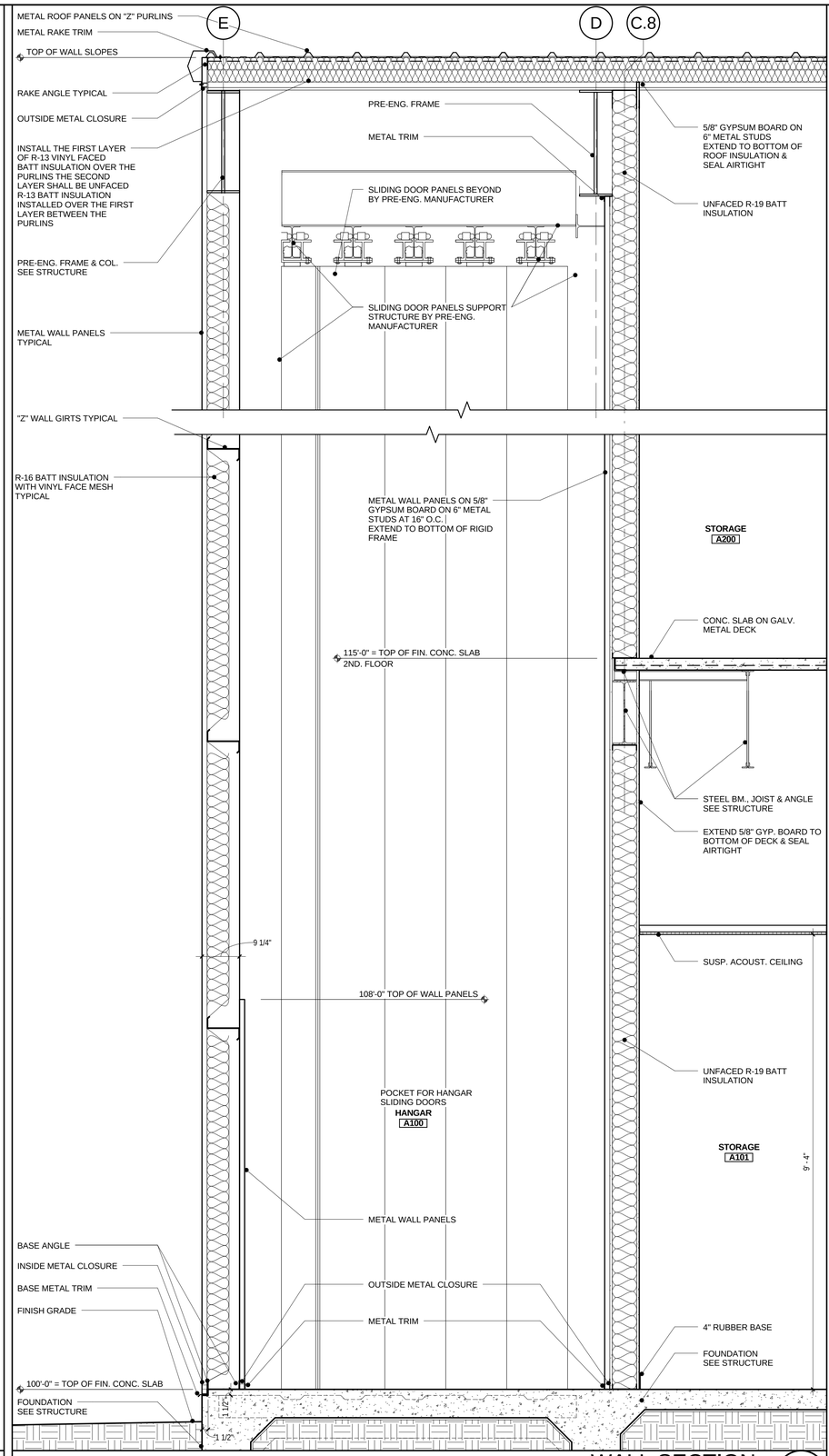
WALL SECTIONS

A5.4



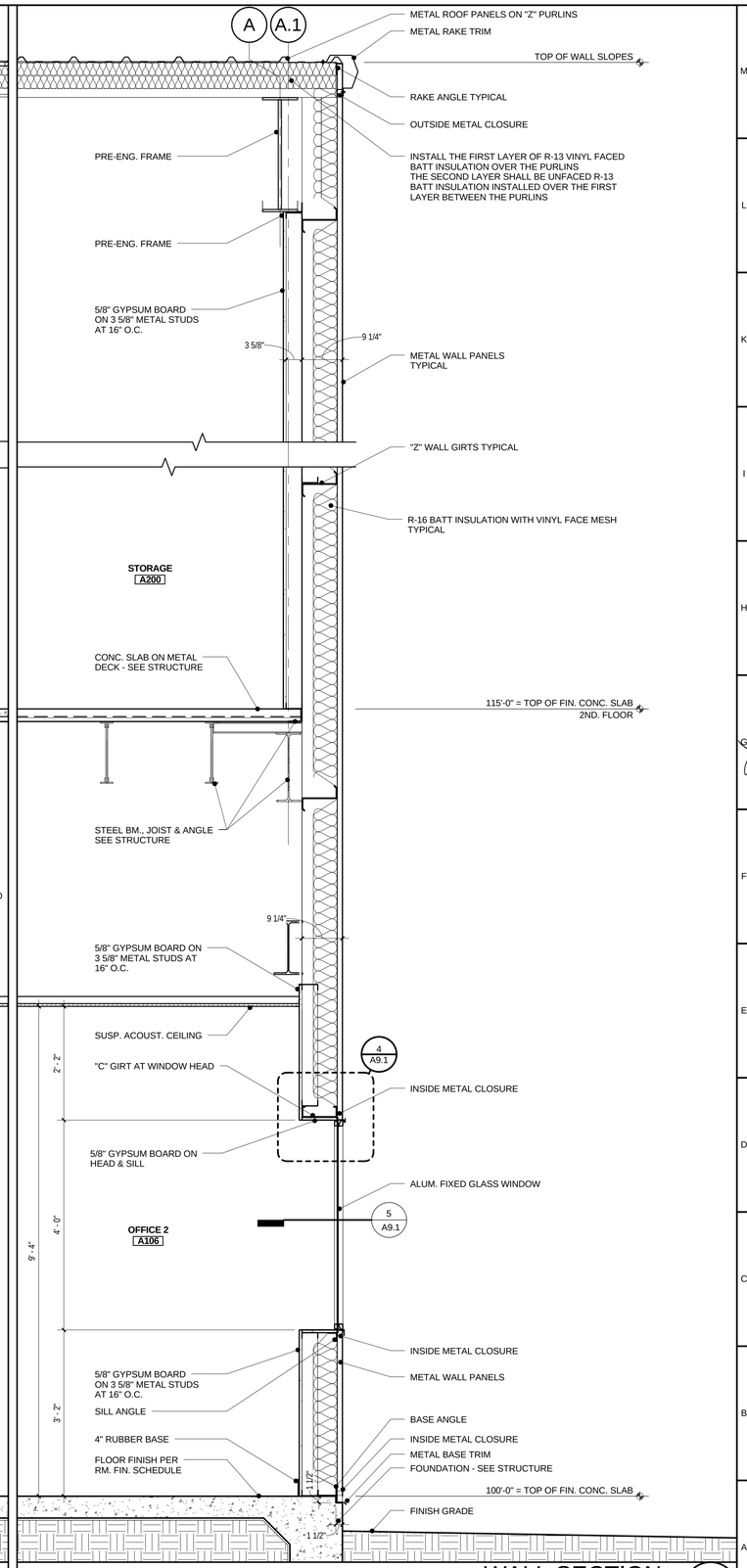
WALL SECTION 3

3/4" = 1'-0"



WALL SECTION 2

3/4" = 1'-0"



WALL SECTION 1

3/4" = 1'-0"

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08.01.2014

NO.	DATE	DESCRIPTION

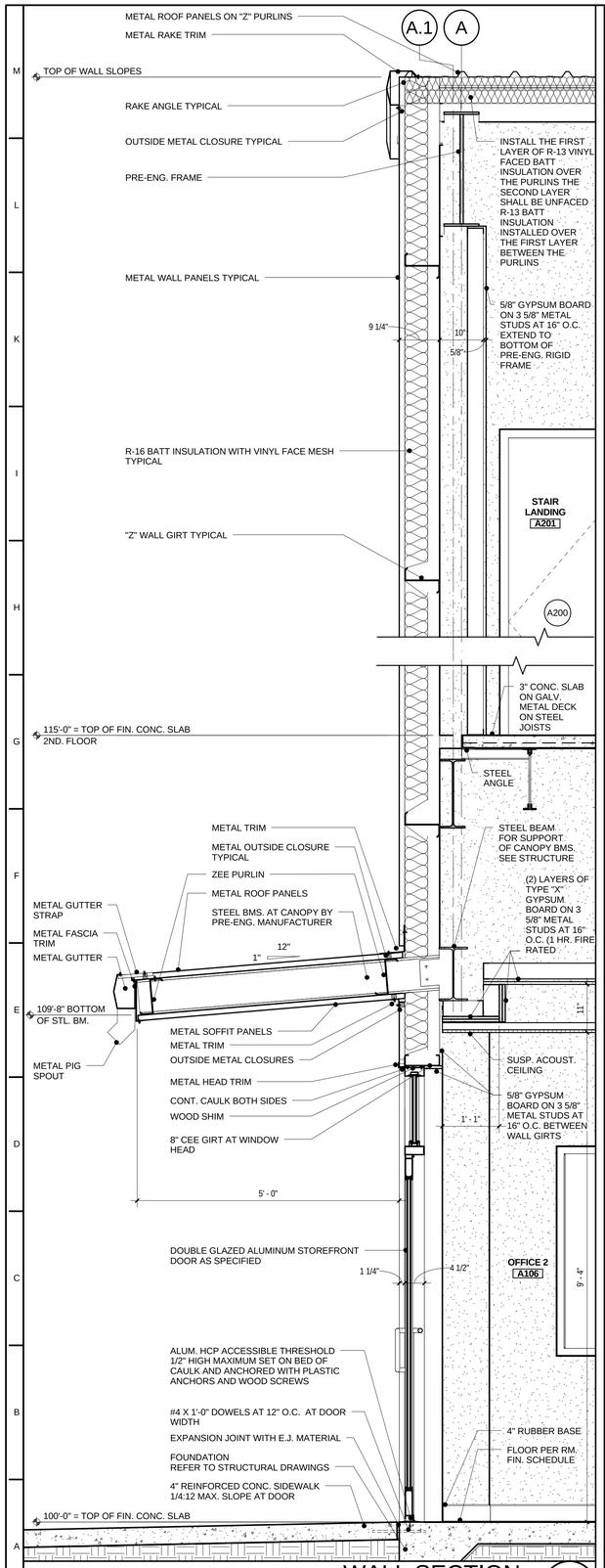
MAINTENANCE HANGAR FOR SOUTH TEXAS INTERNATIONAL AIRPORT AT EDINBURG CITY OF EDINBURG

EDINBURG, TEXAS

PROJECT NO:	201320
DATE:	8/5/2014 9:57:55 AM
STARTING DATE:	01.01.2013
CK BY:Checker	DWN BY: CA.

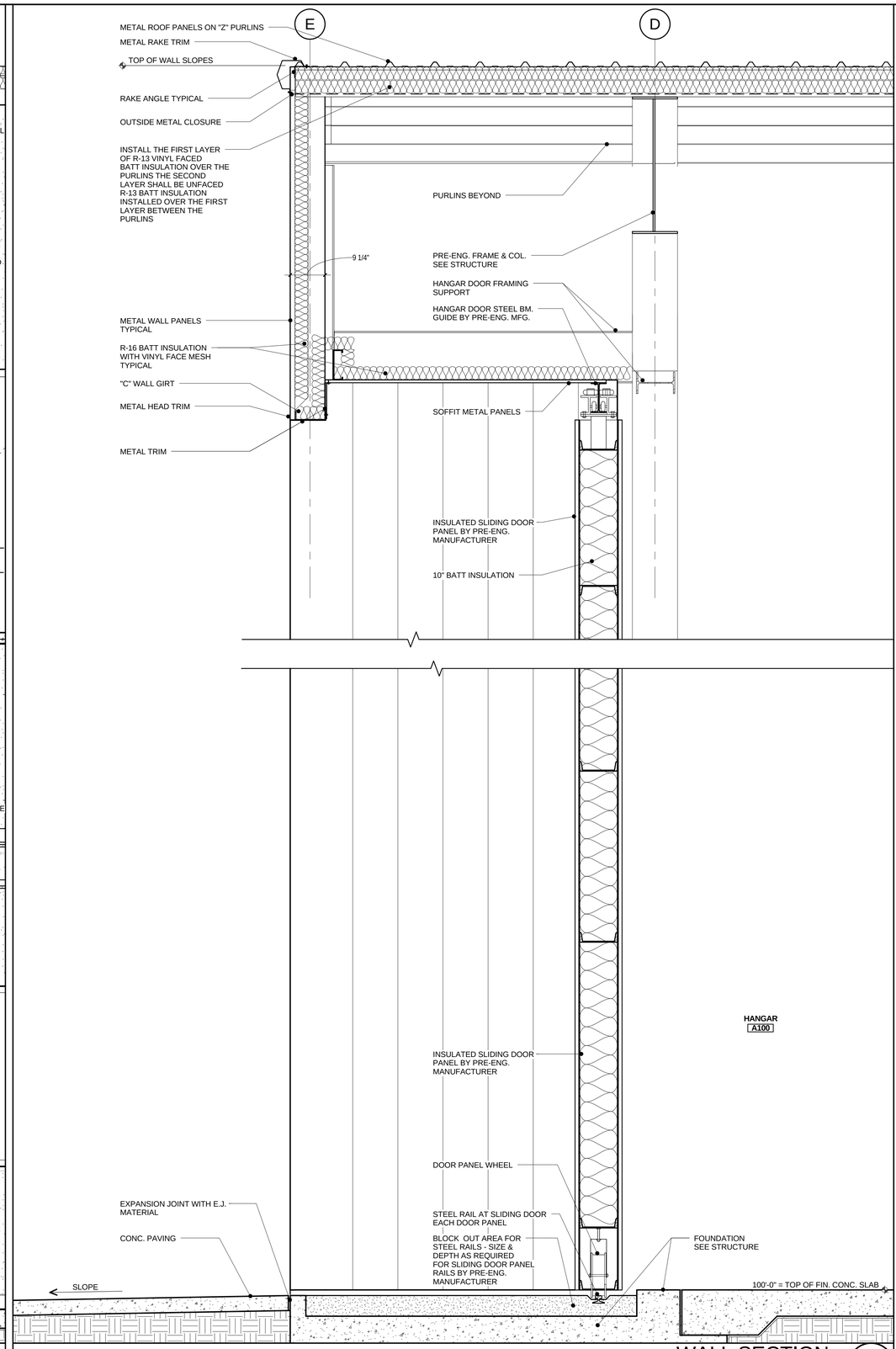
WALL SECTIONS

A5.5



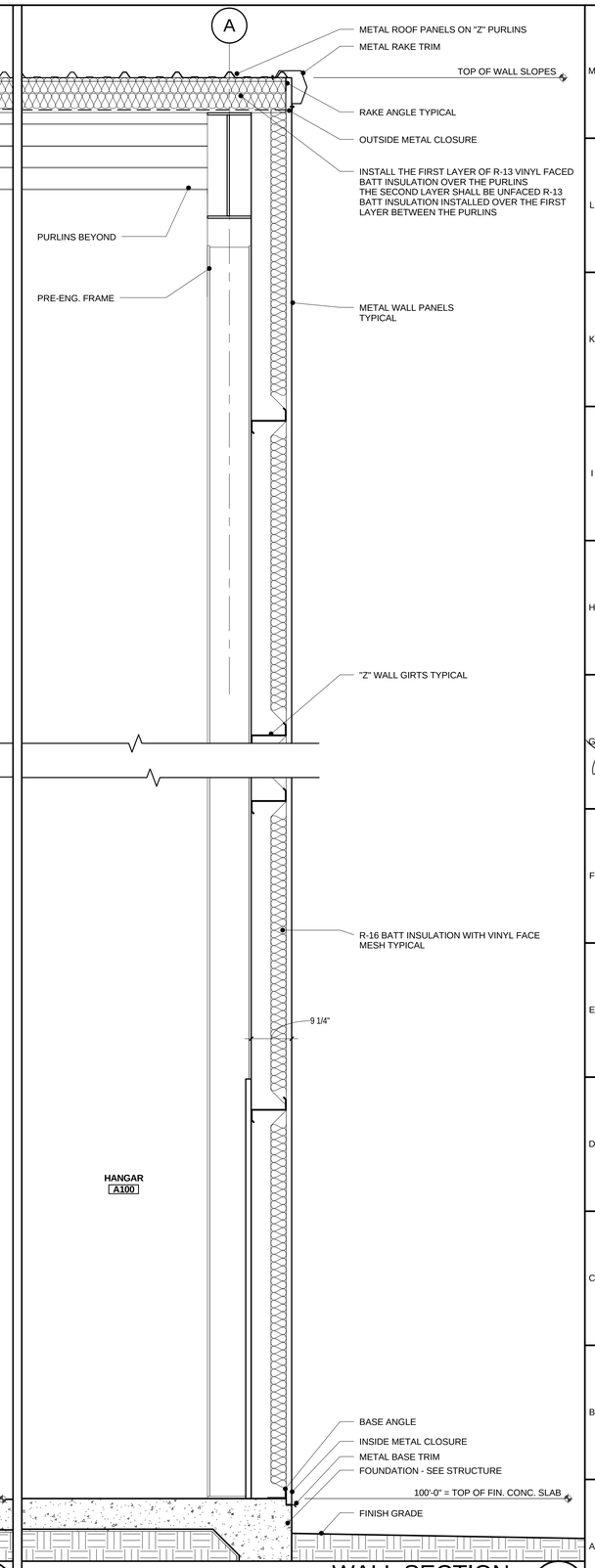
WALL SECTION 3

3/4" = 1'-0"



WALL SECTION 2

3/4" = 1'-0"



WALL SECTION 1

3/4" = 1'-0"

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08.01.2014

NO.	DATE	DESCRIPTION

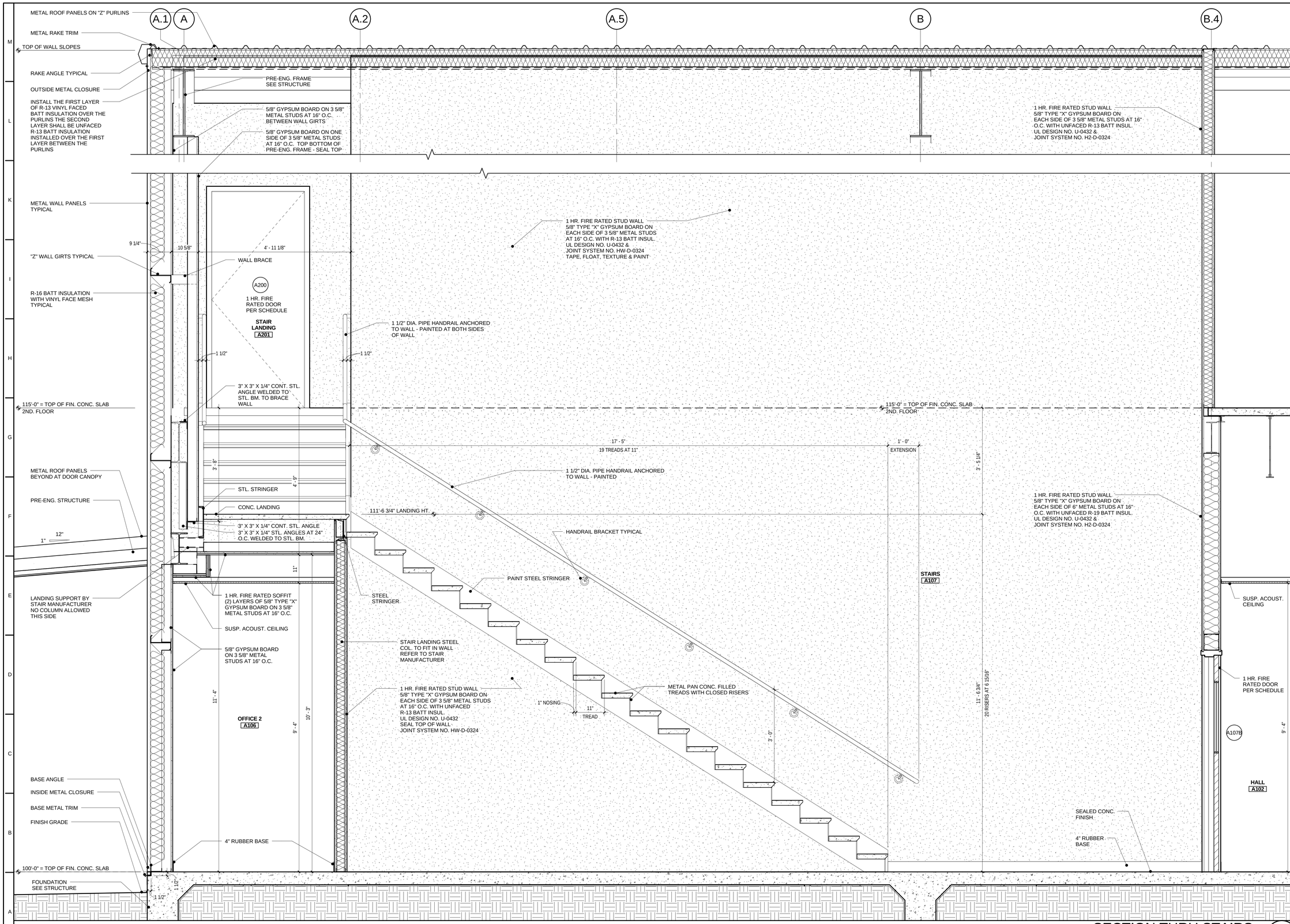
MAINTENANCE HANGAR FOR SOUTH TEXAS INTERNATIONAL AIRPORT AT EDINBURG CITY OF EDINBURG

EDINBURG, TEXAS

PROJECT NO:	201320
DATE:	8/5/2014 9:57:57 AM
STARTING DATE:	01.01.2013
CK BY:Checker	DWN BY: CA

WALL SECTIONS

A5.6



SECTION THRU STAIRS

3/4" = 1'-0"

1

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08.01.2014

NO.	DATE	DESCRIPTION

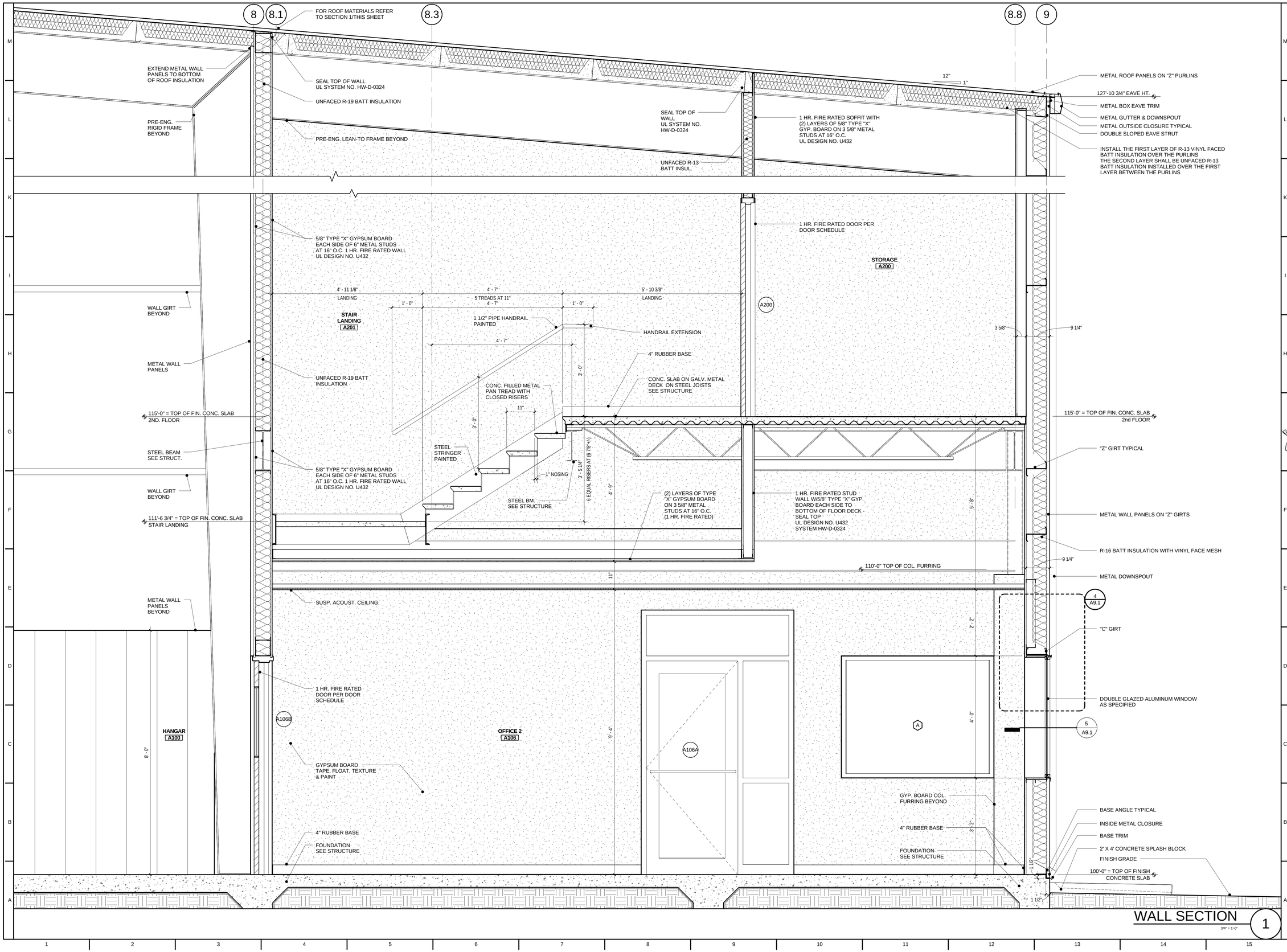
MAINTENANCE HANGAR FOR SOUTH TEXAS INTERNATIONAL AIRPORT AT EDINBURG CITY OF EDINBURG

EDINBURG, TEXAS

PROJECT NO:	201320
DATE:	8/5/2014 9:58:12 AM
STARTING DATE:	01.01.2013
CK BY:Checker	DWN BY: CA

WALL SECTION STAIRS

A5.7



WALL SECTION 1

3/4" = 1'-0"

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NO.	DATE	DESCRIPTION

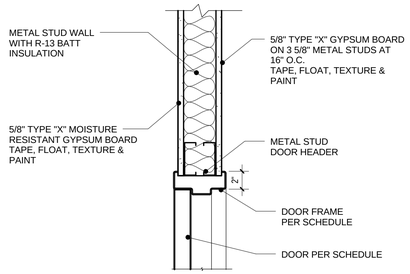
MAINTENANCE HANGAR FOR SOUTH TEXAS INTERNATIONAL AIRPORT AT EDINBURG CITY OF EDINBURG

EDINBURG, TEXAS

PROJECT NO:	201320
DATE:	8/5/2014 9:58:16 AM
STARTING DATE:	01.01.2013
CK BY:Checker	DWN BY: Author

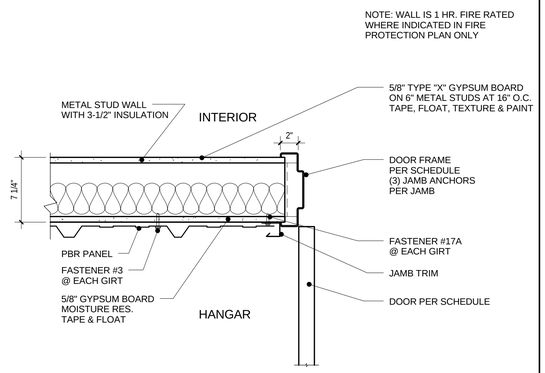
WALL SECTIONS

A5.8



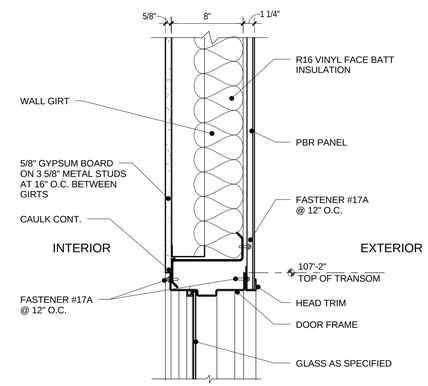
DOOR HEAD 10

1 1/2" = 1'-0"



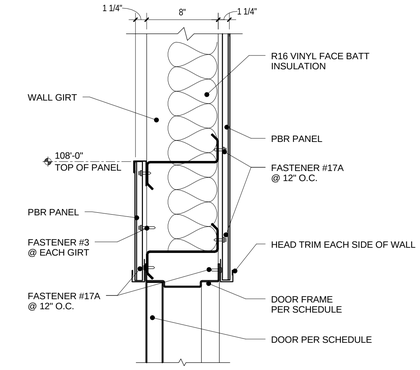
INT. WALL JAMB DOOR W/METAL PANEL 7

1 1/2" = 1'-0"



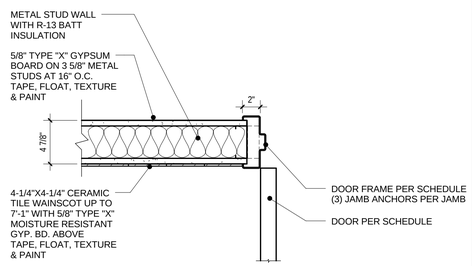
EXT. WALL DOOR HEAD W/ TRANSOM 4

1 1/2" = 1'-0"



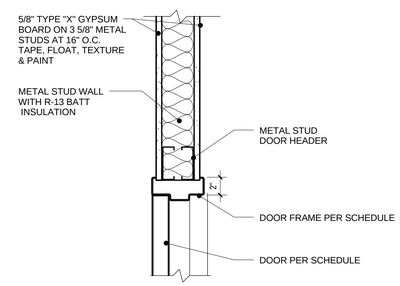
EXTERIOR WALL DOOR HEAD 1

1 1/2" = 1'-0"



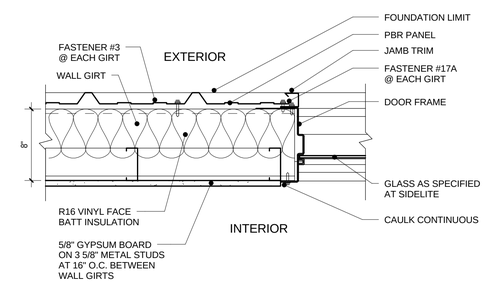
DOOR JAMB WITH CERAMIC TILE 11

1 1/2" = 1'-0"



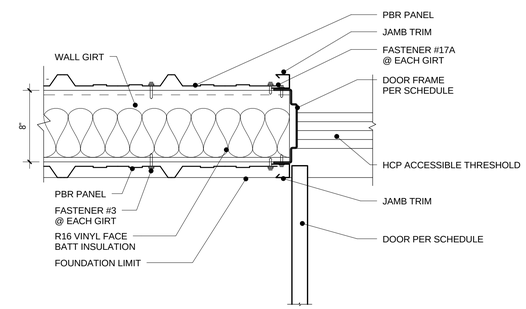
INTERIOR WALL HEAD DOOR 8

1 1/2" = 1'-0"



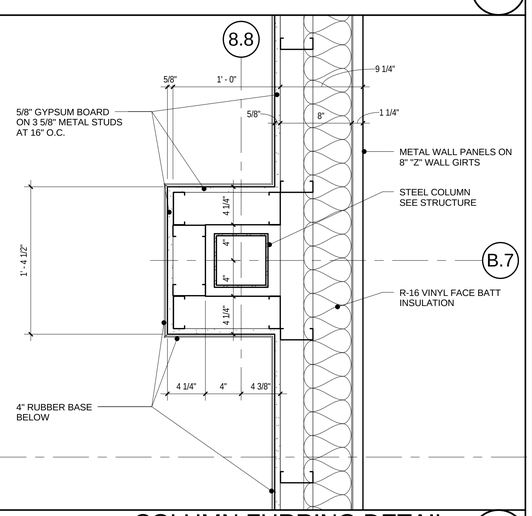
EXT. WALL DOOR JAMB W/ SIDELITE 5

1 1/2" = 1'-0"



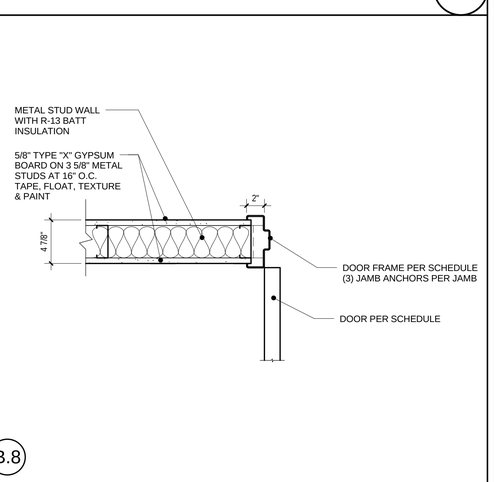
EXTERIOR WALL DOOR JAMB 2

1 1/2" = 1'-0"



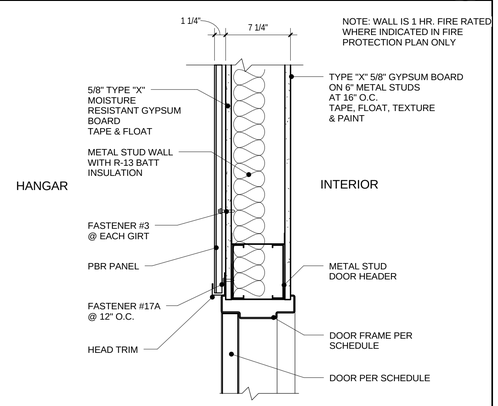
COLUMN FURRING DETAIL 12

1 1/2" = 1'-0"



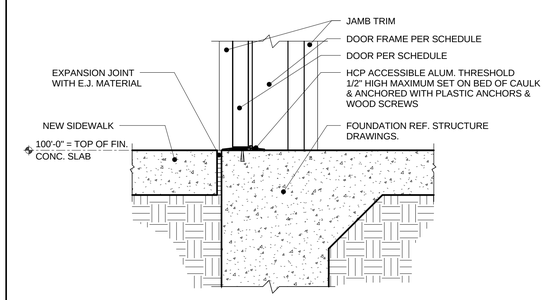
INTERIOR WALL JAMB DOOR 9

1 1/2" = 1'-0"



INT. WALL DOOR HEAD W/METAL PANEL 6

1 1/2" = 1'-0"



EXTERIOR WALL DOOR SILL 3

1 1/2" = 1'-0"

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REGISTERED ARCHITECT JULIO A. FIGUEROA 12858 STATE OF TEXAS
08.01.2014

NO.	DATE	DESCRIPTION

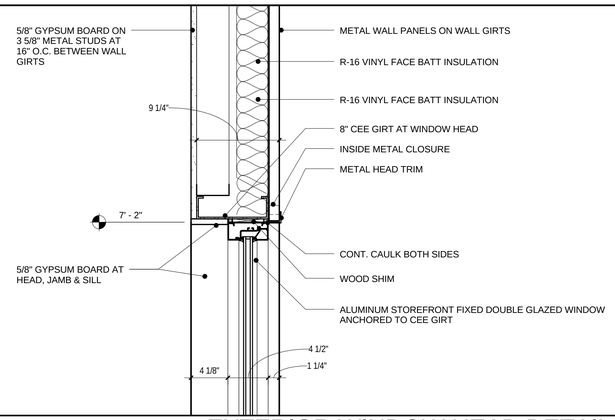
MAINTENANCE HANGAR FOR SOUTH TEXAS INTERNATIONAL AIRPORT AT EDINBURG CITY OF EDINBURG

EDINBURG, TEXAS

PROJECT NO:	201320
DATE:	8/5/2014 9:58:17 AM
STARTING DATE:	01.01.2013
CK BY:Checker	DWN BY: VDV

DOOR & WINDOW DETAILS

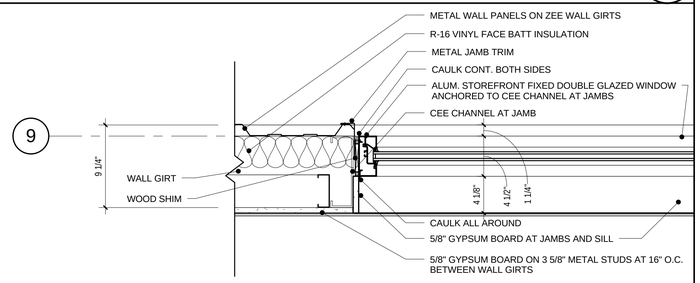
A6.1



EXTERIOR WINDOW HEAD DETAIL

1 1/2" = 1'-0"

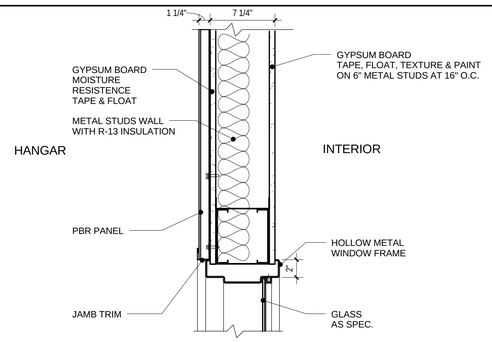
4



EXTERIOR WINDOW JAMB DETAIL

1 1/2" = 1'-0"

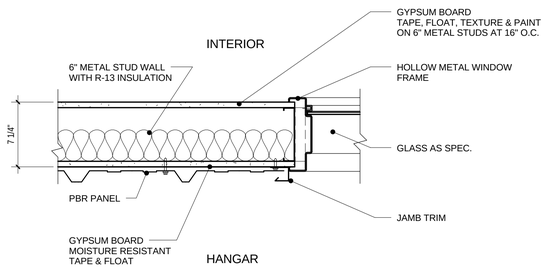
5



INT. WALL - WINDOW HEAD W/METAL PANEL

1 1/2" = 1'-0"

6



INT. WALL - WINDOW JAMB W/METAL PANEL

1 1/2" = 1'-0"

7

FIRST FLOOR DOOR SCHEDULE

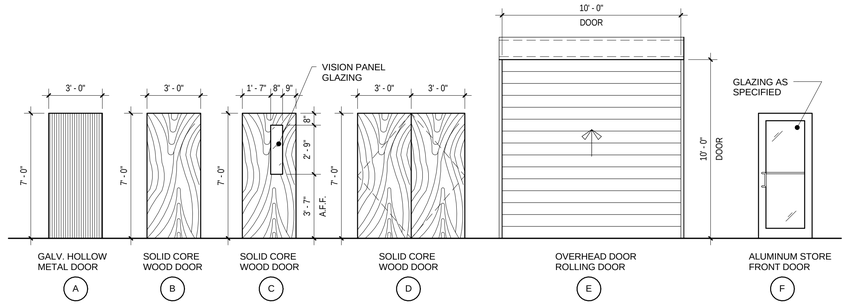
Mark	Pair or Single	DOOR DIMENSIONS Width	Height	Thickness	DOOR TYPE AND FINISHES Door Type	Door Material	Door Finish	FRAME TYPE AND FINISHES Frame Type	Frame Material	Frame Finish	DOOR DETAILS Head	Sill	Jamb	Remarks
A100A	-	120' - 0"	24' - 0"	0' - 0"	Hangar Sliding	Metal	Metal Panels	-	Metal	-	-	-	-	BY PRE-ENG. MTL. BLDG. MFG. - INSULATED
A100B	SINGLE	3' - 0"	7' - 0"	1/4"	A	Galv. Hollow Metal	Paint	A	Galv. Hollow Metal	Paint	1/A6.1	3/A6.1	2/A6.1	
A100C	O.H.D. ROLLING DOOR	10' - 0"	10' - 0"	-	E	Manufacture Door	-	-	-	-	2/A5.4	2/A5.4	-	
A100D	O.H.D. ROLLING DOOR	10' - 0"	10' - 0"	0' - 0"	E	Manufacture Door	-	-	-	-	2/A5.4	2/A5.4	-	
A100E	SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"	A	Galv. Hollow Metal	Paint	A	Galv. Hollow Metal	Paint	1/A6.1	3/A6.1	2/A6.1	
A101	PAIR	3' - 0"	7' - 0"	0' - 1 3/4"	D	Solid Core Wood	Natural	C	Hollow Metal	Paint	6/A6.1		7/A6.1	
A102A	SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"	C	Solid Core Wood	Natural	B1	Hollow Metal	Paint	6/A6.1	-	7/A6.1	1 HR. LABEL - PYROSTOP VISION PANEL GLAZING
A102B	SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"	F	Galv. Hollow Metal	Paint	D	Galv. Hollow Metal	Paint	4/A6.1	3/A6.1	5/A6.1	
A103	SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"	B	Solid Core Wood	Natural	B	Hollow Metal	Paint	10/A6.1	-	11/A6.1	
A104	SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"	B	Solid Core Wood	Natural	B	Hollow Metal	Paint	10/A6.1	-	11/A6.1	
A105	SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"	C	Solid Core Wood	Natural	B	Hollow Metal	Paint	8/A6.1	-	9/A6.1	1 HR. LABEL - PYROSTOP VISION PANEL GLAZING
A106A	SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"	F	ALUM.	Paint	D	ALUM.	Paint	4/A6.1	3/A6.1	5/A6.1	
A106B	SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"	C	Solid Core Wood	Natural	B1	Hollow Metal	Paint	6/A6.1	-	7/A6.1	1 HR. LABEL - PYROSTOP VISION PANEL GLAZING
A106C	SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"	C	Solid Core Wood	Natural	B	Hollow Metal	Paint	8/A6.1	-	9/A6.1	1 HR. LABEL - PYROSTOP VISION PANEL GLAZING
A107A	SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"	C	Solid Core Wood	Natural	B1	Hollow Metal	Paint	6/A6.1	-	7/A6.1	1 HR. LABEL - PYROSTOP VISION PANEL GLAZING
A107B	SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"	C	Solid Core Wood	Natural	B	Hollow Metal	Paint	8/A6.1	-	9/A6.1	1 HR. LABEL - PYROSTOP VISION PANEL GLAZING

SECOND FLOOR DOOR SCHEDULE

Mark	Pair or Single	DOOR DIMENSIONS Width	Height	Thickness	DOOR TYPE AND FINISHES Door Type	Door Material	Door Finish	FRAME TYPE AND FINISHES Frame Type	Frame Material	Frame Finish	DOOR DETAILS Head	Sill	Jamb	Remarks
A200	SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"	B	Solid Core Wood	Natural	B	Hollow Metal	Paint	8/A6.1	-	9/A6.1	

ROOM FINISH SCHEDULE

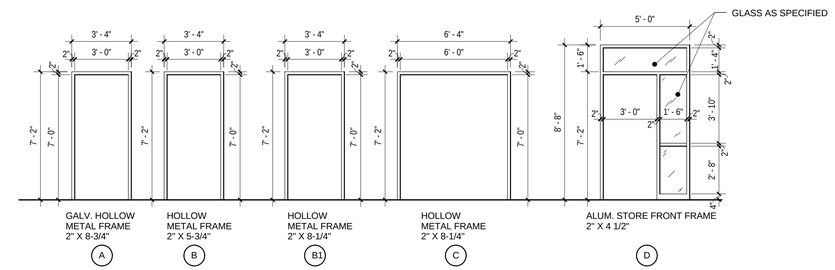
NUMBER	NAME	FLOOR AND BASE FLOOR FINISH	BASE MATERIAL	WALL NORTH WALL FINISH	EAST WALL FINISH	SOUTH WALL FINISH	WEST WALL FINISH	CEILING CEILING FINISH	CEILING HEIGHT	REMARKS
A100	HANGAR	F.3	B.3	W.4	W.5	W.4	W.4	C3	-	
A101	STORAGE	F.1	B.1	W.1	W.1	W.1	W.1	C.1	9'-4"	
A102	HALL	F.1	B.1	W.7	W.1	W.7	W.7	C.2	9'-4"	1 HR. CEILING ASSEMBLY
A102A	E.D.F.	F.1	B.2	-	W.2	W.2	W.2	C.2	9'-4"	1 HR. CEILING ASSEMBLY
A103	MEN	F.2	B.2	W.3	W.3	W.3	W.3	C.1	9'-4"	
A104	WOMEN	F.2	B.2	W.3	W.3	W.3	W.3	C.1	9'-4"	
A105	OFFICE 1	F.1	B.1	W.1/W7	W.1	W.1	W.1	C.1	9'-4"	
A106	OFFICE 2	F.1	B.1	W.1	W.1	W.7	W.1	C.1	9'-4"	
A107	STAIRS	F.3	B.1	W.7	W.7	W.7	W.7	C.3	-	
A108	EYE WASH	F.3	B.3	W.5	W.5	W.5	-	C.4	9'-4"	
A109	ICE MAKER	F.3	B.3	W.5	W.5	W.5	-	C.4	9'-4"	
A200	STORAGE	F.1	B3	W.6	W.6	W.6	W.6	C3	9'-4"	
A201	STAIR LANDING	F.3	B.1	W.7	W.7	-	W.7	C.3	-	



DOOR ELEVATION

1/4" = 1'-0"

2



FRAME ELEVATION

1/4" = 1'-0"

3

KEY FINISHES-BASE FINISH SCHEDULE

Key	Base Finish
B.1	4" RUBBER COVE BASE
B.2	4-1/4" CERAMIC TILE COVE BASE
B.3	NONE

KEY FINISHES-FLOOR FINISH SCHEDULE

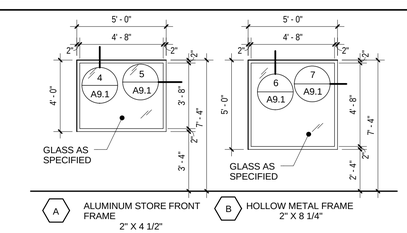
Key	Floor Finish
F.1	V.C.T.
F.2	CERAMIC MOSAIC TILE (2" X 2")
F.3	SEALED CONCRETE

KEY FINISHES-CEILING FINISH SCHEDULE

Key	Ceiling Finish
C.1	2' X 2' LAY-IN ACOUSTICAL CEILING TILE SYSTEM
C.2	2' X 2' LAY-IN ACOUSTICAL 1HR. FIRE RATED ASSEMBLY
C.3	EXPOSED STRUCTURE NOT PAINTED
C.4	METAL CEILING PANELS ON 5/8" GYPSUM BOARD ON 3 5/8" METAL STUDS AT 16" O.C.

KEY FINISHES-WALL FINISH SCHEDULE

Key	Wall Finish
W.1	5/8" GYPSUM BOARD TAPE, FLOAT, TEXTURE & PAINTED
W.2	CERAMIC TILE 4-1/4" X 4-1/4" WAINSCOT UP TO 51" HIGH WITH 5/8" TYPE "X" GYP. BD. (MOISTURE RESISTANT) TAPE, FLOAT, TEXTURE & PAINT ABOVE
W.3	CERAMIC TILE 4-1/4" X 4-1/4" WAINSCOT UP TO 7'-1" HIGH WITH GYP. BD. (MOISTURE RESISTANT) TAPE, FLOAT, TEXTURE & PAINT ABOVE
W.4	METAL WALL PANEL UP TO 8'-0" HIGH WITH EXPOSED STRUCTURE PAINTED
W.5	METAL WALL PANELS OVER 5/8" MOISTURE RESISTANT GYPSUM BOARD
W.6	5/8" GYPSUM BOARD TAPE, FLOAT
W.7	5/8" TYPE "X" GYPSUM BOARD - TAPE, FLOAT, TEXTURE & PAINT



WINDOW ELEVATION

1/4" = 1'-0"

1

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CONSULTANTS:

REGISTERED ARCHITECT JULIO A. FIGUEROA 12858 STATE OF TEXAS
08.01.2014

NO.	DATE	DESCRIPTION

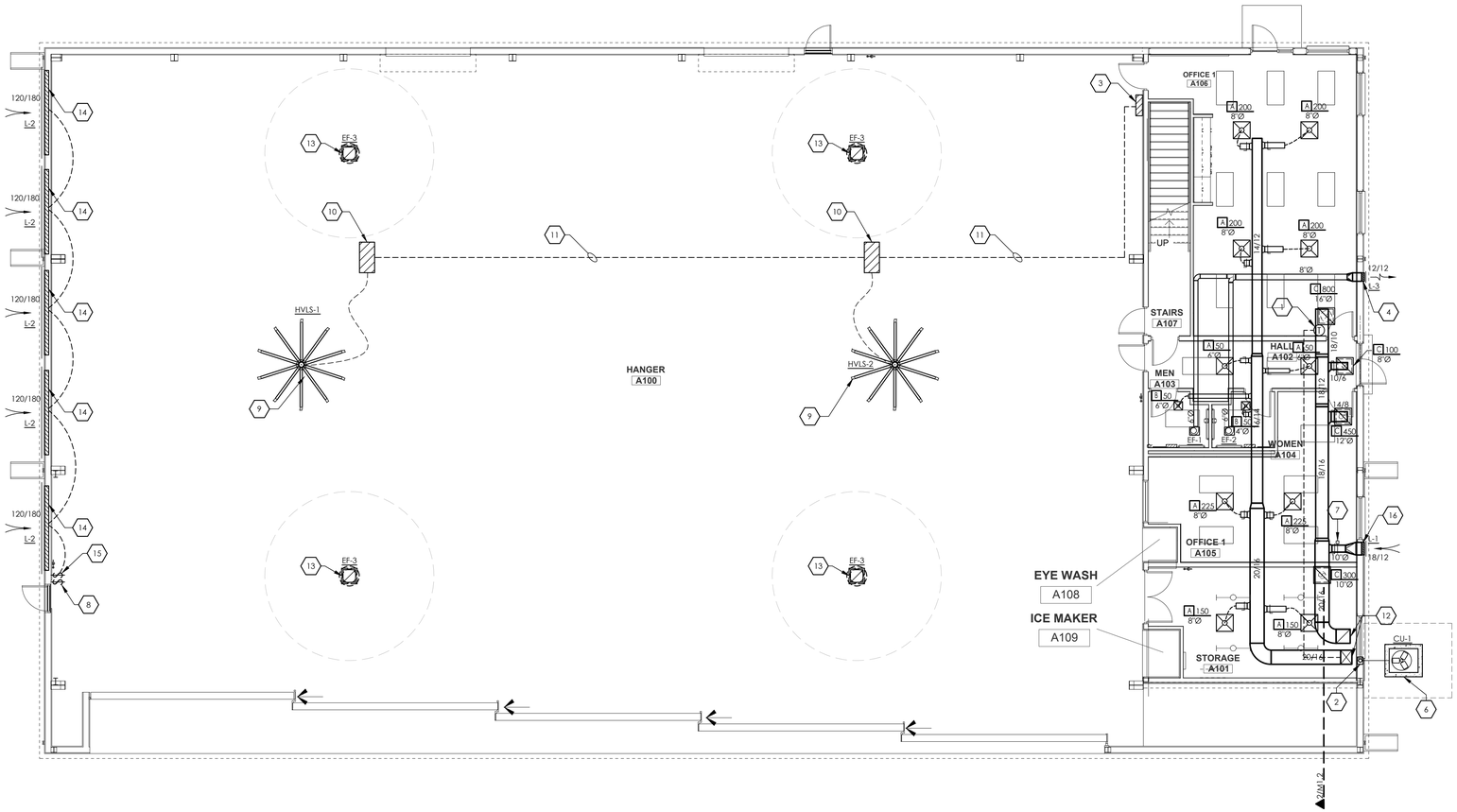
MAINTENANCE HANGAR FOR SOUTH TEXAS INTERNATIONAL AIRPORT AT EDINBURG CITY OF EDINBURG

EDINBURG, TEXAS

PROJECT NO:	201320
DATE:	8/5/2014 9:58:19 AM
STARTING DATE:	01.01.2013
CK BY:Checker	DWN BY: VDV

ROOM AND DOOR SCHEDULES

A9.1



MECHANICAL FLOOR PLAN 1

1/8" = 1'-0"

GENERAL NOTE:

(1) ALL RETURN GRILLES SHALL BE PROVIDED W/ A SQUARE TO ROUND TRANSITION. FLEX DUCTWORK SHALL NOT RUN FOR MORE THAN 6 FEET AND SHALL BE BY FLEXMASTER. ALL RETURNS SHALL BE PROVIDED W/ A BALANCING DAMPER. REFERENCE DETAIL.

(2) ALL DUCTWORK CROSSING WALLS SHALL BE PROVIDED W/ SLEEVES. REFERENCE DETAIL.

KEYED NOTES: MECHANICAL

1. CONTROLS FOR A/C UNIT WILL BE BY MEANS OF A 24 VOLT 7-DAY PROGRAMMABLE THERMOSTAT WITH HEAT-OFF-COOL AND FAN ON-AUTO CAPABILITIES SHOWN ON A DIGITAL DISPLAY. MOUNT THERMOSTAT AT 48" ABOVE FINISHED FLOOR. PROVIDE WITH KEYED CLEAR PLASTIC COVER.
2. ROUTE REFRIGERANT LINES UP INSIDE OF WALL AND OVER TO RESPECTIVE AIR HANDLER. ANCHOR LINES TO STRUCTURE AND SEAL ALL PENETRATIONS WATER TIGHT. PROVIDE SHEET METAL HOOD OVER REFRIGERANT LINES. REFERENCE DETAIL 07 ON PAGE M3.1 FOR WALL PENETRATION DETAIL.
3. FAN CONTROL PANEL, MOUNTED @ 48" A.F.F. ONE SINGLE CONTROLLER FOR QUANTITY OF FANS AS INDICATED.
4. ROUND TO SQUARE EXHAUST DUCT OUT TO LOUVER.
5. UNIT TO BE MOUNTED ON A 24" HIGH PLATFORM CONSTRUCTED OF 1-1/2 ANGLE IRON/ 1" SQUARE METAL TUBING. RETURN AIR DUCT TO BE ROUTED DOWN UNDER UNIT & TIED INTO RETURN AIR OPENING OF UNIT.
6. MOUNT UNIT OVER A 4" CONCRETE HOUSEKEEPING PAD.
7. PROVIDE W/ MOTORIZED DAMPER W/ OPEN/CLOSE OPERATION. DAMPER TO BE ACTUATED TO MAX ONLY WHEN COMPRESSOR OR HEATER IS ENERGIZED & ACTUATED TO THE CLOSED POSITION @ ALL OTHER TIMES. PROVIDE W/ ADDITIONAL MANUAL BALANCING DAMPER TO BALANCE CFM AMOUNTS OF OUTSIDE AIR. MECHANICAL CONTRACTOR TO PROVIDE W/ ANY ELECTRICAL HARDWARE TO POWER DAMPER.
8. SWITCH FOR VENT FANS (EF-3'S) @ 48" A.F.F. FAN OPERATION TO BE INTERLOCK W/ HANGER FIRE SUPPRESSION SYSTEM (WHEN FIRE IS DETECTED FAN TURNS OFF). SWITCH TO BE LABELED "VENT.FAN".
9. HVLS MOUTED TO STRUCTURE. PROVIDE FAN W/ ALL MOUNTING ACCESSORIES REQUIRED FOR HANGING THE METAL STRUCTURE.
10. HVLS MOTOR DRIVE MOUNTING LOCATION ON STRUCTURE (WHERE APPLICABLE). REFER TO INSTALLATION REQUIREMENTS FOR DRIVE MOUNTING DISTANCE REQUIREMENTS. TO BE INTERLOCKED (OUT), W/ FIRE SUPPRESSION SYSTEM.. SEE ELEC FOR POWERING.
11. FAN CONTROL WIRING IN CONDUIT. REFERENCE ELECTRICAL SHEETS FOR CONDUITS.
12. DUCT DOWN FROM UNIT MOUNTED ON 2ND FLOOR STORAGE TO SPACE BETWEEN 2ND FLOOR AND 1ST FLOOR CEILING.
13. EMERGENCY PURGE ROOF MOUNTED FAN. DUCT DOWN FROM FAN TO BE FLUSH W/ ROOF DECK. (DOWN FROM FAN ON 14" CURB). COORDINATE CURB TYPE W/ METAL ROOF. PROVIDE 1/2" X 1/2" MESH OVER DUCT OPENING.
14. MOUNT VENT LOUVER @ 12" A.F.F. ALL MOTORIZED DAMPERS BEHIND LOUVERS (120V) TO BE OPERATED OFF 1 SINGLE SWITCH.
15. MOUNT SWITCH FOR VENTILATION LOUVER DAMPERS @ 48" A.F.F. SWITCH TO BE LABELED. "VENT.LOUVERS". DAMPER POSITION TO BE INTERLOCKED W/ HANGER FIRE SUPPRESION SYSTEM(WHEN FIRE IS DETECTED DAMPERS CLOSE).
16. LOUVER FOR AIR HANDLER OUTSIDE AIR, MOUNTED ABOVE 1ST FLOOR CEILING LEVEL.

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CONSULTANTS:

NO	DATE	DESCRIPTION

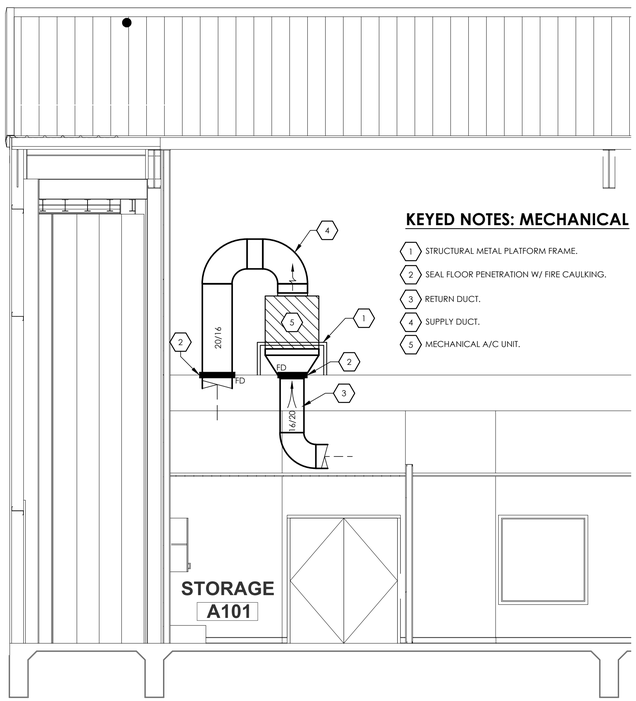
MAINTENANCE HANGAR FOR SOUTH TEXAS INTERNATIONAL AIRPORT AT EDINBURG CITY OF EDINBURG

EDINBURG, TEXAS

PROJECT NO:	201320
DATE:	8/01/2014 11:56:13 AM
STARTING DATE:	06.03.2013
CK BY: L.M.	DWN BY: ---

MECHANICAL FLOOR PLAN

M1.1

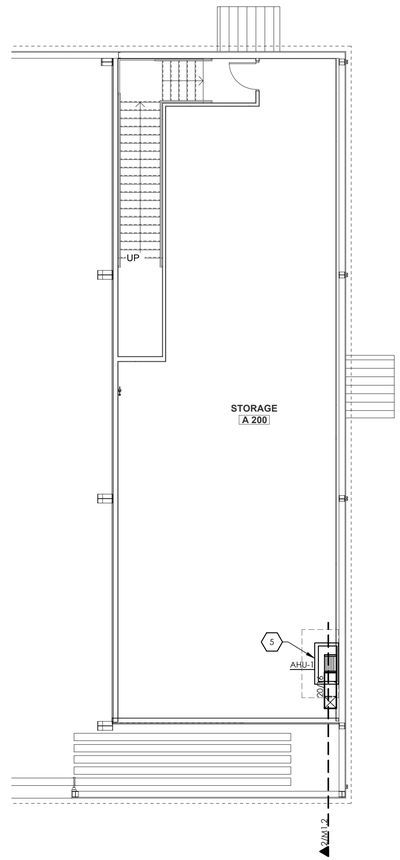


KEYED NOTES: MECHANICAL

1. STRUCTURAL METAL PLATFORM FRAME.
2. SEAL FLOOR PENETRATION W/ FIRE CAULKING.
3. RETURN DUCT.
4. SUPPLY DUCT.
5. MECHANICAL A/C UNIT.

MECHANICAL SECTION 2

1/4" = 1'-0"



MECHANICAL 2ND FLOOR PLAN 1

1/8" = 1'-0"

GENERAL NOTE:

(1) ALL RETURN GRILLES SHALL BE PROVIDED W/ A SQUARE TO ROUND TRANSITION. FLEX DUCTWORK SHALL NOT RUN FOR MORE THAN 6 FEET AND SHALL BE BY FLEXMASTER. ALL RETURNS SHALL BE PROVIDED W/ A BALANCING DAMPER. REFERENCE DETAIL.

(2) ALL DUCTWORK CROSSING WALLS SHALL BE PROVIDED W/ SLEEVES. REFERENCE DETAIL.

KEYED NOTES: MECHANICAL

1. CONTROLS FOR A/C UNIT WILL BE BY MEANS OF A 24 VOLT 7-DAY PROGRAMMABLE THERMOSTAT WITH HEAT-OFF-COOL AND FAN ON-AUTO CAPABILITIES SHOWN ON A DIGITAL DISPLAY. MOUNT THERMOSTAT AT 48" ABOVE FINISHED FLOOR. PROVIDE WITH KEYED CLEAR PLASTIC COVER.
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11. FAN CONTROL WIRING IN CONDUIT. REFERENCE ELECTRICAL SHEETS FOR CONDUITS.
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13. EMERGENCY PURGE ROOF MOUNTED FAN. DUCT DOWN FROM FAN TO BE FLUSH W/ ROOF DECK. (DOWN FROM FAN ON 14" CURB). COORDINATE CURB TYPE W/ METAL ROOF. PROVIDE 1/2" X 1/2" MESH OVER DUCT OPENING.
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CONSULTANTS:

NO	DATE	DESCRIPTION

MAINTENANCE HANGAR FOR
SOUTH TEXAS INTERNATIONAL
AIRPORT AT EDINBURG
CITY OF EDINBURG
EDINBURG, TEXAS

PROJECT NO: 201320
DATE: 8/01/2014 11:56:13 AM
STARTING DATE: 06.03.2013
CK BY: L.M. DWN BY: ---

MECHANICAL
2ND FLOOR PLAN

M1.2

GENERAL NOTES - MECHANICAL:

(1) THE MECHANICAL CONTRACTOR IS FULLY RESPONSIBLE FOR PERFORMING THE WORK IN FULL COMPLIANCE WITH ALL APPLICABLE LOCAL, STATE, AND FEDERAL CODES UNDER THIS SECTION OF THE CONTRACT. IF THE CONTRACTOR DETERMINES THAT THE CONTRACT DOCUMENTS AND PLANS ARE NOT IN COMPLIANCE WITH THE APPLICABLE LOCAL CODES, HE/SHE SHALL INFORM THE ARCHITECT PRIOR TO CONSTRUCTION START FOR DIRECTION. FAILURE TO DO SO SHALL NOT RELIEVE THE CONTRACTOR OF HIS RESPONSIBILITY TO MEET APPLICABLE LOCAL CODES, AND RE-WORK SHALL BE AT CONTRACTOR'S EXPENSE.

(2) CONTRACTOR SHALL HANG AND INSTALL ALL DUCTWORK FLUSH WITH THE BUILDING STRUCTURE TO ACCOMMODATE NEW CEILINGS, CONTRACTOR SHALL COORDINATE ALL INSTALLATION WORK WITH ARCHITECTURAL AND ELECTRICAL DESIGN. ALL DUCTWORK SHALL BE MODIFIED AS NECESSARY AND REQUIRED TO FIT AROUND BUILDING STRUCTURES, ARCHITECTURAL BUILD-OUT AND ELECTRICAL CABLE TRAY INSTALLATIONS. MECHANICAL CONTRACTOR SHALL FAMILIARIZE HIMSELF WITH THE WORK SCOPE OF OTHER TRADES AND PARTICIPATE IN COORDINATING ALL CONSTRUCTION EFFORTS.

(3) CONNECT EACH DIFFUSER TO THE MAIN DISTRIBUTION DUCTS WITH A FLEX-DUCT SECTION; CONNECTIONS SHALL BE COMPLETED IN ACCORDANCE WITH THE DETAIL. EACH FLEX-DUCT CONNECTION SHALL INCLUDE A BUTTERFLY DAMPER TO BE INSTALLED AT THE TRUNK DUCT.

(4) CONTRACTOR SHALL PROVIDE ALL DUCTWORK REQUIRED TO COMPLETE THE HVAC SYSTEM, TIE IN BRANCH DUCTS TO MAIN DUCTS WITH SHEET METAL FLANGES. FLANGE CONNECTION SHALL BE FASTENED WITH CRIMPED SHEET METAL STRIPS AND SEALED WITH SILICONE CAULK.

(5) CONTRACTOR SHALL SUPPLY AND INSTALL FIRE DAMPERS AND ACCESS DOORS IN THE HORIZONTAL DUCTS WHERE THEY PENETRATE FIRE WALLS & BARRIERS.

(6) ALL OPENINGS CUT IN MASONRY AND PLASTER WALLS OR CONCRETE FLOORS SHALL BE CORE DRILLED OR SAWED WHEN POSSIBLE. CONTRACTOR SHALL CHECK BUILDING CONSTRUCTION BEFORE MAKING PENETRATIONS TO AVOID CUTTING THROUGH STRUCTURAL BEAMS AND REINFORCING. CONTRACTOR SHALL INFORM THE ENGINEER IF REINFORCING IS CUT OR DAMAGED WHILE MAKING OPENINGS. CONTRACTOR SHALL REINFORCE ALL OPENINGS AS REQUIRED BY DRAWINGS AND SPECIFICATIONS. PATCH AND SEAL OPENINGS WITH 8000 PSI CEMENT GROUT. INSTALL DECORATIVE TRIM (EQUIPMENT FLANGES, FRAMING OR ESCUTCHEONS) AROUND OPENINGS IN FINISHED AREAS. COORDINATE ALL CUTTING AND PATCHING WITH THE OTHER TRADES

(7) ON ANY WORK SHOWN ON MECHANICAL DRAWINGS REQUIRING DEMOLITION OF EXISTING OR NEW BUILDING STRUCTURES AND FINISHES, IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO COMPLETE THE NECESSARY DEMOLITION. CONTRACTOR SHALL PATCH AND REPAIR ALL DEMOLITION WORK. PATCHING SHALL BE COMPLETED WITH THE SAME MATERIALS AS THE SURROUNDING AREAS, OR WITH ARCHITECT-APPROVED PATCHING MATERIALS. REPAIRS SHALL BE COMPLETED ACCORDING TO ARCHITECTURAL SPECIFICATIONS. ALL REFINISHING SHALL BE APPROVED BY THE ARCHITECT.

(8) CONTRACTOR SHALL BE RESPONSIBLE FOR COMPLETING THE INSTALLATION OF THE AIR DISTRIBUTION SYSTEM SHOWN. DUCTWORK, DUCT ACCESSORIES AND CONTROLS SHOWN AND REQUIRED SHALL BE SUPPLIED AND INSTALLED. ALL INSTALLATION WORK SHALL BE DONE IN ACCORDANCE WITH APPLICABLE CODES. INCLUDING NFPA 90A AND 90B.(NFPA 90a: Standard for the Installation of Air-Conditioning and Ventilating Systems)(NFPA 90B: Standard for the Installation of Warm Air Heating AND AIR-CONDITIONING SYSTEMS)

(9) CONTRACTOR SHALL BALANCE ALL AIR DISTRIBUTION SYSTEMS TO ACHIEVE THE AIR VOLUME REQUIREMENTS INDICATED. BALANCING SHALL INCLUDE ADJUSTMENT OF ALL MANUAL VOLUME DAMPERS, SPUTTER DAMPERS, ZONE DAMPERS (IF REQUIRED), BUTTERFLY DAMPERS AND INDIVIDUAL DIFFUSER VOLUME DAMPERS (FINAL BALANCING ONLY). CONTRACTOR SHALL SUPPLY THE ENGINEER WITH A COMPLETE BALANCING REPORT WHICH INCLUDES, VOLUME, ROOM REFERENCE AND ZONE VOLUME TOTALS.

(10) MOUNT ALL THERMOSTATS (SENSORS) 48" ABOVE THE FINISHED FLOOR LEVEL. THERMOSTATS SHOWN SHALL BE IN CONTROL OF THE ZONE SYSTEM WHICH IS SUPPLYING AIR TO THE AREA WHERE THE THERMOSTAT IS LOCATED. CONTRACTOR SHALL SUPPLY AND INSTALL ALL CONTROL VOLTAGE WIRING AND CONDUIT FOR THERMOSTAT (DDC CONTROL) INSTALLATION.

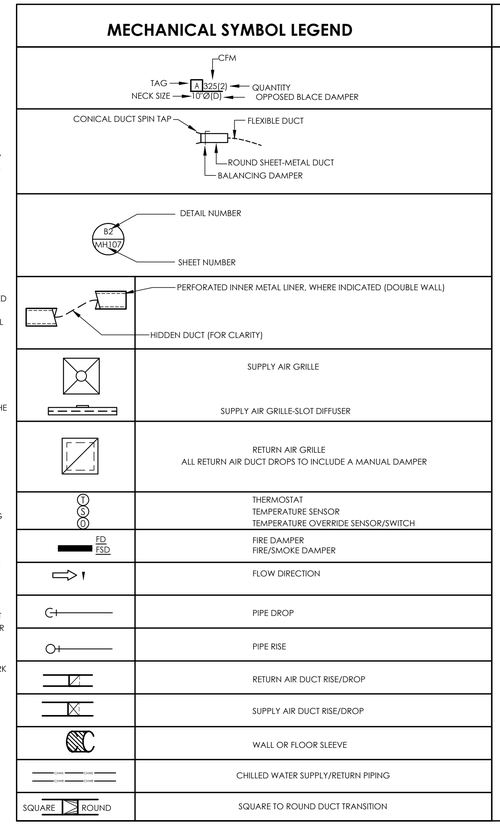
(11) CONTRACTOR SHALL INSTALL NEW REFRIGERANT PIPING FLUSH WITH THE BUILDING STRUCTURE AND MECHANICAL ROOM BOUNDARIES AS SHOWN. CONTRACTOR SHALL COORDINATE ALL INSTALLATION WORK WITH DUCTS AND ELECTRICAL CONDUIT. MECHANICAL CONTRACTOR SHALL FAMILIARIZE HIMSELF WITH THE WORK SCOPE OF OTHER TRADES AND PARTICIPATE IN COORDINATING ALL CONSTRUCTION EFFORTS.

(12) ALL PIPING SHALL BE INSULATED AND JACKETED. REFER TO THE SPECIFICATIONS. THE CONDENSING AND ROOF TOP CONDENSER COILS ARE TO BE COATED IN ACCORDANCE WITH THE SPECIFICATIONS.

(13) PROVIDE SMOKE DETECTOR AND SHUTDOWN CONTROLS ON AIR HANDLERS AND SUPPLY FANS. SMOKE DETECTORS SHALL BE PROVIDED BY DIVISION 16 AND INSTALLED BY DIVISION 15. COORDINATE TO PROVIDE A COMPLETE SYSTEM. PROVIDE BOTH SUPPLY AND RETURN SIDE DEVICES.

(14) PROVIDE SEVEN DAY PROGRAMMABLE THERMOSTAT, 24 HOUR SINGLE/MULTI STAGE COMMERCIAL THERMOSTAT, DUAL SET POINTS, OCCUPIED AND UNOCCUPIED PERIODS, UNIT OPTIMIZATION, AUTO HEATING/COOLING AND AUTO CHANGE OVER. SUB-BASE BACK-UP BATTERY AND TEMPORARY OVER-RIDE. 24 VAC CONTROL VOLTAGE. PROVIDE PLASTIC SEE THRU PROTECTIVE COVER WITH KEY LOCK.

MECHANICAL SYMBOL LEGEND



MECHANICAL ABBREVIATIONS

A/C	AIR CONDITIONED	MAX	MAXIMUM
AD	ACCESS DOOR	MBD	MANUAL BALANCING DAMPER
AFF	ABOVE FINISHED FLOOR	MD	MOTORIZED DAMPER
AHU	AIR HANDLING UNIT	MECH	MECHANICAL
APPROX	APPROXIMATE	MIN	MINIMUM
ARCH	ARCHITECTURAL	MS	MOTOR STARTER
BDD	BACK DRAFT DAMPER	NA	NOT APPLICABLE
BHP	BRAKE HORSEPOWER	NC	NORMALLY CLOSED
BTU	BRITISH THERMAL UNIT	NIC	NOT IN CONTRACT
CFM	CUBIC FEET PER MINUTE	NO	NORMALLY OPEN
CH	CHILLER	NTS	NOT TO SCALE
CHP	CHILLED WATER PUMP		
CLG	CEILING	OA	OUTSIDE AIR
CWP	CONDENSER WATER PUMP	OAH	OUTSIDE AIR INTAKE HOOD
CO	CLEANOUT	OBD	OPPOSED BLADE DAMPER
CT	COOLING TOWER	OC	ON CENTER
CU	CONDENSING UNIT		
CW	COLD WATER	P	PUMP
CL	CENTER LINE	PBD	PARALLEL BLADE DAMPER
		PP	PRIMARY CHILLED WATER PUMP
DB	DRY BULB	PRESS	PRESSURE
DIA	DIAMETER	PRV	PRESSURE REDUCING VALVE
DN	DOWN	PSIG	POUNDS PER SQUARE INCH (GAUGE)
DWG	DRAWING		
DX	DIRECT EXPANSION	R	RETURN (AIR DEVICE)
EAT	ENTERING AIR TEMPERATURE	RA	RETURN AIR
EDH	ELECTRIC DUCT HEATER	RE: 4M7.01	REFER TO DETAIL 4, SHEET M7.01
EF	EXHAUST FAN	RET	RETURN
ELEC	ELECTRICAL	RH	RELATIVE HUMIDITY
ELEV	ELEVATION	RHD	RELIEF HOOD
		RPM	REVOLUTIONS PER MINUTE
F	DEGREES FAHRENHEIT	RTU	ROOF TOP UNIT
FC	FAN COIL		
FD	FIRE DAMPER		
FLEX	FLEXIBLE	S	SUPPLY (AIR DEVICE)
FLG	FLANGE	SA	SUPPLY AIR
FLR	FLOOR	SCH	SCHEDULE
FPM	FEET PER MINUTE	SCHP	SECONDARY CHILLED WATER PUMP
FT	FEET, FOOT	SD	SMOKE DAMPER
FS	FLOW SWITCH	SEC	SECOND
		SF	SUPPLY FAN
GAL	GALLON	SMACNA	SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION
GALV	GALVANIZED		
GPM	GALLONS PER MINUTE	SP	STATIC PRESSURE
		SPEC	SPECIFICATION
HB	HOSE BIBB	SF	SQUARE FOOT
HP	HORSEPOWER	STD	STANDARD
HR	HEAT PUMP (WATER SOURCE)		
HR	HOUR	TEMP	TEMPERATURE
HVAC	HEATING/VENTILATING/ AIR CONDITIONING	TSTAT	THERMOSTAT
		TYP	TYPICAL
HWP	HOT WATER PUMP		
HZ	HERTZ	UF	UNDER FLOOR
		UH	UNIT HEATER
ID	INSIDE DIAMETER	UL	UNDERWRITERS LABORATORIES
IE	INVERT ELEVATION (FLOW LINE)		
IN	INCHES	VEL	VELOCITY
INSUL	INSULATION	VENT	VENTILATE
IN WG	INCHES OF WATER	VF	VENTILATION FAN
		VOL	VOLUME
KW	KILOWATT(S)	VOLT	VOLTAGE
LAT	LEAVING AIR TEMPERATURE	W	WIDE, WIDTH
LB	POUND	W/	WITH
L	LOUVER	WB	WET BULB
		W/O	WITHOUT

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CONSULTANTS:

NO.	DATE	DESCRIPTION

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AIRPORT AT EDINBURG
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EDINBURG, TEXAS

PROJECT NO: 201320
DATE: 8/01/2014 11:56:13 AM
STARTING DATE: 06.03.2013
CK BY: L.M. DWN BY: ---

MECHANICAL
NOTES AND LEGEND

M2.1

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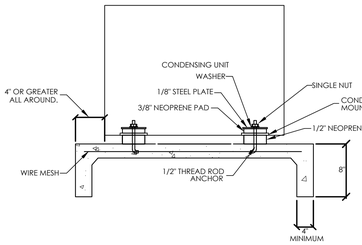
01

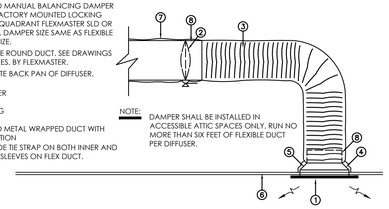


4" HOUSE KEEPING CONCRETE PAD

NO SCALE

02

1. CEILING DIFFUSER
2. ROUND MANUAL BALANCING DAMPER WITH FACTORY MOUNTED LOCKING HAND QUADRANT FLEXMASTER SLD OR EQUAL. DAMPER SIZE SAME AS FLEXIBLE DUCT SIZE.
3. FLEXIBLE ROUND DUCT. SEE DRAWINGS FOR SIZES. BY FLEXMASTER.
4. INSULATE BACK PAN OF DIFFUSER.
5. DIFFUSER
6. CEILING
7. ROUND METAL WRAPPED DUCT WITH INSULATION
8. PROVIDE TIE STRAP ON BOTH INNER AND OUTER SLEEVES ON FLEX DUCT.

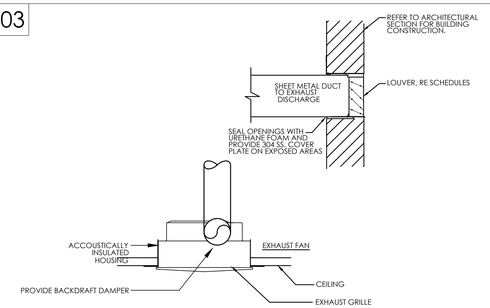


NOTE: DAMPER SHALL BE INSTALLED IN ACCESSIBLE ATTIC SPACES ONLY. RUN NO MORE THAN SIX FEET OF FLEXIBLE DUCT PER DIFFUSER.

DIFFUSER RUN OUT DETAIL

NO SCALE

03

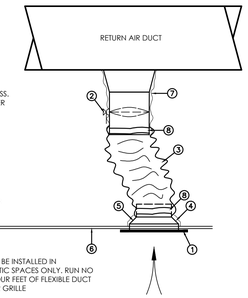


CEILING MOUNTED EXHAUST FAN

NO SCALE

04

1. RETURN AIR GRILLE
2. ROUND MANUAL BALANCING DAMPER WITH FACTORY MOUNTED LOCKING HAND QUADRANT FLEXMASTER SLD OR EQUAL. DAMPER SIZE SAME AS FLEXIBLE DUCT SIZE.
3. FLEXIBLE ROUND DUCT, FOUR FEET OR LESS. SEE DRAWINGS FOR SIZES. BY FLEXMASTER
4. INSULATE BACK PAN OF GRILLE.
5. FIELD FABRICATED SQUARE TO ROUND TRANSITION, FROM NECK OF GRILLE TO SIZE INDICATED ON PLAN.
6. CEILING (SEE PLANS FOR CEILING TYPE)
7. ROUND METAL WRAPPED DUCT WITH INSULATION
8. PROVIDE TIE STRAP ON BOTH INNER AND OUTER SLEEVES ON FLEX DUCT.

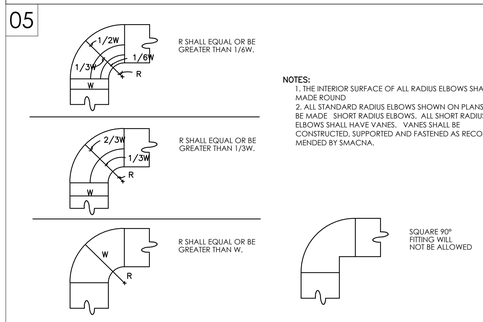


NOTE: DAMPER SHALL BE INSTALLED IN ACCESSIBLE ATTIC SPACES ONLY. RUN NO MORE THAN FOUR FEET OF FLEXIBLE DUCT PER RETURN AIR GRILLE

RETURN AIR GRILLE ATTACHMENT DETAIL

NO SCALE

05

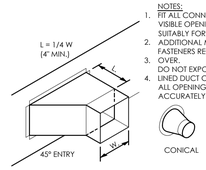


NOTES:
1. THE INTERIOR SURFACE OF ALL RADIUS ELBOWS SHALL BE MADE ROUND
2. ALL STANDARD RADIUS ELBOWS SHOWN ON PLANS MAY BE MADE SHORT RADIUS ELBOWS. ALL SHORT RADIUS ELBOWS SHALL HAVE VANES. VANES SHALL BE CONSTRUCTED, SUPPORTED AND FASTENED AS RECOMMENDED BY SMACNA.

RADIUS DUCT ELBOW DETAIL

NO SCALE

06

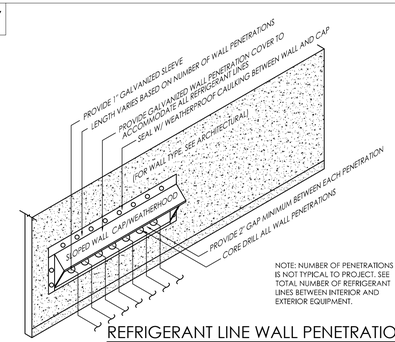


NOTES:
1. FIT ALL CONNECTIONS TO AVOID VISIBLE OPENINGS & SECURE SUITABLY FOR THE PRESSURE CLASS.
2. ADDITIONAL MECHANICAL FASTENERS REQ'D. FOR 4" W.G. & OVER.
3. DO NOT EXPOSE LINER EDGES ON LINED DUCT CONNECTIONS.
4. ALL OPENINGS TO BE CUT ACCURATELY IN SHAPE & SIZE.

BRANCH CONN. DETAIL

NO SCALE

07



NOTE: NUMBER OF PENETRATIONS IS NOT TYPICAL TO PROJECT. SEE TOTAL NUMBER OF REFRIGERANT LINES BETWEEN INTERIOR AND EXTERIOR EQUIPMENT.

REFRIGERANT LINE WALL PENETRATION

NO SCALE

08

AIR HANDLING UNIT SCHEDULE

TAG	AHU-1
TYPE	SINGLE ZONE VAV
FLOW CONFIGURATION	VERTICAL
AREA SERVED	OFFICES
INDOOR UNIT FAN	
SUPPLY CFM	1750
MIN. OUTSIDE AIR (CFM)	250
EXT. STATIC INCHES WC	0.5
MIN FAN POWER	1.0 HP - ECM
INDOOR UNIT COOLING COIL	
ENTERING AIR DB/WB (°F)	77.6/64.7
LEAVING AIR DB/WB (°F	55.6/53.9
MIN. TOTAL/SENSIBLE CAPACITY (MBH)	54/40
RETURN AIR DB/WB (°F)	73/62
AMBIENT AIR DB/WB (°F)	105/78
INDOOR UNIT HEATING SELECTION	
HEATER TYPE/AMBIENT DESIGN DB (°F)	ELEC./36
HEAT INPUT/STAGES	10.8 KW/1
ENTERING/LEAVING DB (°F)	65/85
DETAILS AND ACCESSORIES	
VOLTAGE/PHASE	208/1
MCA/MOCP	71/80
MANUFACTURER	TRANE
MODEL	TAM7A0C60
NOMINAL UNIT SIZE TONNAGE	5 TONS
MAX WEIGHT	175 lbs
NOTES	2

CONDENSING UNIT SCHEDULE

TAG	CU-1
OUTDOOR UNIT ELECTRICAL	
VOLTAGE/PHASE	208/1
MCA/MOCP	41/60
DETAILS AND ACCESSORIES	
MIN COOL/HEAT EFFICIENCY	17 SEER/-
COMPRESSOR QTY/STAGE QTY	1/2
COOL/HEAT AMBIENT DB (°F)	105/36
MANUFACTURER	TRANE
MODEL	4TTR7060
NOMINAL UNIT SIZE TONNAGE	5 TONS
MAX WEIGHT	325 lbs
NOTES	1,2

NOTES:
01. PROVIDE CONDENSER W/ E-COATING AND HAIL GUARDS.
02. PROVIDE W/ SINGLE POINT POWER, TRANE, CARRIER, LENNOX ACCEPTABLE AS ALTERNATES.

LOUVER SCHEDULE

TAG	L-1	L-2	L-3
TYPE	INTAKE	VENTILATION	EXHAUST
SERVICE	AHU's	HANGAR	RR's
DETAILS AND ACCESSORIES			
MAX CFM	450	-	200
LENGTH/HEIGHT (IN)	18/12	120/180	12/12
FREE AREA (SQ FT)	0.5	82.94	0.3
VELOCITY (FPM)	900.00	-	666.67
FINISH	KYNAR	KYNAR	KYNAR
INCLUDED SCREENS	BIRD	BIRD	BIRD
ACTUATION TYPE	NONE	120 V MOTORIZED	NONE
BORDER STYLE	FLANGE TYPE	FLANGE TYPE	FLANGE TYPE
MAUNUFACTURER	GREENHECK	GREENHECK	GREENHECK
MODEL	ESD-403	ESD-403	ESD-403
NOTES			

NOTES:

FAN SCHEDULE

TAG	EF-1,2	EF-3
SERVICE	RR's	HANGAR
LOCATION	CEILING	ROOF
FAN PROPERTIES		
CFM	75	2500
FAN RPM	741	1140
EXT SP (IN WG)	0.2	0.5
FAN POWER	100 W	1 HP
VOLTS/PHASE	277/1	480/3
SOUND LEVEL	0.6 SONES	14.7 SONES
MOUNTING	CEILING	14" CURB
MANUFACTURER	GREENHECK	GREENHECK
MODEL	SP-B110	G-183-B
MAX WEIGHT	25 lbs	100 lbs
NOTES	1,2,3,4	2,4,5,6,7

NOTES:
01. PROVIDE FAN SPEED CONTROL.
02. PROVIDE WITH FACTORY INSTALLED DISCONNECT.
03. FAN OPERATION TO BE INTERLOCKED W/ LIGHTS.
04. PROVIDE FAN WITH BACKDRAFT DAMPER.
05. PROVIDE W/ WALL MOUNTED SWITCH LABELED "VENT. FAN".
06. PROVIDE W/ BELT TENSIONERS.
07. PROVIDE W/ LIFTING LUGS.

HVLS FAN SCHEDULE

TAG	HVLS-1,2
SERVICE	HANGAR
LOCATION	STRUCTURE
DETAILS & ACCESSORIES	
FAN DIAMETER	10 FT
BLADE COUNT	6
MIN DISPLACEMENT VOL	80,000 CFM
MAX FAN RPM	145 RPM
FAN POWER	1 HP
VOLTS/PHASE	480/3
MAX SOUND LEVEL	58 db
FAN WEIGHT	325 LBS
MCA/MOCP	3.5/20
MANUFACTURER	MACRO-AIR
MODEL	MA10XL1006
NOTES	ALL NOTES APPLY

NOTES:
1. VERIFY EXTENSION TUBE LENGTH AND MOUNTING BRACKET WITH MANUFACTURER PRIOR TO ORDERING. I-BEAM MOUNTING SYSTEM.
2. PROVIDE W/ WALL MOUNTED CONTROLS, DIGITAL TOUCH SCREEN, SUITABLE FOR CONTROLLING FAN QUANTITY INDICATED ON PLANS.
3. FAN SHALL BE AMCA CERTIFIED FOR FLOW PERFORMANCE.
4. PROVIDE FAN WITH ONE YEAR FULL LABOR WARRANTY.
5. PROVIDE FAN WITH NON-PRORATED 12 YR PARTS WARRANTY ON MOTOR, DRIVE, ELECTRONIC CONTROLS, & WALL MOUNTED KEYPAD.
6. PROVIDE FAN WITH LIFETIME WARRANTY ON HUB/BLADES.
7. FIRE DISCONNECT TO BE TIED INTO FACP SUCH THAT DURING ALARM EVENTS, FANS ARE DISCONNECTED FROM POWER.
8. MACRO-AIR AND BIG ASS FANS ARE ACCEPTABLE EQUALS.

AIR DEVICE SCHEDULE

TAG	A	B	C
SERVICE TYPE	SUPPLY	SUPPLY	RETURN
PHYSICAL PROPERTIES			
FACE SIZE	24"x24"	12"x12"	24"x24"
NECK SIZE	SEE PLANS	SEE PLANS	20"x20"
MOUNTING SURFACE	CEILING	CEILING	CEILING
DETAILS AND ACCESSORIES			
DAMPER TYPE	NONE	OPPOSED BLADE	OPPOSED BLADE
ACCESSORY	INSUL BACKPAN	INSUL BACKPAN	NONE
COLOR FINISH	WHITE	WHITE	WHITE
MATERIAL	STEEL	STEEL	ALUMINUM
MANUFACTURER	PRICE	PRICE	PRICE
MODEL	SCD	SCD	80
NOTES			

NOTES:
01. PROVIDE W/ FLUSH-TO-ROUND-DUCT FRAME. DUCT BOOTS UNACCEPTABLE.

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CONSULTANTS:

NO.	DATE	DESCRIPTION

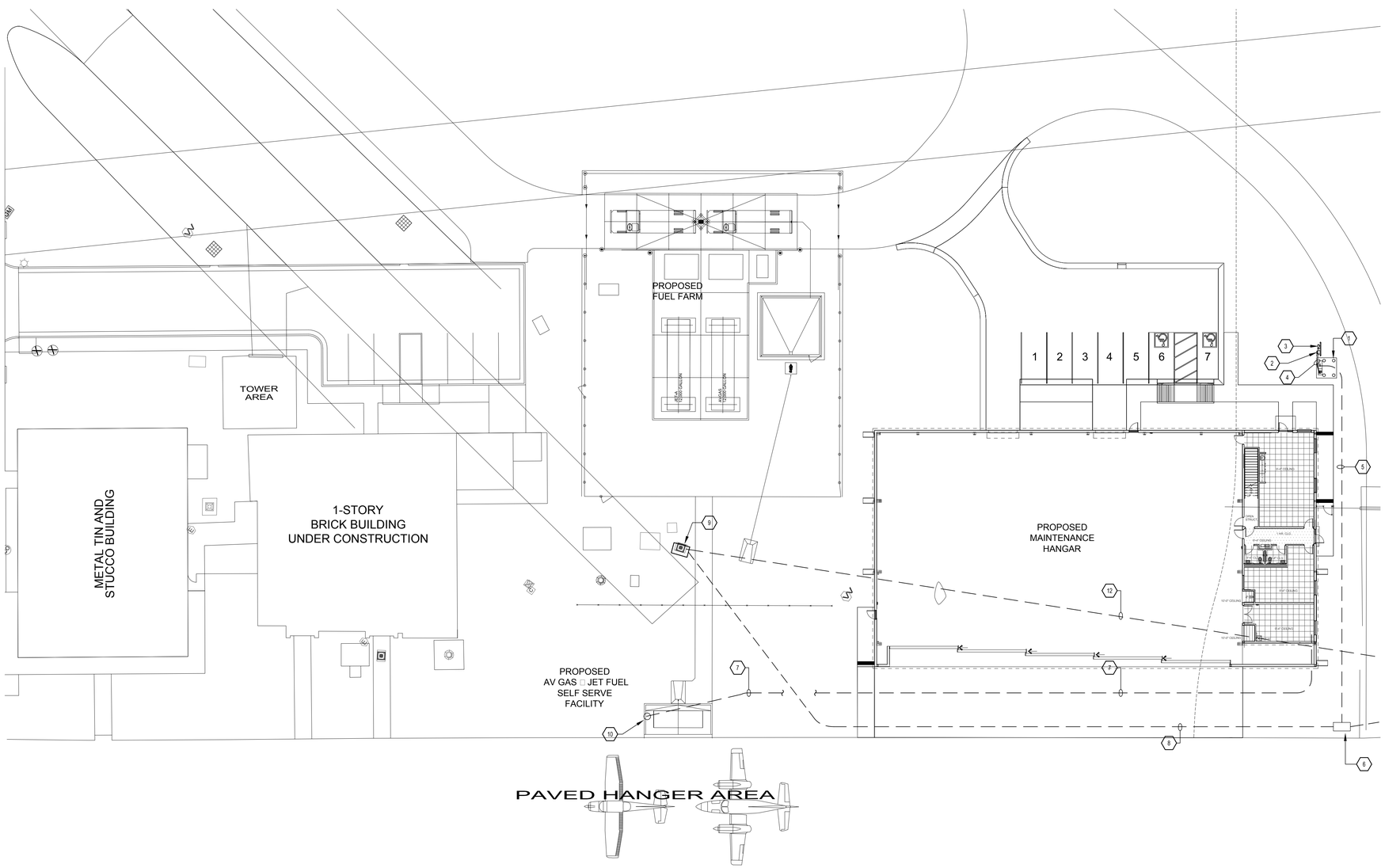
MAINTENANCE HANGAR FOR SOUTH TEXAS INTERNATIONAL AIRPORT AT EDINBURG CITY OF EDINBURG

EDINBURG, TEXAS

PROJECT NO: 201320
DATE: 8/01/2014 11:56:13 AM
STARTING DATE: 06.03.2013
CK BY: L.M. DWN BY: ---

MECHANICAL DETAILS

M3.1



GENERAL ELECTRICAL NOTES (TO ALL SHEETS)

A. CONTRACTOR TO VERIFY ALL EXISTING MAIN POWER SERVICES AND COORDINATE WITH POWER COMPANY FOR ALL NEW REQUIREMENTS AND ALL COST ASSOCIATED. CONTRACTOR SHALL INCLUDE ANY COST FOR THE NEW TRANSFORMER AND OTHER ASSOCIATED FEES IN BID. CONTRACTOR IS RESPONSIBLE TO VERIFY ALL FEES WITH POWER COMPANY AND TO INCLUDE IN BID. CONTRACTOR IS RESPONSIBLE TO COORDINATE WITH POWER COMPANY AS SOON THE CONTRACT IS AWARDED TO ORDER TRANSFORMER AND THE RELATED ELECTRICAL SERVICE EQUIPMENT AS SOON AS POSSIBLE.

B. CONTRACTOR IS RESPONSIBLE FOR ALL EXCAVATION, TRENCHING AND BACKFILLING. COORDINATE WITH ALL UTILITIES PRIOR TO EXCAVATION.

C. CONTRACTOR TO VERIFY ALL EXISTING MAIN TELEPHONE SERVICES AND COORDINATE WITH TELEPHONE COMPANY FOR ALL REQUIREMENTS AND ALL COST ASSOCIATED, INCLUDE ALL COST IN BID. CONDUIT FROM MAIN TELEPHONE RISER SHALL BE FURNISHED AND INSTALLED BY ELECTRICAL CONTRACTOR.

D. ALL ELECTRICAL EQUIPMENT OUTDOORS SHALL BE RATED TYPE NEMA 3R UNLESS OTHERWISE NOTED.

E. CONTRACTOR SHALL HAVE A WORKING KNOWLEDGE OF LOCAL CODES AND ORDINANCES. ALL WORK SHALL CONFORM TO NATIONAL ELECTRICAL CODES AND ALL OTHER AUTHORITY HAVING JURISDICTION. OBTAIN PERMITS AND PAY ALL FEES. PERFORM MODIFICATIONS TO MEET CODE AND ORDINANCE REQUIREMENTS AT NO ADDITIONAL COST TO OWNER. ARCHITECT OR ENGINEER. VERIFY PRIOR TO BID DATE.

F. VERIFY AT JOB SITE THE EXACT LOCATIONS OF STRUCTURAL MEMBERS SUCH AS BEAMS, COLUMNS, ETC. TO LOCATE EQUIPMENT CONDUIT, PANELS AND DEVICES. IF DEVIATIONS FROM THE DRAWING ARE NECESSARY TO MEET STRUCTURAL CONDITIONS MAKE DEVIATIONS WITHOUT ADDITIONAL COST, TO OWNER, ARCHITECT, OR ENGINEER.

G. IN COOPERATION WITH OTHER CONTRACTORS, DETERMINE THE EXACT LOCATION OF EQUIPMENT AND DEVICES AND CONNECTIONS THERETO BY REFERENCE TO THE SUBMITTALS AND ROUGH-IN DRAWINGS, AND BY MEASUREMENTS AT THE SITE. REFER TO ALL OTHER TRADES SUBMITTAL FOR ELECTRICAL INFORMATION.

H. GROUND ENTIRE ELECTRICAL SYSTEM IN STRICT ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE.

I. VERIFY AT JOB SITE GENERAL WORK TO BE DONE AS SPECIFIED, AS NOTED, OR AS REQUIRED FOR INSTALLATION ELECTRICAL SYSTEMS PRIOR TO SUBMISSION OF BIDS.

J. CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS AND EQUIPMENT TO BE REMOVED AND REPLACED BEFORE SUBMITTING HIS BID.

K. ELECTRICAL DRAWINGS ARE DIAGRAMMATIC AND SMALL SCALE ONLY. THEY CONVEY THE INTENT OF THE WORK BUT DO NOT SHOW DETAIL SUCH AS JUNCTION AND PULL BOXES REQUIRED BY THE SPECIFICATIONS AND THE NATIONAL ELECTRICAL CODE(NEC). PROVIDE ALL MATERIALS AND METHODS CALLED FOR IN THE SPECIFICATIONS AND AS REQUIRED IN THE NEC TO PROVIDE A COMPLETE INSTALLATION OF ALL WORK.

L. ALL WIRING SHALL BE COPPER.

M. ALL SLEEVES, PENETRATIONS, ETC. SHALL BE SEALED SOLID NON-SHRINKING MATERIAL IMMEDIATELY UPON FILLING OF THE OPENING WITH PIPE OR CONDUIT.

N. ARRANGE FOR SOURCES OF TEMPORARY CONSTRUCTION SERVICES. SUCH SERVICES SHALL BE NOMINALLY 120/240V, 1-PHASE, 3-WIRE FROM WHICH A COMPLETE SYSTEM OF TEMPORARY POWER AND LIGHTING SHALL BE PROVIDED FOR ALL CONSTRUCTION NEEDS.

O. MAGIC VALLEY ELECTRIC COOP CONTACT:
JUAN HERNANDEZ - 956-463-7475
EMAIL: juanhernandez@magicvalley.coop

KEYED NOTES: ELECTRICAL

1. NEW POWER COMPANY PAD MOUNTED TRANSFORMER. PROVIDE CONCRETE PAD PER POWER COMPANY STANDARDS. COORDINATE COST AND INSTALLATION WITH POWER COMPANY PRIOR TO BID DATE. COORDINATE EXACT LOCATION WITH POWER COMPANY PRIOR TO ANY ROUGH-IN.
2. NEW 120/208V, 3Ø, 4W, ELECTRICAL SERVICE METER.
3. NEW BUILDING MAIN SWITCH DISCONNECT 'MS'.
4. CONTRACTOR TO PROVIDE AND INSTALL PVC CONDUIT FROM NEW UTILITY TRANSFORMER TO NEW ELECTRICAL METER AND MAIN SWITCH DISCONNECT PER POWER COMPANY STANDARDS. VERIFY ALL REQUIREMENTS PRIOR TO ANY ROUGH-IN. REFER TO ELECTRICAL RISER DIAGRAM.
5. CONTRACTOR TO PROVIDE AND INSTALL (1)-4" PVC CONDUIT FROM PROPOSED NEW UTILITY COMPANY ABOVE GROUND PULLBOX TO NEW PAD MOUNT TRANSFORMER. ALL UNDERGROUND WORK SHALL BE ACCORDING TO POWER COMPANY STANDARDS. VERIFY ALL REQUIREMENTS WITH THE POWER COMPANY BEFORE ANY ROUGH-IN. COORDINATE LOCATION, COST, AND INSTALLATION WITH POWER COMPANY PRIOR TO BID.
6. NEW POWER COMPANY PULLBOX. PROVIDE CONCRETE PAD FOR PULLBOX AS PER POWER COMPANY STANDARDS. COORDINATE EXACT LOCATION WITH POWER COMPANY PRIOR TO ANY WORK.
7. CONTRACTOR TO PROVIDE AND INSTALL (1)-3"PVC CONDUIT FOR COMMUNICATION SERVICE EQUIPPED WITH PULLSTRING, AND TURNED UP AND CAPPED AT BOTH ENDS. DEPTH OF CONDUIT SHALL BE A MINIMUM OF 36". VERIFY ALL EXISTING AND NEW UNDERGROUND UTILITIES PRIOR TO ANY WORK. PROVIDE TRENCHING AND BACKFILL AS REQUIRED. COORDINATE EXACT LOCATION WITH OWNER PRIOR TO ANY WORK.
8. CONTRACTOR TO PROVIDE AND INSTALL (1)-4" PVC CONDUIT FROM PROPOSED NEW UTILITY COMPANY ABOVE GROUND PULLBOX TO EXISTING POWER COMPANY PULLBOX. ALL UNDERGROUND WORK SHALL BE ACCORDING TO POWER COMPANY STANDARDS. VERIFY ALL REQUIREMENTS WITH THE POWER COMPANY BEFORE ANY ROUGH-IN. COORDINATE LOCATION, COST, AND INSTALLATION WITH POWER COMPANY PRIOR TO BID.
9. EXISTING POWER COMPANY PULLBOX. FIELD VERIFY EXACT LOCATION PRIOR TO ANY WORK.
10. FIELD COORDINATE STUB UP LOCATION FOR COMMUNICATION CONDUIT.
11. EXISTING POWER COMPANY TRANSFORMER. FIELD VERIFY EXACT LOCATION.
12. EXISTING CONDUIT TO BE REMOVE AND WIRING TO BE REMOVE. COORDINATE WITH MAGIC VALLEY ELECTRIC COOP PRIOR TO BID DATE. VERIFY WITH MAGIC VALLEY ELECTRIC COOP TO CONSTRUCT NEW POWER TO EXISTING BUILDING PRIOR TO REMOVAL OF EXISTING ELECTRICAL LINE. CONTRACTOR SHALL INCLUDE ALL COST IN BID.

ELECTRICAL SITE PLAN 1

SCALE: 1" = 20'-0"

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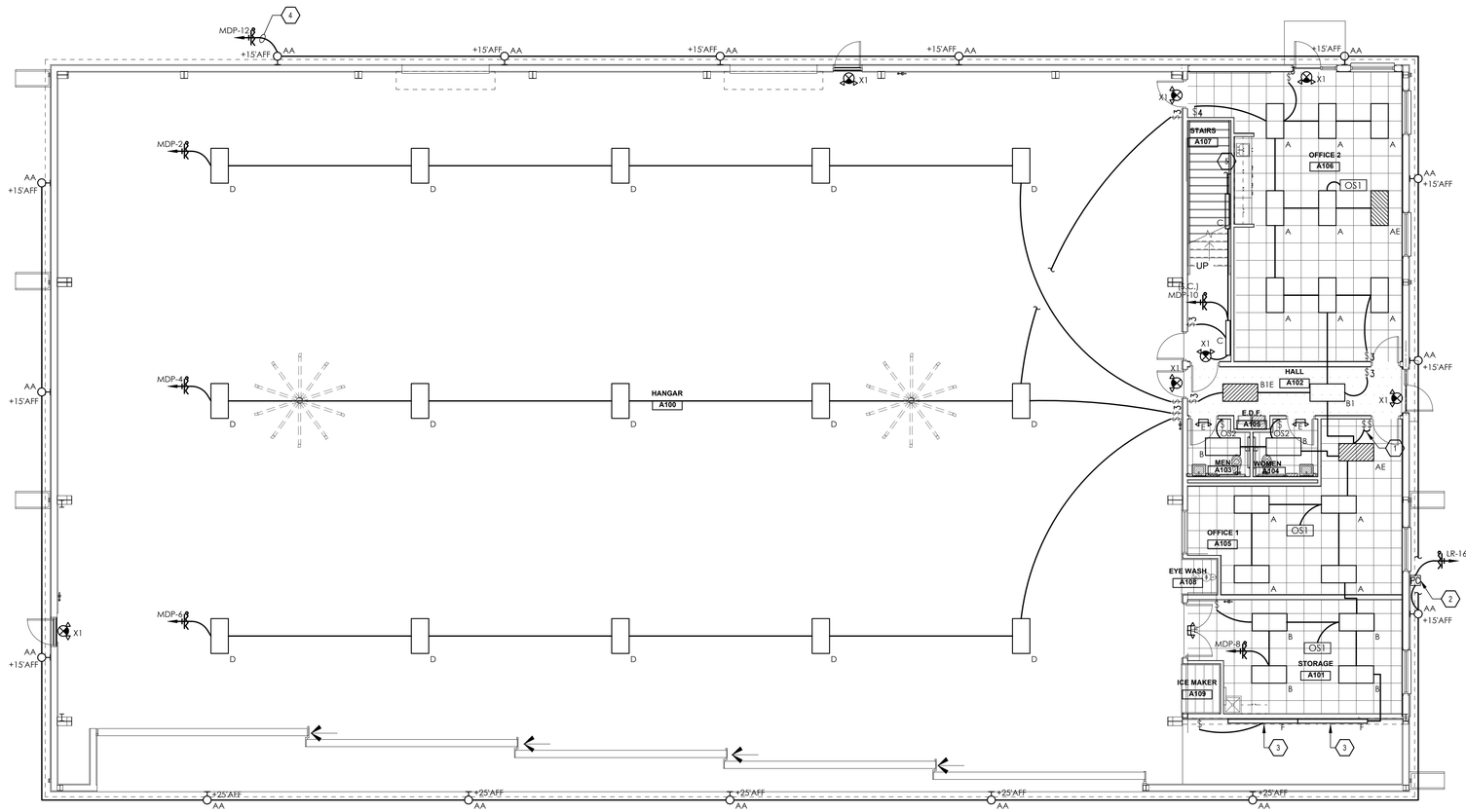
CITY OF EDINBURG
EDINBURG, TEXAS

PROJECT NO:	201320
DATE:	8/01/2014 11:56:13 AM
STARTING DATE:	06.03.2013
CK BY: L.M.	DWN BY: ---

ELECTRICAL SITE PLAN

ES1.1



GENERAL NOTES: LIGHTING

A. ALL EXIT FIXTURES TYPE-'X1 & X2', EMERGENCY LIGHT FIXTURE TYPE-'E' AND ALL EMERGENCY BALLAST SHALL BE ON CIRCUIT 'L-14'. FIXTURE TYPE LABEL WITH AN '_E' ARE LIGHT FIXTURES WITH EMERGENCY BALLAST. REFER TO LIGHT FIXTURE SCHEDULE.

B. VERIFY CEILING TYPES AND COORDINATE WITH FIXTURE TYPE LIGHT FIXTURE SHALL BE COMPATIBLE WITH CEILING TYPE AS INDICATED ON THE ARCHITECTURAL DOCUMENTS. NOTIFY ENGINEER IF DISCREPANCIES EXIST PRIOR TO ORDERING FIXTURES.

C. COORDINATE EXACT ROUTING OF ALL CONDUIT ABOVE CEILING IN BUILDING, TYPICAL FOR ALL BUILDING EXTERIOR LIGHTING.

D. COORDINATE LOCATION OF LIGHTS WITH DIFFUSERS AND GRILLES.

E. SWITCH LEGS ARE NOT SHOWN WHERE SWITCHING SCHEME IS OBVIOUS.

KEYED NOTES: LIGHTING

1. PROVIDE DUAL LEVEL SWITCHING.
2. 277V PHOTOCELL. LOCATE AS DIRECTED BY MANUFACTURER.
3. FIXTURE SHALL BE WALL MOUNT AT 8'-0'AFF.
4. VIA LIGHTING CONTACTOR 'LC'.
5. CONTINUED TO SECOND FLOOR LIGHTING.

ELECTRICAL LIGHTING FLOOR PLAN (1)

1/8" = 1'-0"

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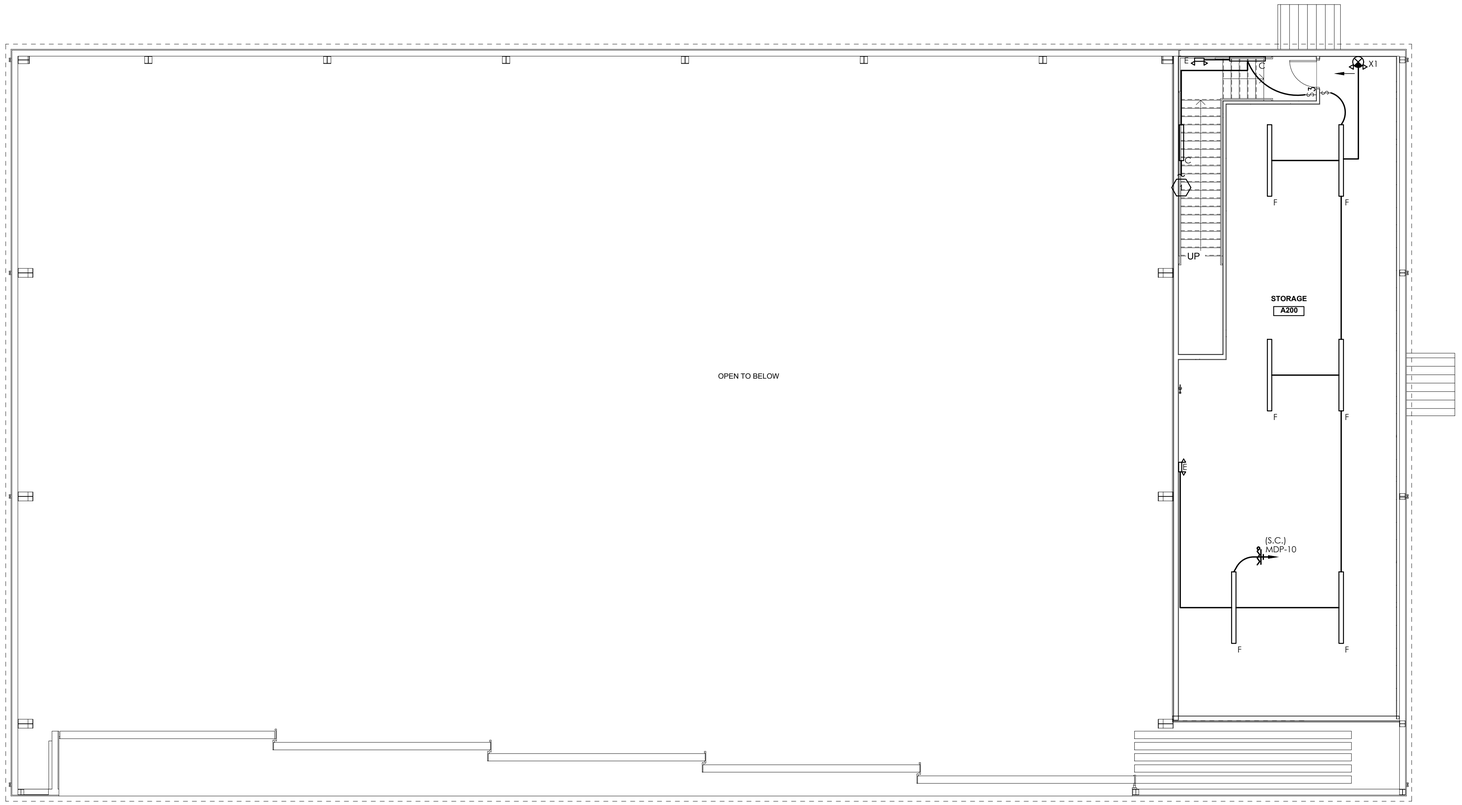
EDINBURG, TEXAS

PROJECT NO:	201320
DATE:	8/01/2014 11:56:13 AM
STARTING DATE:	06.03.2013
CK BY: L.M.	DWN BY: ---

ELECTRICAL LIGHTING FLOOR PLAN

E1.1



GENERAL NOTES: LIGHTING

A. ALL EXIT FIXTURES TYPE-"X1 & X2", EMERGENCY LIGHT FIXTURE TYPE-"E" AND ALL EMERGENCY BALLAST SHALL BE ON CIRCUIT "L-1-4". FIXTURE TYPE LABEL WITH AN "_E" ARE LIGHT FIXTURES WITH EMERGENCY BALLAST. REFER TO LIGHT FIXTURE SCHEDULE.

B. VERIFY CEILING TYPES AND COORDINATE WITH FIXTURE TYPE LIGHT FIXTURE SHALL BE COMPATIBLE WITH CEILING TYPE AS INDICATED ON THE ARCHITECTURAL DOCUMENTS. NOTIFY ENGINEER IF DISCREPANCIES EXIST PRIOR TO ORDERING FIXTURES.

C. COORDINATE EXACT ROUTING OF ALL CONDUIT ABOVE CEILING IN BUILDING. TYPICAL FOR ALL BUILDING EXTERIOR LIGHTING.

D. COORDINATE LOCATION OF LIGHTS WITH DIFFUSERS AND GRILLES.

E. SWITCH LEGS ARE NOT SHOWN WHERE SWITCHING SCHEME IS OBVIOUS.

KEYED NOTES: LIGHTING

1 CONTINUED TO FIRST FLOOR LIGHTING.

ELECTRICAL LIGHTING 2ND FLOOR PLAN

1

1/8" = 1'-0"

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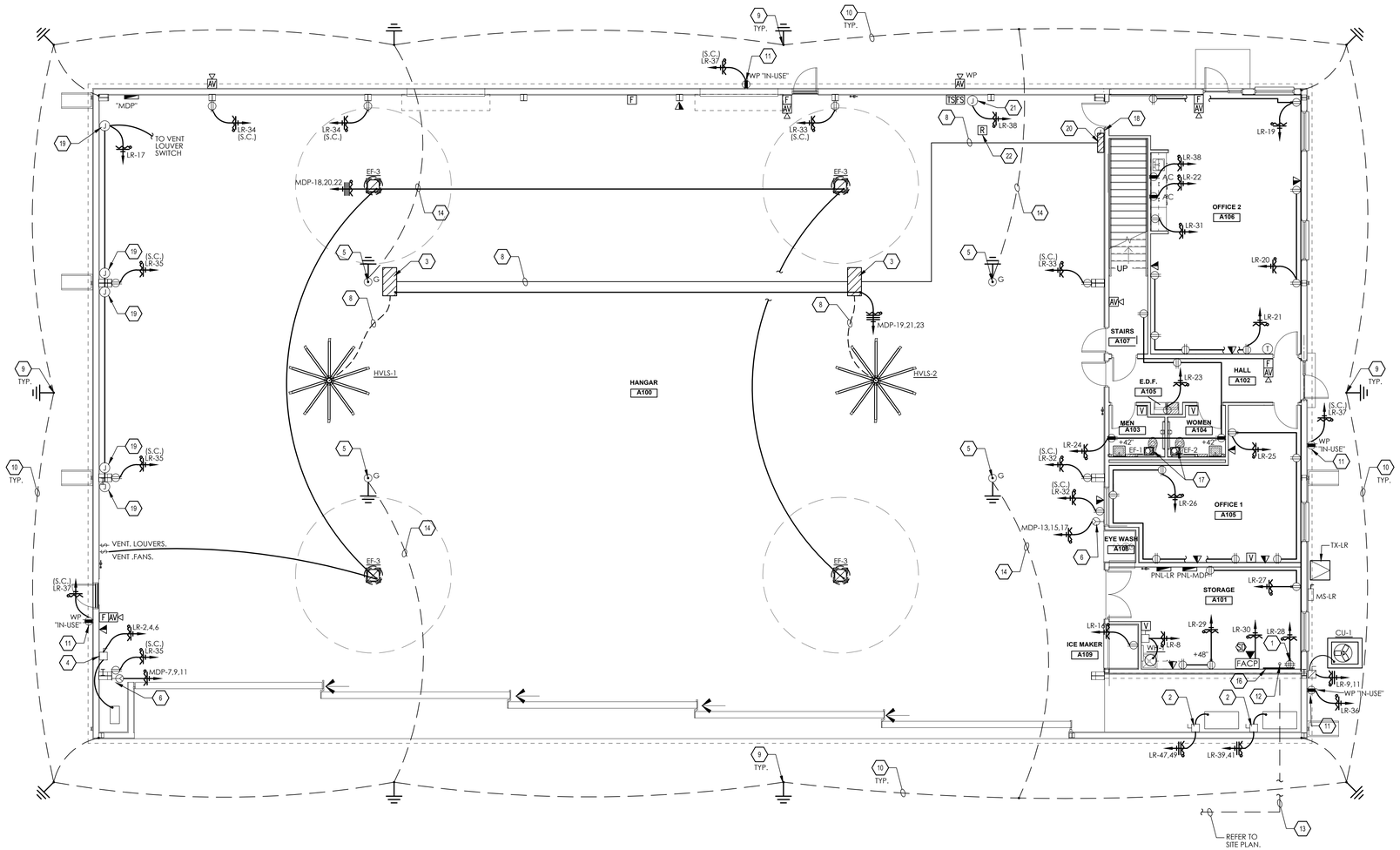
EDINBURG, TEXAS

PROJECT NO:	201320
DATE:	8/01/2014 11:56:13 AM
STARTING DATE:	06.03.2013
CK BY: L.M.	DWN BY: ---

ELECTRICAL LIGHTING FLOOR PLAN

E1.2



GENERAL NOTES: POWER

A. COORDINATE EXACT LOCATION AND MOUNTING HEIGHT OF ALL POWER SOURCE WIRING IN ACCORDANCE WITH ARCHITECTURAL MILLWORK.

B. ELECTRICAL CONTRACTOR SHALL MAKE FINAL CONNECTION TO H.V.A.C EQUIPMENT, PLUMBING EQUIPMENT, REFER TO PANEL SCHEDULE FOR WIRE SIZE.

C. ELECTRICAL CONTRACTOR SHALL PROVIDE STARTERS, RELAYS, CONTACTORS AND THE REQUIRED ELECTRICAL ACCESSORIES FOR MECHANICAL SYSTEM AS REQUIRED.

D. COORDINATE EXACT LOCATION OF ALL MECHANICAL EQUIPMENT IN ACCORDANCE W/MECHANICAL DRAWINGS TO MEET ELECTRICAL AND MECHANICAL REQUIRED CLEARANCE BY THE LATEST CODE.

E. COORDINATE WITH ALL TRADES FOR EXACT LOCATION AND ALL ELECTRICAL REQUIREMENTS PRIOR TO ANY WORK.

F. ELECTRICAL CONTRACTOR SHALL PROVIDE J-BOX AND CONDUIT FOR H.V.A.C. CONTROLS AND THERMOSTATS. COORDINATE EXACT LOCATION WITH MECHANICAL CONTRACTOR.

G. NEMA RATED OUTLETS, REFER TO BREAKER SIZE AND COORDINATE WITH EQUIPMENT REQUIREMENTS PRIOR TO BID.

KEYED NOTES: POWER

1. DEDICATED QUADRAPLEX OUTLET FOR PHONE SERVICE EQUIPMENT.
2. ALTERNATE#2 - PROVIDE 30 A/3/NF DISCONNECT FOR MOTORIZED HANGAR DOOR. CONNECT PER MANUFACTURER'S RECOMMENDATION. FIELD VERIFY EXACT LOCATION WITH SUPPLIER FOR EXACT LOCATION AND ELECTRICAL REQUIREMENTS.
3. FAN MOTOR DRIVE LOCATION. COORDINATE WITH CONTRACTOR FOR EXACT LOCATION.
4. PROVIDE 30A/3/NF DISCONNECT FOR AIRCOMPRESSOR. CONNECT PER MANUFACTURERS RECOMMENDATION.
5. PROVIDE GROUNDING RECEPTACLE (ERICO B166). RECEPTACLE SHALL BE CAST FINISH TO FLOOR AND BE CONNECTED DIRECTLY TO GROUND ROD VIA CADWELD OR THREADS. PROVIDE #4/0 PIGTAIL AND FROM GROUNDING RECEPTACLE TO GROUNDING RING VIA CRAWLED. COORDINATE EXACT LOCATION WITH OWNER PRIOR TO INSTALLATION.
6. GROUND POWER. RECEPTACLE. 480V. 3Ø . 50AMP NEMA RATED TYPE. VERIFY OWNER ON EXACT LOCATION ELECTRICAL REQUIREMENTS PRIOR TO ANY WORK.
7. NOT USE.
8. PROVIDE 3/4" C WITH PULLSTRING FOR FAN CONTROL WIRING. WIRING BY DIVISION-15,. MECHANICAL CONTRACTOR. SUPPORT CONDUIT FROM STRUCTURAL.
9. PROVIDE 10' X 3/4" COPPER CLAD GROUND ROD SPACED AT APPROXIMATELY 50'-0" ON CENTER. PROVIDE CALDWELD CONNECTION TO #4/0 GROUND RING AT EVERY DRIVEN GROUND ROD. PROVIDE #4#0 PIGTAIL TO FROM EVERY DRIVEN GROUND ROD TO BUILDING STEEL.
10. PROVIDE #4/0 BARE STRANED COPPER CONDUCTOR FOR GROUND RING. CONDUCTOR SHALL BE BURIED AT MINIMUM 3'-0" BELOW GRADE AND 10' FROM EXTERIOR WALL.
11. EXTERIOR GFI RECEPTACLES SHALL BE HORIZONTALLY SURFACE MOUNTED WITH W.P. COVER BRANCH CIRCUITS TO RECEPTACLES SHALL BE ROUTED ON THE INTERIOR OF THE BUILDING AND POKE THROUGH WALL TO MAKE FINAL CONNECTION.
12. 4" PVC STUBBED UP TO TELEPHONE BOARD WITH #4/0 PIGTAIL FROM GROUNDING RING.
13. CONTRACTOR TO PROVIDE AND INSTALL (1)-4"PVC CONDUIT FOR COMMUNICATION SERVICE EQUIPPED WITH PULLSTRING. DEPTH OF CONDUIT SHALL BE A MINIMUM OF 36". VERIFY ALL REQUIREMENTS WITH ALL UNDERGROUND UTILITIES PRIOR TO ANY WORK. PROVIDE TRENCHING AND BACKFILL AS REQUIRED.
14. PROVIDE 1-1.5" C WITH 4/0.
15. NOT USE.
16. 3/4"X8'HX4'W PLYWOOD TELEPHONE BOARD FINISHED ONE SIDE. PROVIDE GROUND BAR AND TIE INTO ELECTRICAL GROUNDING SYSTEM VIA WIRE #4.
17. TIE INTO ROOMS LIGHTING CIRCUIT AND INTERLOCK FAN WITH ROOMS LIGHTS. WIRING SHALL BE 2#12, 1#12G, 1/2"C.
18. J-BOX FOR FAN CONTROLLER. COORDINATE WITH MECHANICAL CONTRACTOR.
19. J-BOX FOR MOTORIZED LOUVER. COORDINATE WITH MECHANICAL CONTRACTOR.
20. PROVIDE FIRE ALARM DEVICE TO FAN CONTROL SYSTEM FOR FANS TO SHUT DOWN IN EVENT OF AN ALARM. PROVIDE ALL COST IN BID FOR A COMPLETE OPERABLE CODE COMPLIANT SYSTEM.
21. J-BOX FOR FIRE PROTECTION SYSTEM. COORDINATE WITH CONTRACTOR.
22. ALTERNATE #3-PROVIDE FARM ALARM DEVICES FOR THE FIRE PROTECTION FOAM SYSTEM. COORDINATE WITH CONTRACTOR PRIOR TO BID. INCLUDE ALL COST FOR A COMPLETE OPERABLE CODE COMPLIANT SYSTEM.

ELECTRICAL POWER FLOOR PLAN 1

1/8" = 1'-0"

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MAINTENANCE HANGAR FOR
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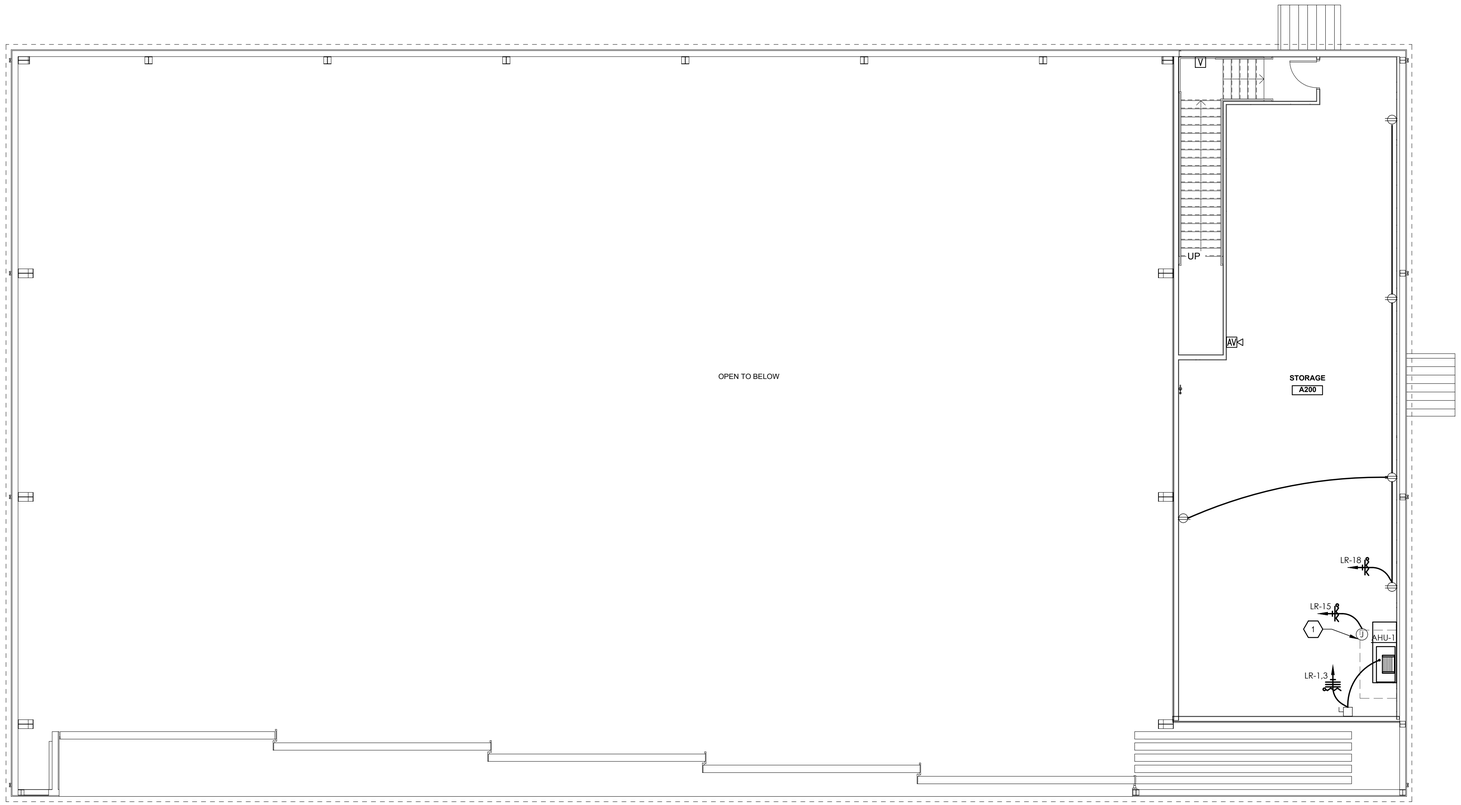
EDINBURG, TEXAS

PROJECT NO:	201320
DATE:	8/01/2014 11:56:13 AM
STARTING DATE:	06.03.2013
CK BY: L.M.	DWN BY: ---

ELECTRICAL POWER FLOOR PLAN

E2.1



GENERAL NOTES: POWER

A. COORDINATE EXACT LOCATION AND MOUNTING HEIGHT OF ALL POWER SOURCE WIRING IN ACCORDANCE WITH ARCHITECTURAL MILLWORK.

B. ELECTRICAL CONTRACTOR SHALL MAKE FINAL CONNECTION TO H.V.A.C EQUIPMENT, PLUMBING EQUIPMENT, REFER TO PANEL SCHEDULE FOR WIRE SIZE.

C. ELECTRICAL CONTRACTOR SHALL PROVIDE STARTERS, RELAYS, CONTACTORS AND THE REQUIRED ELECTRICAL ACCESSORIES FOR MECHANICAL SYSTEM AS REQUIRED.

D. COORDINATE EXACT LOCATION OF ALL MECHANICAL EQUIPMENT IN ACCORDANCE W/MECHANICAL DRAWINGS TO MEET ELECTRICAL AND MECHANICAL REQUIRED CLEARANCE BY THE LATEST CODE.

E. COORDINATE WITH ALL TRADES FOR EXACT LOCATION AND ALL ELECTRICAL REQUIREMENTS PRIOR TO ANY WORK.

F. ELECTRICAL CONTRACTOR SHALL PROVIDE J-BOX AND CONDUIT FOR H.V.A.C. CONTROLS AND THERMOSTATS. COORDINATE EXACT LOCATION WITH MECHANICAL CONTRACTOR.

G. NEMA RATED OUTLETS. REFER TO BREAKER SIZE AND COORDINATE WITH EQUIPMENT REQUIREMENTS PRIOR TO BID.

KEYED NOTES: POWER

1 J-BOX FOR A/C MOTORIZED DAMPER CIRCUIT.

ELECTRICAL POWER 2ND FLOOR PLAN 1

1/8" = 1'-0"

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DATE:	8/01/2014 11:56:13 AM
STARTING DATE:	06.03.2013
CK BY: L.M.	DWN BY: ---

ELECTRICAL POWER FLOOR PLAN

E2.2

ELECTRICAL LEGEND-LIGHTING

---ALL SYMBOLS SHOWN MAY NOT APPEAR IN ALL DRAWINGS.
SYMBOLS ARE SHOWN SCHEMATIC AND MAY NOT BE TO SCALE.

SYMBOL	DESCRIPTION
	2'x4' FLUORESCENT LIGHT FIXTURE
	2'X4' FLUORESCENT FIXTURE W/EMERGENCY BATTERY PACK
	2'x2' FLUORESCENT LIGHT FIXTURE
	2'X2' FLUORESCENT FIXTURE W/EMERGENCY BATTERY PACK
	1'X4' FLUORESCENT LIGHT FIXTURE
	TRACK LIGHT WITH HEADS AS INDICATED
	INCANDESCENT, FLUORESCENT, OR HID WALL WASHER LIGHT FIXTURE CEILING MTD.
	INCANDESCENT, FLUORESCENT, OR HID FIXTURE CLG. OR WALL MTD.
	FLUORESCENT, OR HID FIXTURE WITH EMERGENCY BATTERY PACK. CLG. OR WALL MTD.
	EXIT LIGHT, CEILING OR WALL MOUNTED - SHADING INDICATING SINGLE OR DOUBLE FACE; DIRECTIONAL ARROWS AS INDICATED
	EXIT LIGHT SAME AS ABOVE, EXCEPT WITH AN EMERGENCY UNIT AS A COMBO
	CEILING FAN
	FLUORESCENT STRIP LIGHT
	FLUORESCENT STRIP LIGHT WITH EMERGENCY BATTERY PACK
$	WALL SWITCH SPST, 20A,120/277V
$2	DOUBLE POLE TOGGLE SWITCH, 20A/120/277V
$3	3-WAY WALL SWITCH, 20A,120/277V
$4	4-WAY WALL SWITCH, 20A,120/277V
$D	WALL DIMMER SWITCH
$P	WALL SWITCH SPST, 20A,120/277V - PILOT LIGHT SWITCH
$X K	WALL SWITCH SPST, 20A,120/277V - KEYED SWITCH, X = 3 OR 4 WAY

ELECTRICAL LEGEND-SPECIAL SYTEMS

---ALL SYMBOLS SHOWN MAY NOT APPEAR IN ALL DRAWINGS.
SYMBOLS ARE SHOWN SCHEMATIC AND MAY NOT BE TO SCALE.

SYMBOL	DESCRIPTION	
	WALL MOUNTED TELEPHONE/DATA OUTLET. FURNISH AND INSTALL 1"C., WITH PULLSTRING AND INSULATED BUSHING, STUBBED ABOVE CEILING. +24" UNLESS OTHERWISE NOTE. BOX TO BE MINIMUM 2 1/8" DEEP.	
	WALL MOUNTED TELEPHONE OUTLET. FURNISH AND INSTALL 3/4"C , WITH PULLSTRING AND INSULATED BUSHING, STUBBED ABOVE CEILING. +24" UNLESS OTHERWISE NOTE. BOX TO BE MINIMUM 2 1/8" DEEP.	
	WALL MOUNTED DATA OUTLET. FURNISH AND INSTALL 1"C , WITH PULLSTRING AND INSULATED BUSHING, STUBBED ABOVE CEILING. +24" UNLESS OTHERWISE NOTE. BOX TO BE MINIMUM 2 1/8" DEEP.	
P	PUBLIC TELEPHONE OUTLET.: J-BOX & 3/4"C	
TV	TELEVISION OUTLET. CLG. OR WALL MOUNTED - STUB 3/4" C. ABOVE CEILING FROM OUTLET BOX	
	PUSHBUTTON WALL MOUNTED.	
	FLOOR MOUNTED 2-DUPLEX RECEPTACLE /1GANG FOR TELE/DATA OUTLETS- FLUSH MOUNTED UNO FLOOR BOX = MFR.-WIREMOLD MODEL#RFB4-, RFB-B,RFB-DR,RFB4-LPB COVER #FPBTCBK-VERIFY FLOOR FINISH PRIOR TO ORDER SAME BOX FOR POWER OUTLETS.	
	FLOOR MOUNTED 2-DUPLEX RECEPTACLE /1GANG FOR DATA OUTLET- FLUSH MOUNTED UNO FLOOR BOX = MFR.-WIREMOLD MODEL#RFB4-, RFB-B,RFB-DR,RFB4-LPB COVER #FPBTCBK-VERIFY FLOOR FINISH PRIOR TO ORDER SAME BOX FOR POWER OUTLETS.	
av	AUDIO VIDEO DROP, REFER TO DETAIL	
IC	INTERCOM - CALL SWITCH- JBOX WITH 3/4"C	
S	INTERCOM/PAGING LAY-IN SPEAKER	
	PA EXTERIOR SPEAKER	10'-6" AFF
DC	SECURITY DOOR CONTACT SENSOR - STUB 1/2"C ABOVE CEILING FROM OUTLET BOX	
MD	SECURITY MOTION DETECTOR SENSOR - STUB 1/2"C ABOVE CEILING FROM OUTLET BOX	
G	SECURITY GLASS BREAK SENSOR - STUB 1/2"C ABOVE CEILING FROM OUTLET BOX	
K	SECURITY KEY PAD - STUB 3/4"C ABOVE CEILING FROM OUTLET BOX	
SEC	SECURITY PANEL JUNCTION BOX	54"

ELECTRICAL LEGEND-FIRE ALARM

---ALL SYMBOLS SHOWN MAY NOT APPEAR IN ALL DRAWINGS.
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SYMBOL	DESCRIPTION
	ABOVE CEILING FROM OUTLET BOX
F	FIRE ALARM PULL STATION: STUB 3/4"C ABOVE CEILING FROM J-BOX
AV	FIRE ALARM AUDIBLE/VISUAL SIGNAL: STUB 3/4"C ABOVE CEILING FROM J-BOX
V	FIRE ALARM VISUAL SIGNAL: STUB 3/4"C ABOVE CEILING FROM J-BOX
SD SD	FIRE ALARM SMOKE DETECTOR CEILING OR WALL MOUNTED: STUB 3/4"C ABOVE CEILING FROM J-BOX
H	HEAT DETECTOR CEILING OR WALL MOUNTED: STUB 3/4"C ABOVE CEILING FROM J-BOX
SD D	DUCT SMOKE DETECTOR: STUB 3/4"C ABOVE CEILING FROM J-BOX
SD A	SMOKE DETECTOR WITH AN AUDIBLE BASE: STUB 3/4"C ABOVE CEILING FROM J-BOX
FACP	FIRE ALARM CONTROL PANEL, ADDRESSABLE, SURFACE MTD UNO.
FAAP	FIRE ALARM REMOTE ANNUNCIATOR PANEL, FLUSH MOUNTED UNO
PAD-X	POWER SUPPLY, DEDICATED 110V
DH	DOOR HOLDER DEVICE: STUB 3/4"C ABOVE CEILING FROM J-BOX
TS	TAMPER SWITCH: STUB 3/4"C ABOVE CEILING FROM J-BOX
FS	FLOW SWITCH: STUB 3/4"C ABOVE CEILING FROM J-BOX
F	FIRE ALARM OUTDOOR SPEAKER, WEATHER PROOF: STUB 3/4"C ABOVE CEILING FROM J-BOX

ELECTRICAL LEGEND-GENERAL

---ALL SYMBOLS SHOWN MAY NOT APPEAR IN ALL DRAWINGS.
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SYMBOL	DESCRIPTION
	HEAVY DUTY DISCONNECT SWITCH FUSED
	HEAVY DUTY DISCONNECT SWITCH NONFUSED
	HEAVY DUTY COMBINATION DISCONNECT/MOTOR STARTER
	HEAVY DUTY MOTOR STARTER
	ENCLOSED BREAKER, RE: TO SCH. FOR MORE INFO.
R	ROTARY TYPE DISCONNECT SWITCH
$M	120V,20AMP, MOTOR RATED SWITCH, NEMA-1 ENCLOSURE
	MOTOR
	PANELBOARD, CLEARANCE AS PER LATEST NEC
	SWITCH LEG
	ELECTRICAL CONDUIT
	UNDERGROUND ELECTRICAL CONDUIT
X, X, X	MULTI-POLE DEVICE CIRCUIT NUMBERS
X/X/X	THREE SINGLE POLE DEVICE CIRCUIT NUMBERS
A-1	CONDUIT AND WIRE HOMERUN TO PANEL. SHORT HATCH INDICATES NEUTRAL CONDUCTOR, LONG HATCHES INDICATE PHASE CONDUCTORS, AND LONG HATCH WITH CIRCLE INDICATES ISOLATES OR INSULATED GROUND. ALPHANUMERIC DESCRIPTION INDICATES PANEL AND BREAKER.
A-1	UNDERGROUND CONDUIT AND WIRE HOMERUN TO PANEL. SHORT HATCH INDICATES NEUTRAL CONDUCTOR, LONG HATCHES INDICATE PHASE CONDUCTORS, AND LONG HATCH WITH CIRCLE INDICATES ISOLATED OR INSULATED GROUND. ALPHANUMERIC DESCRIPTION INDICATES PANEL AND BREAKER.
	DETAIL NUMBER
	SHEET NUMBER
T	THERMOSTAT WALL MOUNTED - STUB 1/2"C ABOVE CEILING FROM OUTLET BOX. COORDINATE EXACT LOCATION AND HEIGHT WITH MECHANCIAL DIVISION.
	TELEPHONE BOARD
PC	PHOTO CELL(MFR.INTERMATIC #K4136M)
LC	LIGHTING CONTACTOR, NEMA-1, W/H.O.A. SWITCH
TC	TIME CLOCK (MFR.TORK#72022)
CP-1	CIRCULATING PUMP

ELECTRICAL ABBREVIATIONS:

ABBV:	DESCRIPTION	ABBV:	DESCRIPTION
AFF	ABOVE FINISHED FLOOR	MFR.	MANUFACTURER
BFC	BELOW FINISHED CEILING	(S.C.)	SHARE CIRCUIT
C	CONDUIT	QRCPT(S)	QUAD RECEPTACLE(S)
CB	CIRCUIT BREAKER	RCPT(S)	DUPLEX RECEPTACLE(S)
EC	EMPTY CONDUIT	CRCPT(S)	I.G. RECEPTACLE(S)
EX	EXISTING	QCRCPT(S)	QUAD I.G. RECEPTACLE(S)
F	FUSE	PNL	PANEL
G	GROUND (EQUIPMENT)	SO (S.O.)	SPACE ONLY
GFI	GROUND FAULT INTERRUPTER	SP	SPARE
MTD	MOUNT OR MOUNTED	ST (S.T.)	SHUNT TRIP
NF	NONFUSED	SW	SWITCH
NIC	NOT IN CONTRACT	UF	UNDERFLOOR
H.D	HEAVY DUTY	UG	UNDERGROUND
NL	NIGHT LIGHT	UNO(U.N.O.)	UNLESS NOTED OTHERWISE
AC	ABOVE COUNTER	WG	WIRE GUARD
HT.	HEIGHT	WP	WEATHERPROOF
MTD.	MOUNTING	XFMR	TRANSFORMER
FDR.	FEEDER	MB	MAIN BREAKER
CKT.	CIRCUIT	MLO	MAIN LUGS ONLY
LTG.	LIGHTING	RMC	RIGID METAL CONDUIT
LC	LIGHTING CONTACTOR	RNC	RIGID NONMETALLIC CONDUIT
IG	ISOLATED GROUND	EMT	ELECTRICAL METALLIC TUBING CONDUIT
EA.	EACH	S/N	SOLID NEUTRAL
N1	NEMA-1	AC	ABOVE COUNTER
N3R	NEMA-3R	AHJ	AHUTHORITY HAVING JURISDICTION
N4X	NEMA-4X		
SS	STAINLESS STEEL		

NOTES:

1.) 48" AFF INDICATES TO TOP OF DEVICE;
15" AFF INDICATES TO BOTTOM OF DEVICE;
ALL OTHER MOUNTING HEIGHTS REFER TO CENTERLINE OF DEVICE.
AC INDICATES 6" ABOVE COUNTER TO BOTTOM OF DEVICE.

ELECTRICAL LEGEND - WIRING DEVICES

---ALL SYMBOLS SHOWN MAY NOT APPEAR IN ALL DRAWINGS.
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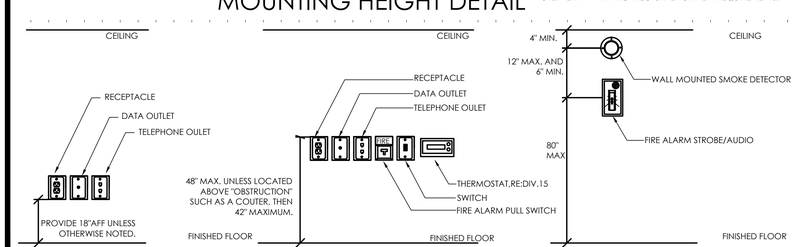
	SINGLE RECEPTACLE - 20A/125V/2P/3W/G NEMA 5-20R
	DUPLEX RECEPTACLE - 20A/125V/2P/3W/G NEMA 5-20R
H H	HOSPITAL GRADE DUPLEX RECEPTACLE/GFI - 20A/125V/2P/3W/G NEMA 5-20R
	DUPLEX RCPT, GFI - 20A/125V/2P/3W/G NEMA 5-20R
WP/ "IN-USE"	DUPLEX RCPT, GFI INSTALLED IN A "IN-USE" WEATHER PROOF STEEL ENCLOSURE- 20A/125V/2P/3W/G NEMA 5-20R WP/"IN-USE" SHALL BE EQUAL TO MFR. CARLON, METALLIC SERIES SINGLE GANG, VERTICAL MOUNT #ME9UVMG DOUBLE GANG, VERTICAL MOUNT #ME9U2VMG
	QUADRAPLEX RECEPTACLE
	ISOLATED GROUND QUADPLEX RECEPTACLE
	ISOLATED GROUND DUPLEX RECEPTACLE - 20A/125V NEMA 5-20R
	208V RECEPTACLE, VERIFY NEMA NO. WITH EQUIPMENT SUPPLIER
Y	SPECIAL PURPOSE RECEPTACLE (NEMA NO. AS INDICATED)
J J	JUNCTION BOX - SIZE & MOUNTING AS REQUIRED MINIMUM OF 4" SQUARE
J	J-BOX - AIR HAND DRYER: (RECESSED HAND DRYERS TO BE PROVIDED BY DIVISION 16. ELECTRICAL)HB-750 AUTOMATIC HANDCRAFT AS MANUFACTURER BY BOBRICK. (COLOR WHITE) QUANTITY: REFER TO DRAWINGS (MIN. ONE PER LAV. COMPLETE W/ ELE. CONNECTIONS TYP.)
	FLOOR MOUNTED 2-DUPLEX RECEPTACLE/2-GANG FOR DATA - FLUSH MOUNTED UNO FLOOR BOX = MFR.-WIREMOLD MODEL#RFB4(MULTISERVICE STEEL RECESSED FLOOR BOX-, RFB-B,RFB-DR,RFB4-LPB COVER #FPBTCBK-VERIFY FLOOR FINISH PRIOR TO ORDER SAME BOX FOR DATA OUTLETS.
G	GROUND RECEPTACLE - MFR. ERICO #B166.

MOUNTING HEIGHT DETAIL

NOTE: VERIFY WITH ARCHITECTURAL FOR ADA REQUIREMENTS.



GENERAL ELECTRICAL NOTES

1. ALL SYMBOLS AND ABBREVIATIONS SHOWN ON THIS LEGEND MAY NOT APPEAR ON THIS SET OF DRAWINGS.
2. USE DIRECTIONAL ARROW ON EXIT SIGNS AS REQUIRED.
3. IEEE STANDARD C37.2-1991, ELECTRICAL POWER SYSTEM DEVICE FUNCTION NUMBERS.
4. CONTRACTOR SHALL NOT INSTALL MORE THAN THREE CURRENT CARRYING CONDUCTORS IN A COMMON RACEWAY. IF CONTRACTOR IS PLANNING ON GROUPING MULTIPLE CIRCUITS IN A SINGLE RACEWAY, THE CONTRCATOR MUST SUBMIT ALL DERATING CALCULATIONS FOR THE PROPOSED INSTALLATION IN ACCORDANCE WITH NEC ARTICLE 310.15 (B) (2) FOR APPROVAL PRIOR TO INSTALLATION. NON APPROVED INSTALLATIONS WILL BE REMOVED AND REINSTALLED BY THE CONTRACTOR IN ACCORDANCE WITH THE NEC AT NO ADDITIONAL COST TO THE OWNER.
5. THERE SHALL NOT BE MORE THAN THE EQUIVALENT OF THREE 90° BENDS (270 DEGREES TOTAL) BETWEEN PULL POINTS. WHERE THERE ARE MORE THAN THREE QUARTER BENDS, CONTRACTOR SHALL PROVIDE PULL BOXES AS SPECIFIED AND SIZED IN ACCORDANCE WITH NEC.
6. COMPLY WITH NEC REQUIREMENTS FOR ELECTRICAL INSTALLATIONS. ALL ELECTRICAL EQUIPMENT AND MATERIAL TO BE APPROVED, LISTED, LABELED, IDENTIFIED AND INSTALLED PER RECOGNIZED ELECTRICAL TESTING LABORATORY.
7. ALL RECEPTACLES, SWITCHES AND JUNCTION BOXES SERVED BY EMERGENCY BRANCH CIRCUITS SHALL BE "RED" IN COLOR. COVERPLATES SHALL BE LABELED IN ACCORDANCE WITH SPECIFICATIONS TO INDICATE PANELBOARD AND CIRCUIT NO. (IE: ET"LA-3).

LUMINAIRE SCHEDULE

MARK	VOLTAGE	LAMP	MOUNTING	DESCRIPTION	MODEL NO.
A	120V	3-F32T8SP40	RECESSED LAY-IN	2X4 LAY-IN FLUORESCENT TROFFER W/ ACRYLIC LENS & ELECTRONIC BALLAST	LITHONIA 2GT8 _ 3 32_ A12125 MVOLT GEB
AE	SAME AS TYPE 'A' EXCEPT WITH 1400 LUMEN EMERGENCY BATTERY PACK				
B	120V	2-F32T8SP40	RECESSED LAY-IN	2X4 LAY-IN FLUORESCENT TROFFER W/ ACRYLIC LENS & ELECTRONIC BALLAST	LITHONIA 2GT8 _ 2 32_ A12125 MVOLT GEB
B1	120V	2-F32T8SP40	RECESSED	2X4 RECESSED FLUORESCENT TROFFER W/ ACRYLIC LENS & ELECTRONIC BALLAST	LITHONIA 2GT8 F 2 32_ A12125 MVOLT GEB
B1E	SAME AS TYPE 'B1' EXCEPT WITH 1400 LUMEN EMERGENCY BATTERY PACK				
C	120V	2-F17T8SP40	SURFACE MIN. 8'AFF	2' WALL MOUNTED FLUORESCENT LIGHT FIXTURE W/ ACRYLIC LENS & ELECTRONIC BALLAST	LITHONIA WC-2-17-_-MVOLT-GEB10IS
D	120V	LED 394 WATTS 4000k	SUSPENDED 27'AFF	LED HIGH BAY FIXTURE, WIDE DISTRIBUTION ,LENS AND DRIVER INCLUDED	LITHONIA IBL 36L WD LP740 DLC
E	120V	INCLUDED	SURFACE MIN. 8'AFF	THERMOPLASTIC EMERGENCY LIGHTING UNIT W/ SELF-DIAGNOSTICS	LITHONIA ELM2-SD
F	120V	4-F32T8SPX40	SURFACE	8' FLUORESCENT CHANNEL WITH ELECTRONIC BALLAST, WIRE GUARD	LITHONIA TC-4-32-MVOLT-GEB-WGCUN
X1	120V	INCLUDED	SURFACE	THERMOPLASTIC EXIT/EMERGENCY UNIT WITH SELF-DIAGNOSTICS	LITHONIA LHQM LED _-R SD
AA	120V	LED - 3970 LM 5000K	SURFACE	LED WALL PACK, INTEGRAL PHOTOCELL, RATED FOR WET LOCATION	LITHONIA OLW-31-_-_-DB

NOTE:
EQUAL MANUFACTURER SHALL BE ACCEPTABLE WITH EQUAL PERFORMANCE OF SPECIFIED EQUIPMENT AND APPROVED BY ENGINEER.
SUBMIT EQUAL MANUFACTURERS TO ENGINEER 10 DAYS PRIOR TO BID DATE.
SUBMIT LIGHT FIXTURES CUTSHEETS TO OWNER FOR APPROVAL PRIOR TO ORDER.

DISCONNECT SCHEDULE

LABEL	DESCRIPTION
AHU-1	100AMP, 1Ø, 3W, N1,208V, S/N, N.F., H.D. DISCONNECT
CU-1	60AMP, 1Ø, 3W, N3R, 208V, S/N, H.D. FUSED DISCONNECT
WH-1,2	30AMP, 1Ø, 2W, N1, 120V, S/N, N.F., H.D. DISCONNECT
AIR COMPRESSOR	30AMP, 1Ø, 3W, N1,208V, S/N, N.F., H.D. DISCONNECT
2 - GARAGE DOORS	30AMP, 1Ø, 3W, N1,208V, S/N, N.F., H.D. DISCONNECT

NOTE: 1. REFER TO BREAKER SIZE FOR FUSE SIZE.

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ELECTRICAL LEGEND

E3.1

DRY-TYPE TRANSFORMER SCHEDULE

LABEL	TRANSFORMER DESCRIPTION	PRIMARY VOLTAGE FEEDER - 480V, 3Ø	SECONDARY VOLTAGE FEEDER - 120/208V, 3Ø, 4W
TX-LR	TYPE-DT-3; GENERAL, 75KVA, AL. WINDINGS,3-PHASE, (P)480V-(S)208/120V,115°RISE,NEMA-3R	3#1, 1#6G IN 2"C	4#3/0, 1#6G IN 2"C

NOTE: ALL DRY-TYP TRANSFORMER SHALL BE ENERGY EFFICIENT MODELS.

OCCUPANCY SENSOR LEGEND

SYMBOL	HUBBELL MODEL NUMBER	COMMENTS
OS1	OMNI-DT2000	PROVIDE POWER PACK(#MP POWER PACK) POSITIONED AS DIRECTED BY MANUFACTURER. PROVIDE AN ADDITIONAL SLAVE PACK FOR DUAL LEVEL CONTROL. FOR DUAL LEVEL APPLICATION PROVIDE #MPSA, POWER PACK AND SLAVE RELAY. REFER TO PLANS FOR DUAL LEVEL SWITCHING, CLASSROOMS AND OFFICES.
$OS2	LH-MT-S1	

GENERAL NOTES:
A. CONTRACTOR SHALL REFER TO MANUFACTURERS INSTRUCTIONS AND WIRING DIAGRAMS PRIOR TO BID DATE.
B. CONTRACTOR SHALL INCLUDE ALL COST IN BID FOR AN OPERABLE LIGHTING SYSTEM.
NOTES:

1. All sensor locations are approximate, refer to manufacturers installation instructions prior to installation.
2. Ultrasonic ceiling mount sensors should be located a minimum of six feet from HVAC supply/return vents.
3. Contractor is responsible for: proper sensitivity & time delay settings (for non-adaptive products) recommended placement, and field verification of circuits with in respect to power placement.
4. Contractor is responsible for field verification of required number of power packs:
   - One power pack is required for each circuit to be controlled.
   - One power pack is required for every three sensors in the zone.
   - If multiple circuits are to be controlled by a sensor, an auxiliary relay can be used in conjunction with the power pack.
   - The maximum number of sensors that can be put on a power pack is to be reduced by one for each slave pack used.
5. Sensors mounted over the door must be placed one foot inside the threshold.
6. Contractor is responsible for ensuring that the sensor bill of materials complies with the sensor design and layout specifications.
7. Contractor is responsible for installing equipment in compliance with local code.
8. Refer to manufacturers wiring diagrams.

C. ACCEPTABLE MANUFACTURERS: LUTRON AND SENSOR SWITCH

GENERAL NOTES:

A. PROVIDE GROUND /BONDING AS INDICATED ON THE NATIONAL ELECTRICAL CODE.

B. NAME PLATES SHALL BE PROVIDED FOR ALL ELECTRICAL SWITCH GEAR, PANEL BOARDS, LIGHTING CONTACTORS, LIGHTING CONTROL PANELS, ETC.. BY ELECTRICAL CONTRACTOR.

C. NEW ELECTRICAL METERING AND SERVICE EQUIPMENT SHALL BE PROVIDED AND INSTALLED ACCORDING TO THE LOCAL POWER UTILITY CO. AND CITY REQUIREMENTS. VERIFY AND COORDINATE WITH POWER UTILITY CO. AND AHJ BEFORE BID AND INSTALLATION.

D. COMPLY WITH NFPA 70E SAFETY REQUIREMENTS.

E. PANELBOARDS WITH MORE THAN 42 CIRCUITS SHALL BE IN ONE CABINET ENCLOSURE, UNLESS OTHERWISE NOTED.

F. PROVIDE 4"CONCRETE PAD FOR ALL DRY-TYPE TRANSFORMERS.

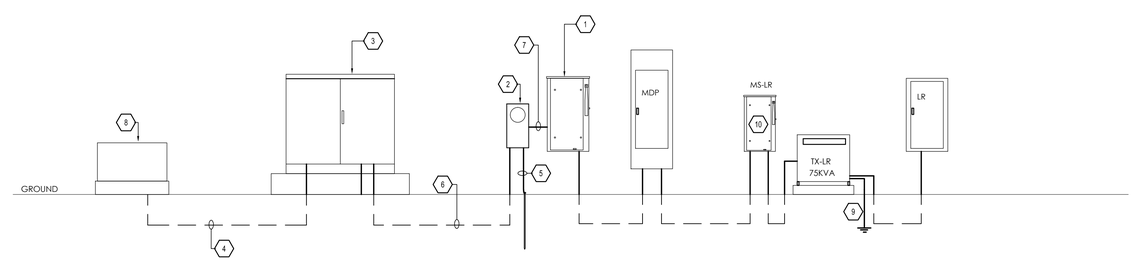
G. ALL TWO SECTION PANELBOARDS SHALL BE FEED THRU LUGS.

H. CONTRACTOR SHALL BE RESPONSIBLE FOR DELIVERY OF ELECTRICAL SERVICE TO THE NEW BUILDING WITHIN PROJECT SCHEDULE. COORDINATE ALL COST FOR LABOR AND MATERIALS WITH LOCAL ELECTRICAL UTILITY COMPANY PRIOR TO BID. ALL COST ASSOCIATED WITH THE DELIVERY OF ELECTRICAL SERVICE INCLUDING ALL MATERIALS SHALL BE INCLUDED IN BID. TRANSITION OF NEW ELECTRICAL SERVICE SHALL PROCEED IN WEEKENDS OR HOLIDAYS, INCLUDE ALL COST IN BID FOR OVERTIME FROM ELECTRIC UTILITY COMPANY. NO ADDITIONAL PAYMENT WILL BE MADE FOR SERVICE DELIVERY COSTS AFTER CONTRACT HAS BEEN AWARDED.

ELECTRICAL RISER DIAGRAM KEYED NOTES:

1. PROVIDE 400AMPS, 480V, 3Ø, 4W, S/N, N3R, HEAVY DUTY FUSED DISCONNECT, FUSED@225AMPS.
2. NEW ELECTRICAL SERVICE METER 480/277V, 3Ø, 4W. CONTRACTOR SHALL PROVIDE METER BASE. VERIFY WITH POWER FOR METER BASE REQUIREMENTS PRIOR TO BID DATE. INCLUDE ALL COST IN BID. COORDINATE ALLOCATION OF METER SOCKET AND WIRING WITH POWER COMPANY.
3. NEW POWER COMPANY PAD MOUNT TRANSFORMER 480/277V, 3Ø, 4W, PROVIDE CONCRETE PAD AS PER POWER COMPANY REQUIREMENTS.
4. FURNISH AND INSTALL 1-4"C FOR UTILITY PRIMARY RACEWAY TO POWER SOURCE AS DIRECTED BY UTILITY COMPANY. PROVIDE WARNING RIBBONS 12" ABOVE CONDUIT.
5. 1#3/0G IN 1"C, 3/4"X10' COPPER CLAD RODS. PROVIDE GROUNDING AS PER NEC REQUIREMENTS.
6. PROVIDE 1-RUN 4#4/0, 3"C.
7. PROVIDE 1-RUN 4#4/0, 1#4G, 3"C.
8. EXISTING POWER COMPANY PULLBOX. FIELD VERIFY EXACT LOCATION.
9. 1#6G, GROUND ELECTRODE CONDUCTOR, CALDWELD CONNECTION TO BUILDING REBAR AND STRUCTURE STEEL.
10. PROVIDE 200AMPS, 480V, 3Ø, 4W, S/N, N3R, HEAVY DUTY NON-FUSED DISCONNECT.

480/277V, 3Ø, 4W ELECTRICAL LOAD ANALYSIS	
DISCRIPTION	TOTAL KVA
LIGHTING	14
GENERAL POWER	84
A/C	15
WATER HEATER	3
MOTORS	28
TOTAL WATTS:	144 KVA
TOTAL AMPS:	173 AMPS
TOTAL AMPS+25%:	216 AMPS
WIRE SIZE AMPS:	225 AMPS



1 ELECTRICAL SCHEMATIC DIAGRAM
SCALE: NTS

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MEP ENGINEERING
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Texas Registered Engineering Firm - F10362
Project number:14.2.07

08/01/14

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CONSULTANTS:

NO.	DATE	DESCRIPTION

MAINTENANCE HANGAR FOR
SOUTH TEXAS INTERNATIONAL
AIRPORT AT EDINBURG
CITY OF EDINBURG
EDINBURG, TEXAS

PROJECT NO: 201320
DATE: 8/01/2014 11:56:13 AM
STARTING DATE: 06.03.2013
CK BY: L.M. DWN BY: ---
ELECTRICAL RISER

E4.1

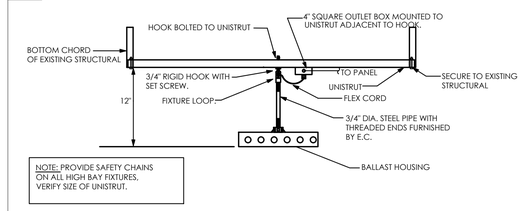
PANEL -MDP	AMP	LUGS	NEMA	V(LL)		(P)		(W)		V(LN)	MNT	KAIC	FDR	
LOCATION:	225	MLO	1	480		3		4		277	SUR.	22	1-RUN 4#4/0, 1#4G, 3"C	
LOAD SERVED	CKT #	LOAD KVA	BKR SIZE	POLE	FEEDER/BRANCH CIRCUIT SIZE	A	B	C	FEEDER/BRANCH CIRCUIT SIZE	POLE	BKR SIZE	LOAD KVA	CKT #	LOAD SERVED
PANEL -LR	1	20	125	3	4#1, 1#6G,2"C	*			2#12, 1#12G,1/2"C	1	20	2	2	HANGAR LIGHTING
VIA TX-LR	3	23			-		*		2#12, 1#12G,1/2"C	1	20	2	4	HANGAR LIGHTING
"	5	20			-			*	2#12, 1#12G,1/2"C	1	20	2	6	HANGAR LIGHTING
GROUND POWER	7	11	50	3	4#6, 1#10G,1"C	*			2#12, 1#12G,1/2"C	1	20	2.7	8	LIGHTING
"	9	11			-		*		2#12, 1#12G,1/2"C	1	20	0.9	10	LIGHTING
"	11	11			-			*	2#12, 1#12G,1/2"C	1	20	2	12	EXTERIOR LIGHTING
GROUND POWER	13	11	50	3	4#6, 1#10G,1"C	*			2#12, 1#12G,1/2"C	1	20	2	14	EMERGENCY LTG
"	15	11			-		*						16	SPACE
"	17	11			-			*	4#12, 1#12G,1/2"C	3	20	2.3	18	4 - EF-3
2 - HVLS-1	19	1.8	20	3	4#12, 1#12G,1/2"C	*			-			2.3	20	"
"	21	1.8			-		*		-			2.3	22	"
"	23	1.8			-			*	-				24	SPACE
SPACE	25				-	*			-				26	SPACE
SPACE	27				-		*		-				28	SPACE
SPACE	29				-			*	-				30	SPACE
SPACE	31				-	*			-				32	SPACE
SPACE	33				-		*		-				34	SPACE
SPACE	35				-			*	-				36	SPACE
SPACE	37				-	*			-				38	SPACE
SPACE	39				-		*		-				40	SPACE
SPACE	41				-			*	-				42	SPACE
LOADS	-	(KVA)				52	48	47				(KVA)	-	DESCRIPTIVE LOADS
CONNECTED LOAD	-	146				KVA/PHASE						14	-	LIGHTING
RESERVE	25	37										66	-	RECEPTACLES
TOTAL LOAD	-	**183**										0	-	COOLING
												12	-	MOTOR
TOTAL AMPS	-	**220**										54	-	OTHER

NOTES:
1)
2)
3)

PANEL: LR	AMP	LUGS	NEMA	V(LL)		(P)		(W)		V(LN)	MNT	KAIC	FDR	
LOCATION:	200	MB	1	208		3		4		120	SUR.	10	1-RUN 4#3/0, 1#6G, 2"C	
LOAD SERVED	CKT #	LOAD KVA	BKR SIZE	POLE	FEEDER/BRANCH CIRCUIT SIZE	A	B	C	FEEDER/BRANCH CIRCUIT SIZE	POLE	BKR SIZE	LOAD KVA	CKT #	LOAD SERVED
AHU-1	1	7.4	80	2	3#4, 1#8G,1 1/2"C	*			3#8, 1#10G,1"C	3	30	2.9	2	AIR COMPRESSOR
"	3	7.4			-		*		-			2.9	4	"
SPACE	5				-			*	-			2.9	6	"
	7				-	*			2#10, 1#10G,3/4"C	1	25	1.5	8	WH-1
CU-1	9	4.3	60	2	3#6, 1#10G,1"C		*		-				10	SPACE
"	11	4.3			-			*	-	-	-	-	12	SPACE
SPARE	13		20	1	-	*			-				14	SPACE
J-BOX	15	1.5	20	1	2#12, 1#12G,1/2"C		*		2#12, 1#12G,1/2"C	1	20	1	16	2) 1 RCPT
J-BOX	17	1.5	20	1	2#10, 1#10G,3/4"C			*	2#12, 1#12G,1/2"C	1	20	0.8	18	4 RCPTS
3 RCPTS	19	0.6	20	1	2#12, 1#12G,1/2"C	*			2#12, 1#12G,1/2"C	1	20	0.4	20	2 RCPTS
4 RCPTS	21	0.8	20	1	2#12, 1#12G,1/2"C		*		2#12, 1#12G,1/2"C	1	20	1	22	1 RCPTS
E.D.F.	23	1	20	1	2#12, 1#12G,1/2"C			*	2#12, 1#12G,1/2"C	1	20	0.8	24	2 RCPTS
3 RCPTS	25	0.6	20	1	2#12, 1#12G,1/2"C	*			2#12, 1#12G,1/2"C	1	20	0.8	26	4 RCPTS
2 RCPTS	27	0.4	20	1	2#12, 1#12G,1/2"C		*		2#12, 1#12G,1/2"C	1	20	0.8	28	1 QRCPT
1 RCPT	29	0.4	20	1	2#12, 1#12G,1/2"C			*	2#12, 1#12G,1/2"C	1	20	0.6	30	FACP
REF.	31	1.2	20	1	2#12, 1#12G,1/2"C	*			2#12, 1#12G,1/2"C	1	20	0.4	32	2 RCPTS
2 RCPTS	33	0.4	20	1	2#12, 1#12G,1/2"C		*		2#8, 1#10G,3/4"C	1	20	0.4	34	2 RCPTS
3 RCPTS	35	0.6	20	1	2#8, 1#10G,3/4"C			*	2#12, 1#12G,1/2"C	1	20	1.5	36	1 RCPT
2 RCPTS	37	0.4	20	1	2#8, 1#10G,3/4"C	*			2#12, 1#12G,1/2"C	1	20	1.5	38	J-BOX FIRE PROTECTION
1) GARAGE DOOR	39	2.5	30	2	3#10, 1#10G,3/4"C		*		-	1	20		40	SPARE
"	41	2.5			-			*	-	1	20		42	SPARE
SPACE	43				-	*			-	1	20		44	SPARE
SPACE	45				-		*		-	1	20		46	SPARE
1) GARAGE DOOR	47	2.5	30	2	3#10, 1#10G,3/4"C			*	-	1	20		48	SPARE
"	49	2.5			-	*			-	1	20		50	SPARE
SPACE	51				-		*		-	1	20		52	SPARE
SPACE	53				-			*	-	1	20		54	SPARE
SPACE	55				-	*			-	1	20		56	SPARE
SPACE	57				-		*		-				58	SPACE
SPACE	59				-			*	-				60	SPACE
SPACE	61				-	*			-				62	SPACE
SPACE	63				-		*		-				64	SPACE
LOADS	-	(KVA)				20	23	20				(KVA)	-	DESCRIPTIVE LOADS
CONNECTED LOAD	-	54				KVA/PHASE						2	-	LIGHTING
RESERVE - %	0	0										18	-	RECEPTACLES
TOTAL LOAD	-	**54**										0	-	COOLING
												15	-	HEATING
												16	-	MOTOR
												0	-	KITCHEN
												3	-	OTHER
TOTAL AMPS	-	**149**												

NOTES:
1) IF ALTERNATE #2 IS NOT ACCEPTED PROVIDE SPARE BREAKER.
2) PROVIDE GFI BREAKER
3)

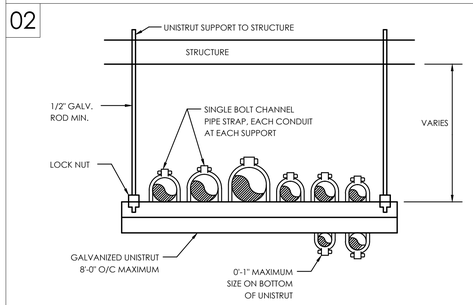
01



FIXTURE MOUNTING DETAIL - TYPE-A

NO SCALE

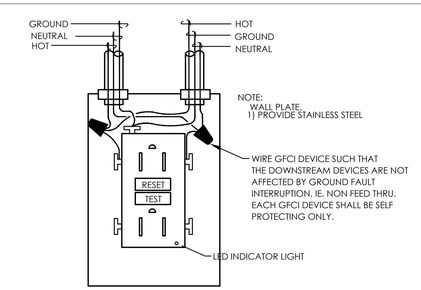
02



SUPPORT DETAIL FOR MULTIPLE CONDUIT HORIZONTAL RUNS

NO SCALE

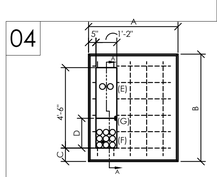
03

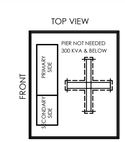


GFI RECEPTACLE- WIRING DIAGRAM

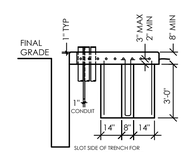
NO SCALE

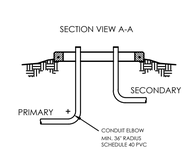
04





PAD DIMENSION TABLE			
DIM. \ KVA	UP TO 300 KVA	500 THRU 1000 KVA	1500 THRU 3000 KVA
A	5'-0"	6'-0"	7'-0"
B	6'-0"	7'-0"	8'-0"
C	0'-9"	1'-3"	1'-9"
D	1'-8"	2'-0"	2'-0"
E	HIGH VOLTAGE OR PRIMARY SIDE OF TRANSFORMER, PRIMARY CONDUITS		
F	LOW VOLTAGE OR SECONDARY SIDE OF TRANSFORMER. ONE 1" CONDUIT FOR METERING. OTHER CONDUITS FOR SECONDARY WIRE		
G	CONSUMER TO INSTALL GROUND RODS 5/8" X 8' IN COMPARTMENT OPENING		





NOTES:
1. PAD ASSEMBLIES INCLUDE SITE PREPARATION, BEDDING AND DRAINAGE.
2. SLABS MAY BE PRECAST OR POURED IN PLACE.
3. CONCRETE TESTING 4000 POUNDS PER SQUARE INCH.
4. STEEL REINFORCING SHOULD BE NO. 4 REAR, AATSM-A615 GRADE 60. PLACE APPROX. 6" OPPOSITE CORNER EACH WAY AND SECURELY TIED TOGETHER.
5. MINIMUM CONCRETE COVER OVER REINFORCING STEEL 5 INCHES.
6. WOOD FLOAT FINISH. LEAVING NO DEPRESSION.
7. CONTACT MVEC REPRESENTATIVE TO INSPECT BEFORE POURING CONCRETE.
8. A CLEAR AREA SHOULD BE MAINTAINED FOR 10 FEET IN FRONT OF PADMOUNT.
9. TOP OF PAD SHOULD BE A MIN OF 3" ABOVE GRADE AND BOTTOM OF PAD A MIN OF 5' BELOW GRADE.
10. CONDUITS SHOULD BE IN FRONT BUT NOT UNDER WEIGHT OF TRANSFORMER.

TRANSFORMER PAD (MAGIC VALLEY)

NO SCALE

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McAllen Harlingen

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CONSULTANTS:

NO.	DATE	DESCRIPTION

MAINTENANCE HANGAR FOR SOUTH TEXAS INTERNATIONAL AIRPORT AT EDINBURG CITY OF EDINBURG

EDINBURG, TEXAS

PROJECT NO:	201320
DATE:	8/01/2014 11:56:13 AM
STARTING DATE:	06.03.2013
CK BY: L.M.	DWN BY: ---

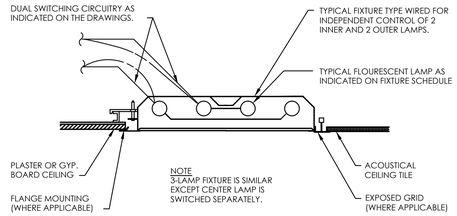
ELECTRICAL DETAILS

E5.1

TRINITY MEP ENGINEERING
3533 Moreland Dr. Ste A I Weslaco, Tx 78596
p:956.973.0500 I f:956-351-5750
www.trinitymep.com I Copyright 2014
Texas Registered Engineering Firm - F10362
Project number:14.2.07

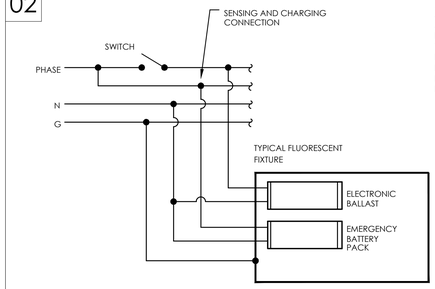
08/01/14
STATE OF TEXAS
LEONARDO MUNOZ
91437
LICENSED PROFESSIONAL ENGINEER

01



DUAL CIRCUIT FIXTURE WIRING
NO SCALE

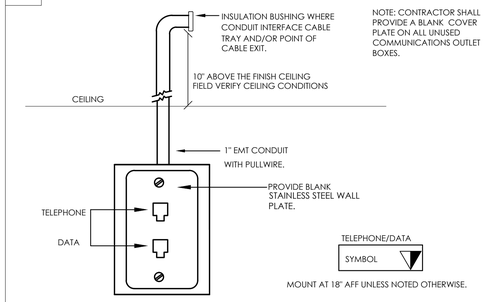
02



NOTE:
ALL EXIT LIGHT FIXTURE AND EMERGENCY FIXTURES SHALL BE ON THE NON-SWITCHED LEG. REFER TO LIGHT FIXTURE SCHEDULE FOR FIXTURE TYPE AND PLANS.

TYPICAL EMERGENCY LIGHT FIXTURE SCHEMATIC
NO SCALE

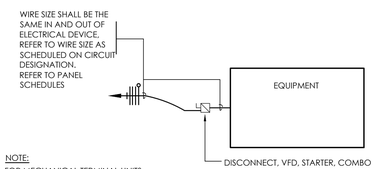
03



NOTE: CONTRACTOR SHALL PROVIDE A BLANK COVER PLATE ON ALL UNUSED COMMUNICATIONS OUTLET BOXES.

TELEPHONE/ DATA DETAIL
NO SCALE

04



NOTE:
FOR MECHANICAL TERMINAL UNITS, REFER TO MECHANICAL EQUIPMENT CONNECTION SCHEDULE

EQUIPMENT CIRCUIT DETAIL
NO SCALE

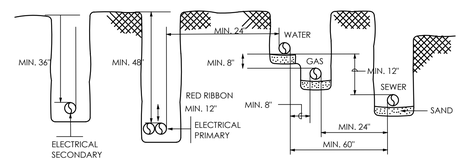
05

CLEAR TRENCH OF ALL ROCKS AND DEBRIS BEFORE ADDING SAND CUSHION.

COMPACT TRENCH FILL TO 95% PROCTOR DENSITY.

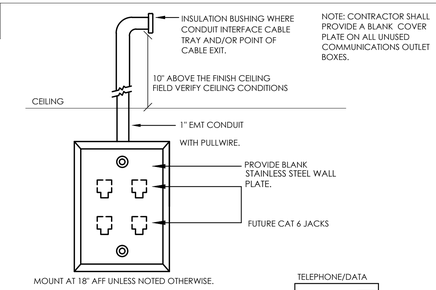
MAINTAIN A MINIMUM OF 60 INCHES UNDISTURBED EARTH BETWEEN PARALLEL WATER AND SEWER LINES OR SUPPORT WATER LINE ON SEPARATE SHELF A MINIMUM OF 12" ABOVE SEWER LINE.

MAINTAIN A MINIMUM OF 24" HORIZONTALLY BETWEEN ELECTRICAL PRIMARY AND SEWER. MAINTAIN A MINIM OF 12" VERTICALLY OR 24" HORIZONTALLY BETWEEN ELECTRICAL PRIMARY AND WATER LINES, GAS LINES, TELEPHONE RACEWAYS AND CABLE RACEWAYS.



TRENCH DETAIL
NO SCALE

06



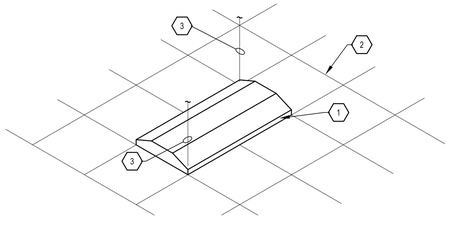
NOTE: CONTRACTOR SHALL PROVIDE A BLANK COVER PLATE ON ALL UNUSED COMMUNICATIONS OUTLET BOXES.

DATA DETAIL
NO SCALE

07

KEYED NOTES:

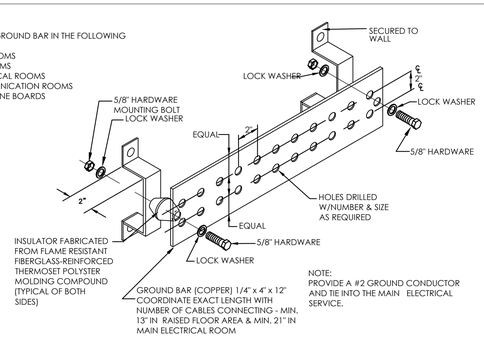
1. 2'x 4' LAY-IN FLUORESCENT FIXTURE
2. SUSPENDED CEILING
3. TIE WIRE, CONNECT TO ALL FOUR CORNERS OF FIXTURE TO TOP OF STRUCTURE, INDEPENDENT OF CEILING SUPPORTS.



TYPICAL LAY-IN FIXTURE SUPPORT
NO SCALE

08

PROVIDE GROUND BAR IN THE FOLLOWING ROOMS:
1. MDF ROOMS
2. IDF ROOMS
3. ELECTRICAL ROOMS
4. COMMUNICATION ROOMS
5. TELEPHONE BOARDS

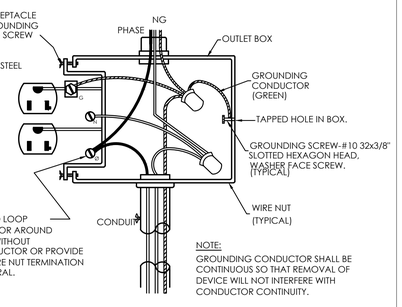


NOTE:
PROVIDE A #2 GROUND CONDUCTOR AND TIE INTO THE MAIN ELECTRICAL SERVICE.

WALL MOUNTED SINGLE-POINT GROUND BAR DETAIL
NO SCALE

09

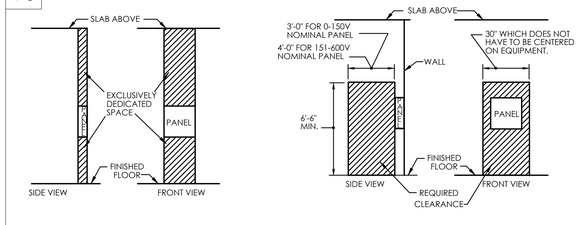
NOTE:
1) PROVIDE STAINLESS STEEL WALL PLATE.



NOTE:
GROUNDING CONDUCTOR SHALL BE CONTINUOUS SO THAT REMOVAL OF DEVICE WILL NOT INTERFERE WITH CONDUCTOR CONTINUITY.

TYPICAL RECEPTACLE GROUNDING DETAIL
NO SCALE

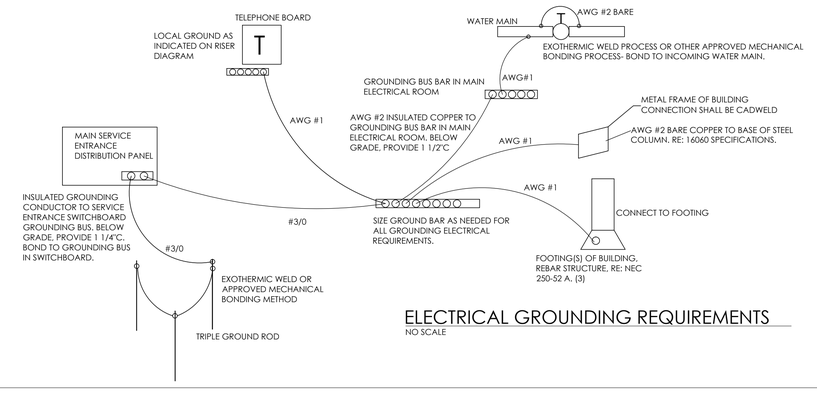
10



NOTE:
REFER TO THE LATEST NATIONAL ELECTRICAL CODE AND LOCAL CODES.

TYPICAL PANEL BOARD REQUIRED CLEARANCE
NO SCALE

11



ELECTRICAL GROUNDING REQUIREMENTS
NO SCALE

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NO.	DATE	DESCRIPTION

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AIRPORT AT EDINBURG
CITY OF EDINBURG
EDINBURG, TEXAS

PROJECT NO:	201320
DATE:	8/01/2014 11:56:13 AM
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ELECTRICAL DETAILS

E5.2

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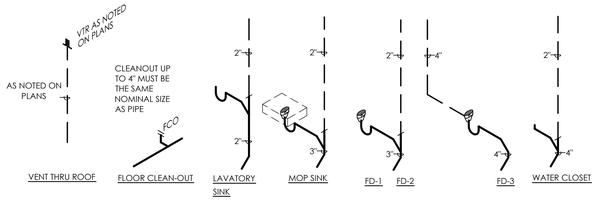


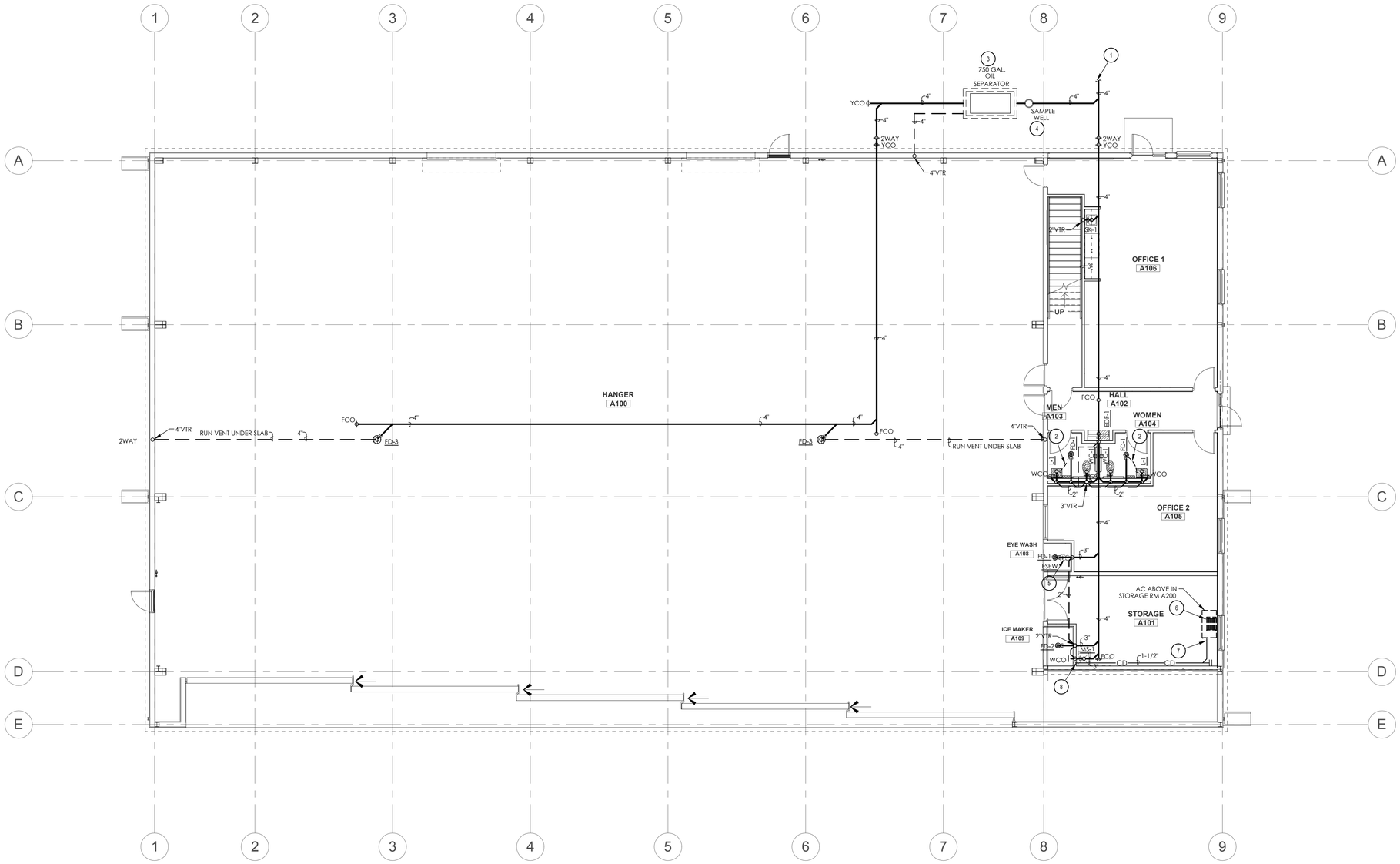
SEWER VENT

03 TYPICAL RISER SCHEMATICS

NOT TO SCALE

KEYED NOTES: PLUMBING

1. REFER TO CIVIL ENGINEERING PLANS FOR CONTINUATION OF PLUMBING FIVE FEET AWAY FROM BUILDING. PLUMBER TO MAKE FINAL CONNECTION TO SEPTIC SYSTEM DRAINAGE FIELD. SIZE AND LOCATION TO BE DETERMINATE BY CIVIL ENGINEER/SEPTIC SYSTEM DESIGNER AS APPROVED BY HIDALGO COUNTY HEALTH DEPARTMENT.
2. 1/2" COPPER FROM TRAP PRIMER. PROVIDE LAVATORY WITH "PRIME-EZE" TRAP PRIMER BY JR SMITH. REFER TO DETAIL 12/P4.1.
3. PLUMBER TO PROVIDE SEDIMENT AND OIL SEPARATOR EQUAL TO PARK MODEL NO. SOCMP-750 WITH FRAME & COVER, H-20 TRAFFIC RATING. REFER TO MANUFACTURE'S SPECS AND DETAILS FOR INSTALLATION. SEDIMENT AND OIL SEPARATOR TO BE INSTALLED AND COMPLY WITH LOCAL CODE. REFER TO DETAIL 17/P4.1.
4. SAMPLE WELL EQUAL TO PARK ENVIRONMENTAL EQUIPMENT MODEL NO. SWB154. REFER TO DETAIL 18/P4.01.
5. EMERGENCY SHOWER AND EYE WASH UNIT PROVIDED AND INSTALLED BY PLUMBER. REFER TO DETAIL 02/P2.1.
6. AIR HANDLING UNIT AT STORAGE ROOM A200 ABOVE.
7. COPPER CONDENSATE FROM "AHU-1" COORDINATE ROUTING WITH HVAC CONTRACTOR.
8. COPPER CONDENSATE DRAIN LINE DOWN NEXT TO WALL DISCHARGE TO MOP SINK.



SEWER VENT

PLUMBING FLOOR PLAN 1

1/8" = 1'-0"

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EDINBURG, TEXAS

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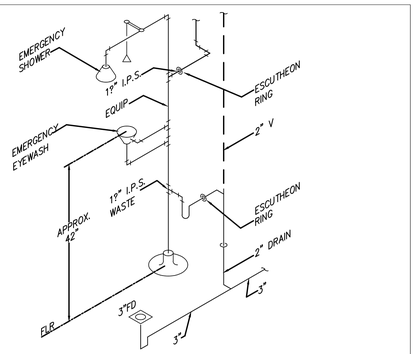
CK BY: L.M.	DWN BY: ---

SEWER VENT
PLUMBING FLOOR PLAN

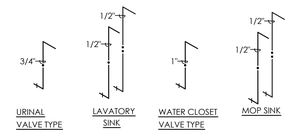
P1.1

02



FREE STANDING SAFETY SHOWER

NO SCALE



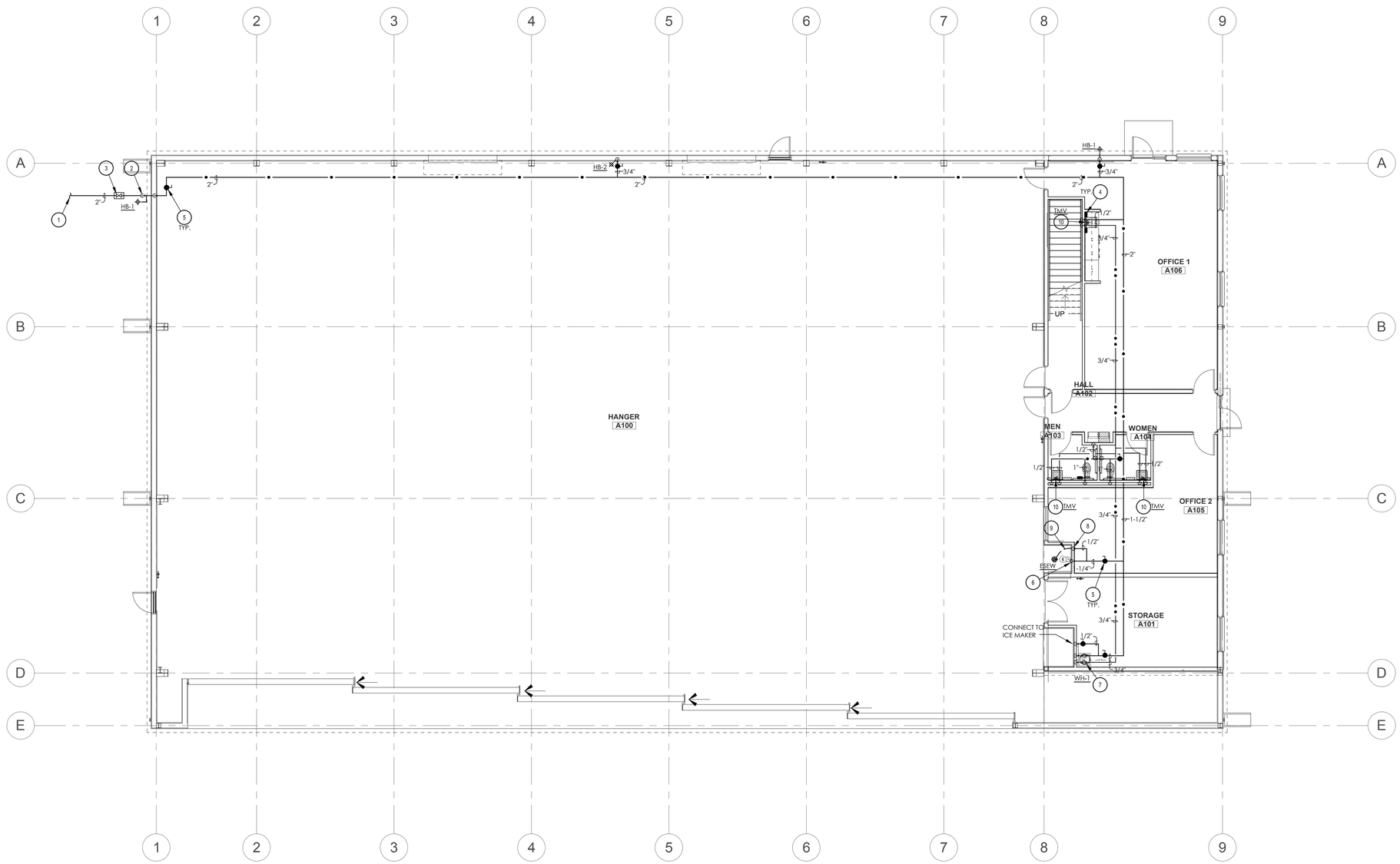
DOMESTIC WATER

03 TYPICAL RISER SCHEMATICS

NOT TO SCALE

PLUMBING KEYED NOTES:

1. REFER TO CIVIL SITE PLAN FOR CONTINUATION OF OF PLUMBING FIVE FEET AWAY FROM BUILDING. PLUMBING CONTRACTOR TO BE RESPONSIBLE FOR COORDINATION, VERIFICATION AND CONNECTION OF ALL UTILITIES TO SITE UTILITY STUB-OUTS. PROVIDE 2" WATER METER AND BACKFLOW PREVENTER AS REQUIRED.
2. WATER SERVICE ENTRANCE. REFER TO DETAIL 01/P4.1.
3. CUT-OFF VALVE IN CAST IRON BOX. SET BOX FLUSH WITH FINISHED FLOOR.
4. WATER HAMMER ABOVE CEILING. PROVIDE ACCESS PANEL WHERE LOCATED IN AN INACCESSIBLE CEILING. PANEL SHALL BE 12"X12" PAINTED TO MATCH CEILING.
5. BRONZE CUT-OFF VALVE ABOVE CEILING. PROVIDE ACCESS PANEL WHERE LOCATED IN AN INACCESSIBLE CEILING. PANEL SHALL BE 12"X12" PAINTED TO MATCH CEILING.
6. EMERGENCY SHOWER AND EYEWASH, PROVIDED AND INSTALLED BY PLUMBER, REFER TO DETAIL # 02 THIS SHEET.
7. INSTALL WATER HEATER ABOVE MOP SINK. REFER TO DETAIL 16/P4.1.
8. PRESSURE DROP ACTIVATED TRAP PRIMER, PROVIDE ACCESS PANEL IF INACCESSIBLE. SEE DETAIL 06/P4.1.
9. 1/2" COPPER FROM TRAP PRIMER COVER WITH POLYETHYLENE SLEEVE "POLY SLEEVE" OR EQUAL. TYPICAL ALL TRAP-PRIMERS.
10. PROVIDE THERMOSTATIC MIXING VALVE (TMV) EQUAL TO POWERS E480. SET TEMPERATURE PER LOCAL JURISDICTION REQUIREMENTS.



DOMESTIC WATER

PLUMBING FLOOR PLAN 1

1/8" = 1'-0"

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DOMESTIC WATER PLUMBING FLOOR PLAN

P2.1

ABBREV. DESCRIPTION

AC	ABOVE CEILING
AFF	ABOVE FINISHED FLOOR
ASA	AMERICAN STANDARDS ASSOCIATION
ASME	AMERICAN SOICIETY OF MECHANICAL ENGINEERS
ASTM	AMERICAN SOCIETY FOR TESTING MATERIALS
AW	ACID WASTE
AWWA	AMERICAN WATER WORKS ASSOCIATION
AV	ACID VENT
BTUH	BRITISH THERMAL UNIT PER HOUR
CA	COMPRESSED AIR
CI	CAST IRON
CO	CLEANOUT
CU	COPPER
DN	DOWN
EQ	EQUAL
FCO	FLOOR CLEANOUT
FF	FINISH FLOOR
FG	FINISH GRADE
FH	FIRE HYDRANT
GAL	GALLON(S)
GALV	GALVANIZED
GW	GREASE WASTE
HB	HOSE BIBB
HP	HORESPOWER
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE
OC	ON CENTER
RD	ROOF DRAIN(S)
RE:4/P6	REFER TO DETAIL 4 DRAWING P-6
RO	REVERSE OSMOSIS
SD	STORM DRAIN
SPEC	SPECIFICATION
TYP	TYPICAL
UG	UNDERGROUND
UL	UNDERWRITERS LABORATORIES
VTR	VENT THRU ROOF
V	VACUUM
W/	WITH
WCO	WALL CLEAN OUT
YCO	YARD CLEAN OUT

PLUMBING FIXTURE SCHEDULE

MARK	FIXTURE TYPE	CONNECTION SIZE San. Sewer	Vent	Cold Water	Hot Water	DESCRIPTION
WC-1	WATER CLOSET FLOOR MOUNTED ADA (HIGH EFFICIENCY)	4"	2"	1"	-	CRANE "HYMONT" MODEL NO. 3H701, FLOOR MOUNTED WATER CLOSET, WITH ELONGATED RIM, 17-1/4" RIM HEIGHT, VITREOUS CHINA, SIPHON JET FLUSH ACTION 10"- 12" ROUGH IN, WITH SLOAN ROYAL FLUSH VALVE MODEL NO. 111-1.28 HIGH EFFICIENCY (1.28 GPF). INCLUDES 1-1/2" TOP SPUD AND 2 BOLT CAPS, WITH "BENEKE" OPEN FRONT SEAT LESS COVER MODEL 533SS. FLUSH LEVER SHALL BE MOUNTED ON APPROACH SIDE OF FIXTURE.
L-1	LAVATORY WALL HUNG STANDARD AND ADA REFER TO ARCH'L DRAWING FOR MOUNTING HEIGHTS	2"	2"	1/2"	1/2"	CRANE "HARWICH" MODEL NO. 1412V (20x18) WALL HUNG LAVATORY, WITH ANTI-SPLASH RIM AND HIGH BACK, CONCEALED FRONT OVERFLOW. INCLUDES WALL HANGER. VITREOUS CHINA, WITH FAUCET HOLES ON 4" CENTERS. PROVIDE FAUCET EQUAL TO MOEN MODEL 8413, SINGLE HANDLE, VANDAL RESISTANT, ADA APPROVED. PROVIDE PROTECTIVE COVER ON P-TRAP AND STOPS.
SK-1	STAINLESS STEEL SINK HANDICAPPED	2"	2"	1/2"	1/2"	SINGLE COMPARTMENT STAINLESS STEEL SINK BY ELKAY MODEL NO. LRAD1720-60 SELF RIMMING, TOP MOUNT WITH STAINLESS STEEL MOUNTING CHANNELS, 18 GAUGE TYPE 302 CENTERED REAR DRAIN, COMPLETE WITH MOEN TWO-HANDLE KITCHEN FAUCET MODEL NO. 8799. PROVIDE LKADOS CHROME PLATED BRASS OFFSET TAILPIECE FOR WHEELCHAIR USE.
EDF-1	ELECTRIC WATER COOLER REFER TO ARCH'L DRAWING FOR MOUNTING HEIGHTS	2"	2"	1/2"	-	BI-LEVEL ELECTRIC WATER COOLER SHALL BE "ELKAY" MODEL No. EZSTL-8-C, WITH CAPACITY OF 8.0 GALLONS, STAINLESS STEEL BASIN WITH INTEGRAL DRAIN GRID AND EMBOSSED BUBBLER PAD, LEAD FREE ADA COMPLIANT, WITH ZURN CARRIER MODEL No. Z-1225, WITH APRON MODEL NO. LKAPR-EZL TO COMPLY WITH TAS AND ADA.
MS-1	MOP SINK	3"	2"	1/2"	1/2"	FIAT MODEL NO. TSB100, 24"X24"X12" TERRAZO MOP SINK, COMPLETE WITH FAUCET MODEL 830-AA, MOP SINK SHALL INCLUDE ALL HOSE BRACKETS, HOSE, AND MOP HANGER. WITH 3" DRAIN WITH STRAINER & DEEP SEAL P-TRAP. PROVIDE WALL GUARD MSG2424.
HB-1	HOSE BIB EXTERIOR GENERAL USE	-	-	3/4"	-	MILD TEMPERATURE WALL HYDRANT SHALL BE WADE MODEL 8600MT-175 3/4" INLET WITH BRONZE CASING, BRONZE FACE AND STRAIGHT INLET CONNECTION WITH INTEGRAL BACKFLOW PREVENTER.
HB-2	WALL FAUCET INTERIOR HOSE BIB	-	-	3/4"	-	WOODFORD MODEL 26 P-3/4" INLET, WITH BACKFLOW PREVENTER AND LOOSE TEE KEY.
ESEW	EMERGENCY SHOWER AND EYEWASH	3"	2"	1-1/4"	-	EQUAL TO BRADLEY MODEL NO. S19310BF.
FD-1	RESTROOM FLOOR DRAIN	AS NOTED ON PLANS				EQUAL TO JOSAM PART # 30003-6A-Y-50, CAST IRON BODY WITH CLAMP RING, FLANGE, ADJUSTABLE NIKALOY STRAINER, HUB OUTLET WITH GASKET AND 1/2" PRIMER TAP.
FD-2	ICE MAKER FLOOR DRAIN	AS NOTED ON PLANS				EQUAL TO JOSAM PART # 30003-7E1-2, CAST IRON BODY WITH CLAMP RING, FLANGE, ADJUSTABLE EXTENDED RIM STRAINER, HUB OUTLET WITH GASKET.
FD-3	FOR USE IN HANGARS FLOOR DRAIN	AS NOTED ON PLANS				JOSAM 38424-IGS SERIES COATED CAST IRON COMBINATION EXTRA DEEP FLOOR DRAIN AND INTEGRAL DEEP SEAL TRAP WITH DOUBLE DRAINAGE FLANGE, WEEPHOLES, SIDE OUTLET AND HUB VENT CONNECTION, ROUND TOP, FLUSH-WITH-FLOOR CLEANOUT, REMOVABLE SEDIMENT BUCKET, FUNNEL SHAPED INTERNAL SEAL WITH INTEGRAL RIM DESIGNED SO THAT HEAVY-DUTY GRATE CANNOT BE REPLACED UNLESS FUNNEL IS IN POSITION.

NOTES:

1. ALL VITREOUS CHINA FIXTURES SHALL BE WHITE.
2. INSULATE ALL WATER AND WASTE PIPING UNDER LAVATORIES WITH HANDY-SHIELD JACKET BY PLUMBEREX.

WATER HEATER SCHEDULE

MARK	STORAGE GALLONS	RECOVERY GPH	DEGREE RISE DEG F	WATER TEMP LEAVING	WATER INLET	WATER OUTLET	VOLTAGE/ PHASE	ELEMENTS KW	DESCRIPTION
WH-1	12	10	60	120	3/4"	3/4"	120/1	1.5	BRADFORD WHITE LIGHT DUTY COMMERCIAL WALL HUNG WATER HEATER, MODEL NO. LD-WH12U3-1

PLUMBING PIPING MATERIAL:

1. SANITARY DRAIN & VENT INSIDE BUILDING BELOW GRADE: SCHEDULE 40 PVC
2. SANITARY DRAIN OUTSIDE BUILDING: SCHEDULE 40 PVC
3. SANITARY DRAIN & VENT INSIDE BUILDING ABOVE GRADE: SCHEDULE 40 PVC
4. SANITARY DRAIN & VENT IN PLENUM CEILING: NO-HUB CAST IRON
5. DOMESTIC HOT & COLD WATER: COPPER, TYPE "L" HARD DRAWN
6. DOMESTIC WATER BELOW GRADE: COPPER, TYPE "K" SOFT ANNEALED
7. DOMESTIC WATER BELOW GROUND OUTSIDE OF BUILDING PIPING 2" SIZE AND SMALLER: COPPER, TYPE "L" HARD DRAWN

PLUMBING GENERAL NOTES: (ALL SHEETS)

A. ALL WORK AND MATERIAL SHALL BE IN COMPLIANCE WITH ALL APPLICABLE CODES AS ADAPTED AND AMENDED BY THE INSPECTING AUTHORITIES.

B. ALL PLUMBING WORK SHALL BE INSTALLED SO AS TO AVOID CONFLICT WITH ALL ELECTRICAL WORK, MECH'L WORK AND STRUCTURAL MEMBERS. COORDINATE WITH MECHANICAL, ELEC'L AND STRUCTURAL FOR PROPER CLEARANCES.

C. REFER TO ARCHITECTURAL DRAWINGS AND SPECIFICATIONS FOR PHASING AND SEQUENCE OF CONSTRUCTION OF WORK.

D. SLEEVE ALL OUTSIDE WALL, FLOOR SLAB, AND GRADE BEAM PENETRATIONS PER DETAILS AND PER CODE.

E. LOCATE ALL PLUMBING VENTS TO ROOF (VTR) SO THAT THEY TERMINATE A MINIMUM OF 1'-0" AWAY FROM ANY VERTICAL SURFACE AND 10'-0" AWAY FROM ANY OUTSIDE AIR INTAKES.

F. RECORD INVERT ELEVATIONS OF ALL YCO'S ON "AS-BUILT" DRAWINGS.

G. MINIMUM 3" WASTE LINE BELOW FLOOR AND MINIMUM 2" WASTE RISER, UNLESS NOTED OTHERWISE (UNO).

H. PLUMBING CONTRACTOR SHALL PAY FOR ALL UTILITY CONNECTIONS FEES, PERMITS, TESTS AND INSPECTIONS. FURNISH 3 COPIES OF INSPECTION CERTIFICATE BEFORE REQUESTING FINAL PAYMENT.

I. PLUMBING CONTRACTOR SHALL BE RESPONSIBLE FOR PATCHING AND REPAIRING ALL AREAS WHICH ARE DAMAGED BY HIS OPERATIONS.

J. CUTTING OF CONCRETE FLOORS SHALL BE BY MACHINE SAW. HOLES FOR PIPES (WALL OR FLOOR) SHALL BE DONE WITH CORE DRILLING EQUIPMENT WITH PRIOR APPROVAL FROM THE STRUCTURAL ENGINEERS.

K. PRESSURE TEST ALL INSTALLATIONS PRIOR TO CONNECTING EQUIPMENTS.

L. LABEL ALL PIPING PER ANSI STANDARD.

M. PROVIDE PROPER INSULATION ON ALL HOT WATER PIPING, STORM PIPING AND CONDENSATE PIPING.

N. PROVIDE SHUT-OFF VALVES (STOPS) ON ALL ROUGH-INS TO FIXTURES AND EQUIPMENTS.

O. PROVIDE ANY BACK FLOW PREVENTION DEVICE REQUIRED BY CODE OR GOVERNING AUTHORITIES. CONTRACTOR SHALL VERIFY THIS WITH CITY OR LOCAL AGENCIES AND INCLUDE COST OF SAME IN BID. CONTRACTOR TO HAVE BACK FLOWS CERTIFIED.

P. PROVIDE WATER HAMMER ARRESTORS AS INDICATED ON THE DRAWINGS. AIR CHAMBERS NOT AN APPROVED SUBSTITUTE.

Q. ALL EXPOSED PIPING FOR DESIGNATED DISABLED ACCESS FIXTURES SHALL BE COVERED OR OTHERWISE WRAPPED IN ACCORDANCE WITH A.D.A. REQUIREMENTS AND LOCAL AUTHORITY.

R. ALTERNATE MATERIALS NOT IDENTIFIED IN SPECIFICATIONS/DRAWINGS BUT APPROVED BY LOCAL AUTHORITY SHALL BE SUBMITTED TO ARCHITECT AND PLUMBING ENGINEER FOR REVIEW PRIOR TO INSTALLATION.

S. ISOMETRIC DIAGRAMS ARE FOR SIZING PURPOSES ONLY AND SHALL NOT BE USED FOR MATERIAL TAKE-OFFS, OR BE CONSTRUED TO INDICATE ACTUAL SITE INSTALLATION.

T. DRAWING IS DIAGRAMMATIC ONLY. CONTRACTOR SHALL COORDINATE EXACT LOCATIONS OF PIPING, DEVICES AND EQUIPMENT WITH BUILDING ELEMENTS AND THE WORK OF OTHER TRADES.

U. EVERY FLOOR DRAIN, FLOOR SINK OR HUB DRAIN SHALL BE SERVED BY AN AUTOMATIC TRAP PRIMER, UNO.

V. CLEANING CLEAN AND DISINFECT POTABLE DOMESTIC WATER PIPING AS FOLLOWS:
1. PURGE NEW PIPING AND PARTS OF EXISTING DOMESTIC WATER PIPING THAT HAVE BEEN ALTERED, EXTENDED, OR REPAIRED BEFORE USING.
2. USE PURGING AND DISINFECTING PROCEDURES PRESCRIBED BY AUTHORITIES HAVING JURISDICTION OR, IF METHODS ARE NOT PRESCRIBED, PROCEDURES DESCRIBED IN EITHER AWWA C651 OR AWWA C652 OR AS DESCRIBED BELOW:
A. FLUSH PIPING SYSTEM WITH CLEAN, POTABLE WATER UNTIL DIRTY WATER DOES NOT APPEAR AT OUTLETS.
B. FILL AND ISOLATE SYSTEM ACCORDING TO EITHER OF THE FOLLOWING:
1) FILL SYSTEM OR PART THEREOF WITH WATER/CHLORINE SOLUTION WITH AT LEAST 50 PPM (50 MG/L) OF CHLORINE, ISOLATE WITH VALVES AND ALLOW TO STAND FOR 24 HOURS.
2) FILL SYSTEM OR PART THEREOF WITH WATER/CHLORINE SOLUTION WITH AT LEAST 200 PPM (200 MG/L) OF CHLORINE, ISOLATE AND ALLOW TO STAND FOR THREE HOURS.
C. FLUSH SYSTEM WITH CLEAN, POTABLE WATER UNTIL NO CHLORINE IS IN WATER COMING FROM SYSTEM AFTER THE STANDING TIME.
D. SUBMIT WATER SAMPLES IN STERILE BOTTLES TO AUTHORITIES HAVING JURISDICTION. REPEAT PROCEDURES IF BIOLOGICAL EXAMINATION SHOWS CONTAMINATION.
B. PREPARE AND SUBMIT REPORTS OF PURGING AND DISINFECTING ACTIVITIES.
C. CLEAN INTERIOR OF DOMESTIC WATER PIPING SYSTEM, REMOVE DIRT AND DEBRIS AS WORK PROGRESSES.

PLUMBING SYMBOL LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	BALL VALVE		DOMESTIC COLD WATER
	CHECK VALVE		DOMESTIC HOT WATER
	GATE VALVE		DOMESTIC HOT WATER RETURN
	UNION		SANITARY SEWER VENT
	DIRECTION OF FLOW		SANITARY WASTE LINE
	WALL CLEANOUT	140°	140° HOT WATER
	FLOOR CLEANOUT YARD CLEANOUT		SANITARY DIRECTION OF FLOW
	FLOOR SINK		BRANCH - TOP CONNECTION
	FLOOR DRAIN		PIPE RISER
	WALL HYDRANT OR HOSE BIBB		PIPE DROP
WHA	WATER HAMMER ARRESTOR		POINT OF CONNECTION (APPROXIMATED FIELD VERIFY EXACT POINT OF CONNECTION)

NOTE: 1. NOT ALL SYMBOLS USED ON THIS PROJECT
2. INSTALL WATER CLOSET FLUSH VALVE HANDLE TOWARDS WIDER SIDE OF WATER CLOSET OR DOOR OPENING.
3. INSTALL ADA APPROVED FLUSH VALVE HANDLE FOR ADA PLUMBING FIXTURES.

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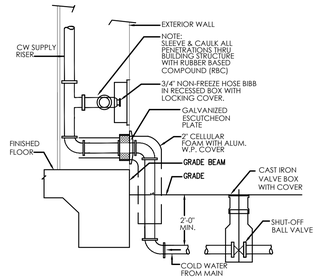
PLUMBING SCHEDULE LEGEND

P3.1

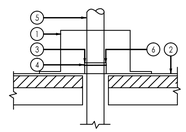
01



WATER SERVICE ENTRANCE DETAIL

NO SCALE

05

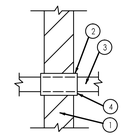


1. PREFABRICATED ROOF CURB. FURNISHED & INSTALLED BY ROOFING CONTR. [COORDINATE]
2. METAL ROOFING
3. STAINLESS STEEL CLAMP
4. SLEEVE PIPE BY ROOFING CONTR.
5. VTR
6. PROVIDE CAULKING GROVE
7. LOCATE MIN. 10'-0" FROM A/C AIR INTAKES

VENT THRU ROOF DETAIL

NO SCALE

09



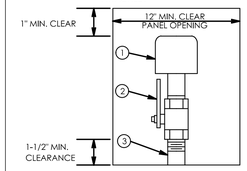
1. MASONRY WALL
2. GALVANIZED SCHEDULE 40 STEEL OR COPPER SLEEVE. SIZE TO BE MINIMUM 3/8" LARGER IN DIAMETER THAN PIPE AND INSULATION.
3. PLUMBING PIPE (REUSER LINES, DOMESTIC WATER, AIR, AND GAS PIPING).
4. FILL VOID WITH MINERAL WOOL AND CAULK VERMIN TIGHT.

WALL SLEEVE DETAIL

NO SCALE

13

1. WATER HAMMER ARRESTOR. SIZE AS PER MANUFACTURER'S
2. BALL VALVE. SAME NOMINAL SIZE AS PIPE BRANCH. OPENING IN BALL VALVE TO MATCH PIPE I.D.
3. PIPE SAME SIZE AS BRANCH LINE TO WHICH IT IS ATTACHED.



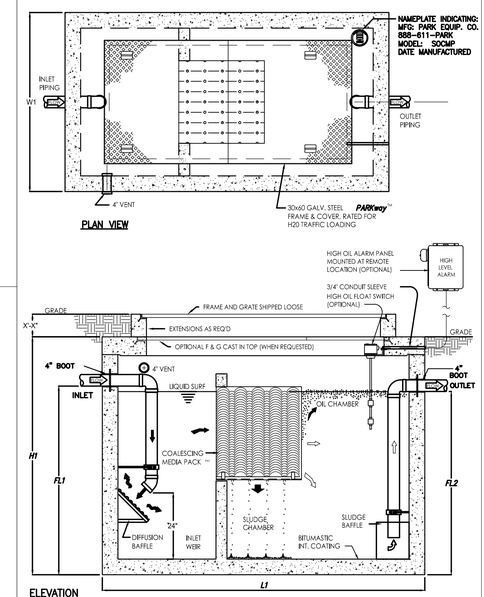
NOTE: PROVIDE REDUCER IF REQUIRED BETWEEN VALVE AND WATER HAMMER ARRESTOR.

DIMENSIONS FOR MIN. PANEL SIZE AND OPENING IF WATER HAMMER ARRESTOR IS LOCATED IN WALL. LOCKING PANEL COLOR TO BE DETERMINED BY ARCHITECT.

WATER HAMMER ARRESTOR DETAIL

NO SCALE

17



SAND-OIL INTERCEPTOR SCHEDULE								
MODEL NO.	CAPACITY USGal	OIL CAP. US (GAL)	EMPTY WT (LBS)	LENGTH L1	WIDTH W1	HEIGHT H1	INLET FL1	OUTLET FL2
SOCMP-750	750	375	10,000	7'-10"	4'-4"	6'-0"	4'-5"	4'-2"

SAND-OIL SEPARATOR DETAIL

NO SCALE

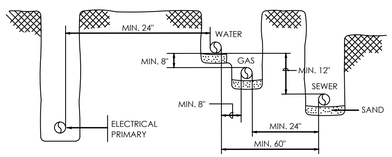
02

CLEAR TRENCH OF ALL ROCKS AND DEBRIS BEFORE ADDING SAND CUSHION.

COMPACT TRENCH FILL TO 95% PROCTOR DENSITY.

MAINTAIN A MINIMUM OF 60 INCHES UNDISTURBED EARTH BETWEEN PARALLEL WATER AND SEWER LINES OR SUPPORT WATER LINE ON SEPARATE SHELF A MINIMUM OF 12" ABOVE SEWER LINE.

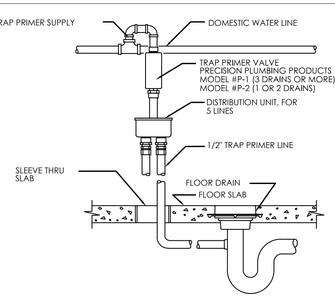
MAINTAIN A MINIMUM OF 24" HORIZONTALLY BETWEEN ELECTRICAL PRIMARY AND SEWER. MAINTAIN A MINIM OF 12" VERTICALLY OR 24" HORIZONTALLY BETWEEN ELECTRICAL PRIMARY AND WATER LINES, GAS LINES, TELEPHONE RACEWAYS AND CABLE RACEWAYS.



TRENCHING DETAIL

NO SCALE

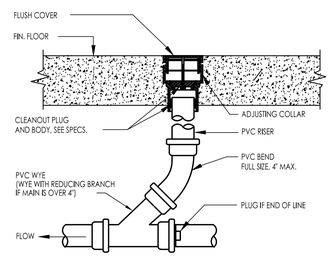
06



TRAP SEAL PRIMER DETAIL

NO SCALE

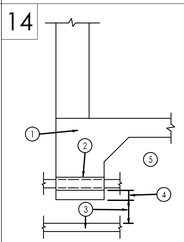
10



FLOOR CLEANOUT DETAIL

NO SCALE

14

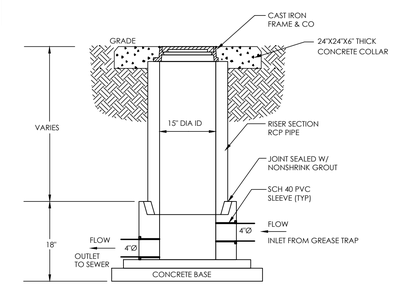


1. GRADE BEAM
2. GALVANIZED SCH 40 STEEL SLEEVE. SIZE PER SPECS. CENTER PIPE IN SLEEVE.
3. PIPING PASSING HORIZONTALLY UNDER GRADE BEAM SHALL BE LOCATED A MINIMUM OF 6" BELOW BEAM. PROVIDE A SLEEVE.
4. PIPING PASSING HORIZONTALLY THROUGH GRADE BEAM SHALL BE LOCATED NO LESS THAN 6" ABOVE BOTTOM OF BEAM.
5. COORDINATE LOCATIONS OF PIPING IN 3,4,5 ABOVE AS RELIEVING ARCHES OR ADDITIONAL CONCRETE MAY BE REQUIRED TO MAINTAIN STRUCTURAL INTEGRITY OF BEAM.

GRADE BEAM SLEEVE DETAIL

NO SCALE

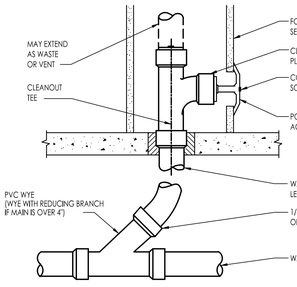
18



SAMPLE WELL BASIN

NO SCALE

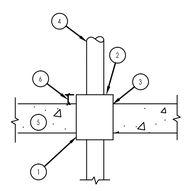
03



WALL CLEANOUT DETAIL

NO SCALE

07

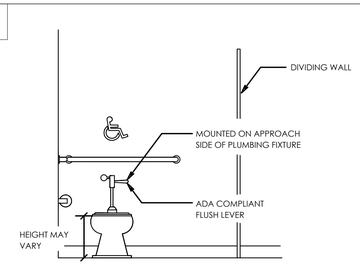


1. METAL SLEEVE TWO SIZES LARGER THAN PIPE
2. FILL VOID WITH NON-SHRINKING WATERPROOF, VERMIN PROOF MATERIAL
3. ALL PLUMBING PIPE PENETRATIONS THROUGH GROUND FLOOR, AND GRADE BEAMS SHALL BE SLEEVED
4. PIPE
5. CONCRETE SLAB
6. MINIMUM 2"

FLOOR PENETRATION DETAIL

NO SCALE

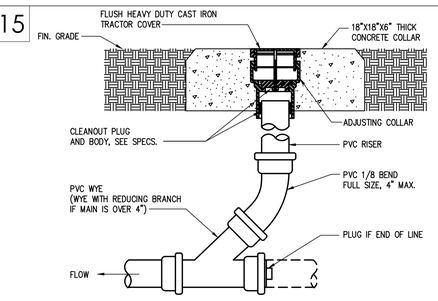
11



ADA WATER CLOSET DETAIL

NO SCALE

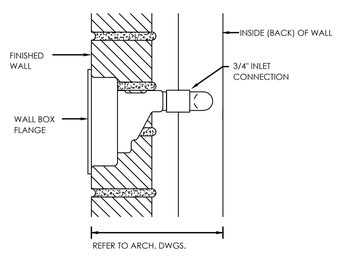
15



YARD CLEANOUT DETAIL

NO SCALE

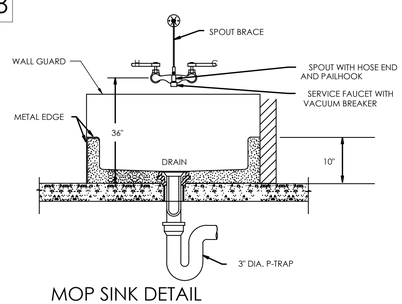
04



WALL HYDRANT DETAIL

NO SCALE

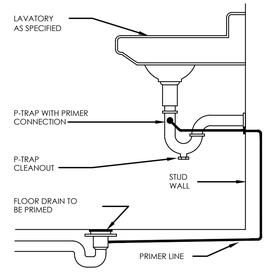
08



MOP SINK DETAIL

NO SCALE

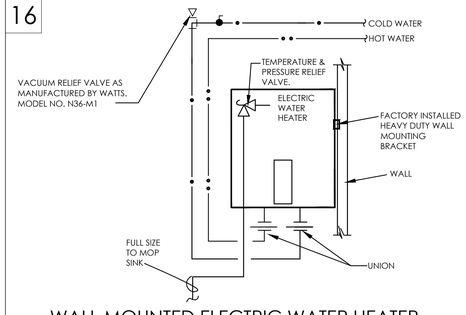
12



TRAP SEAL PRIMER INSTALLATION DETAIL

NO SCALE

16



WALL MOUNTED ELECTRIC WATER HEATER

NO SCALE

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McAllen Harlingen

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CONSULTANTS:

NO.	DATE	DESCRIPTION

MAINTENANCE HANGAR FOR SOUTH TEXAS INTERNATIONAL AIRPORT AT EDINBURG
CITY OF EDINBURG
EDINBURG, TEXAS

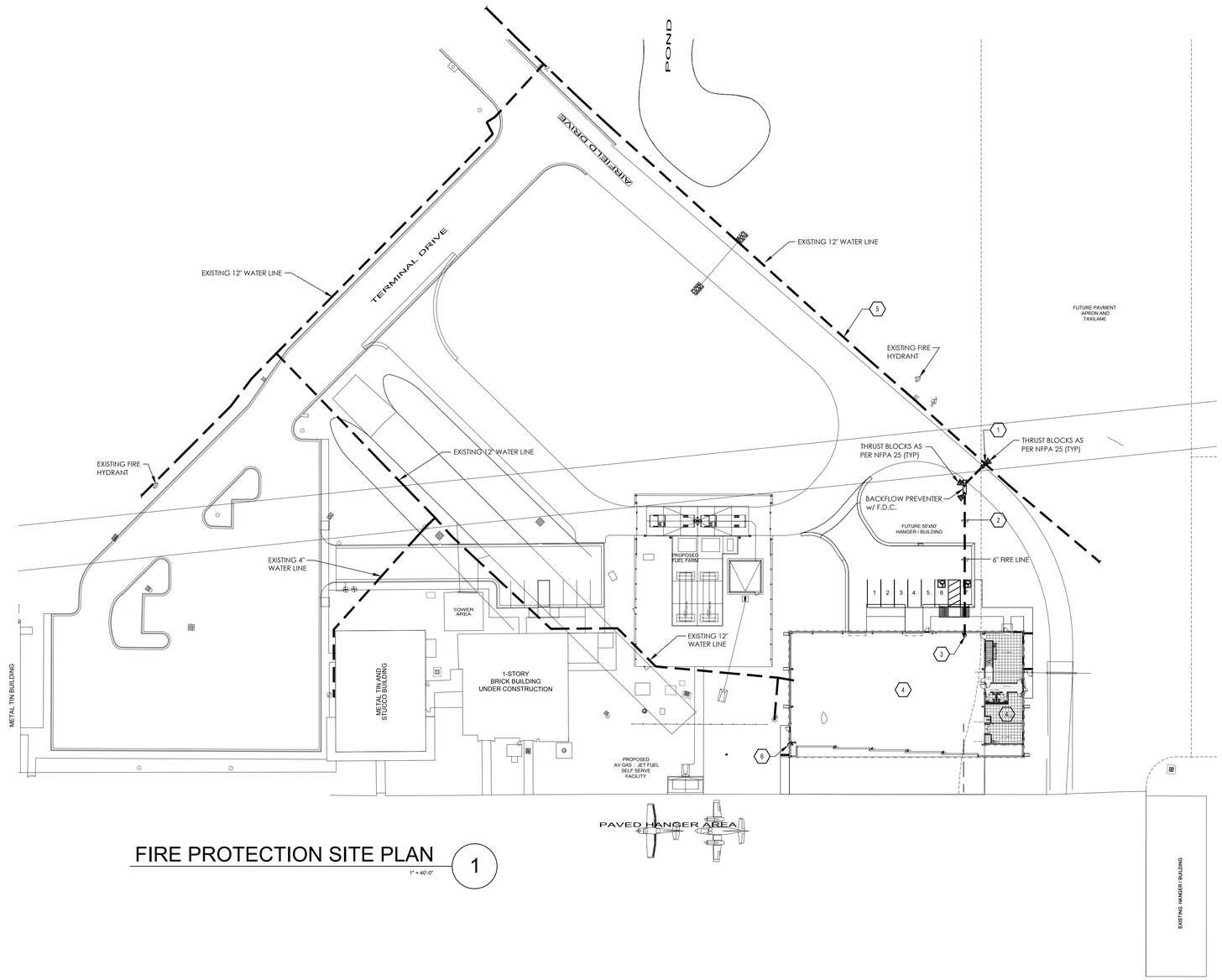
PROJECT NO:	201320
DATE:	8/01/2014 11:56:13 AM
STARTING DATE:	06.03.2013
CK BY: L.M.	DWN BY: ---

PLUMBING DETAILS

P4.1

TRINITY MEP ENGINEERING
3533 Moreland Dr. Ste A I Weslaco, Tx 78596
p:956.973.0500 I f:956-351-5750
www.trinitymep.com I Copyright 2014
Texas Registered Engineering Firm - F10362
Project number:14.2.07

08/01/14
STATE OF TEXAS
LEONARDO MUNOZ
97137



FIRE PROTECTION SITE PLAN 1

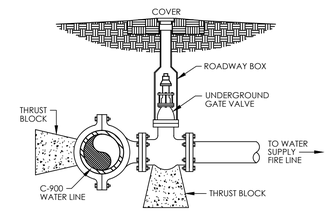
1" = 40'-0"

GENERAL NOTES: FIRE PROTECTION

1. SYSTEM TO BE DESIGNED TO MEET ALL LATEST NFPA CODES. PLANS SHALL BE SUBMITTED TO THE CITY OF EDINBURG FOR REVIEW AND APPROVAL. FIRE MARSHAL TO BE THE FINAL APPROVING AUTHORITY FOR ALL FIRE PROTECTION WORK.
2. ALL PIPE TO BE SIZED HYDRAULICALLY
3. DETAILS DESCRIBE SOME SPRINKLER COMPONENTS REQUIRED BY AN AUTOMATICALLY OPERATED SYSTEM. SPRINKLER CONTRACTOR TO PROVIDE ALL SYSTEM COMPONENTS REQUIRED FOR A TURN KEY FIRE SPRINKLER SYSTEM.
4. HAZARD CLASSIFICATION SHALL BE AS PER NFPA 13.
5. ALL ABOVE CEILING PIPING WILL NEED TO BE ROUTED AROUND CONDUITS, BEAMS, MECHANICAL DUCT WORK AND DRAIN LINES. ALL PIPE LEFT WITH TRAP WATER NEEDS TO BE PROVIDED W/ A DRAIN VALVE.
6. SEAL ALL WALL OPENINGS W/ MORTAR OR FIRE CAULKING.

KEYED NOTES: FIRE PROTECTION

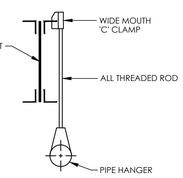
1. FIRE SPRINKLER MAIN TO CONNECT TO AN EXISTING 12" C-900 WATER LINE. REFER TO DETAIL #1.
2. RUN FIRE MAIN AND FDC LINES BETWEEN 3 AND 4 FEET DEEP. PROVIDE 4 INCHES OF SAND UNDER PIPE. COVER ALL PIPE AND LEAVE JOINTS EXPOSED FOR ENGINEER AND FIRE DEPARTMENT INSPECTION.
3. FIRE SPRINKLER SYSTEM RISER SHALL BE PLACED IN THIS AREA. REFER TO DETAIL #4.
4. THIS IS A NEW BUILDING FACILITY. FIRE PROTECTION SYSTEM TO COORDINATE WITH ALL OTHER TRADES.
5. REFER TO CIVIL PLAN FOR EXACT WATER MAIN LOCATIONS.
6. INSPECTOR'S TEST TO CONNECT TO FIRE PROTECTION SYSTEM.



1 TAPPING SLEEVE DETAIL

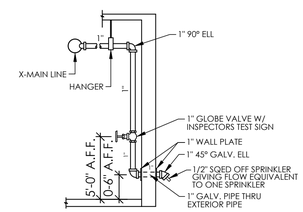
NTS

NOTE: CARE SHALL BE TAKEN DURING DIGGING. ALL LINES DAMAGED UNDERGROUND WILL BE FIXED BY THE CONTRACTOR.



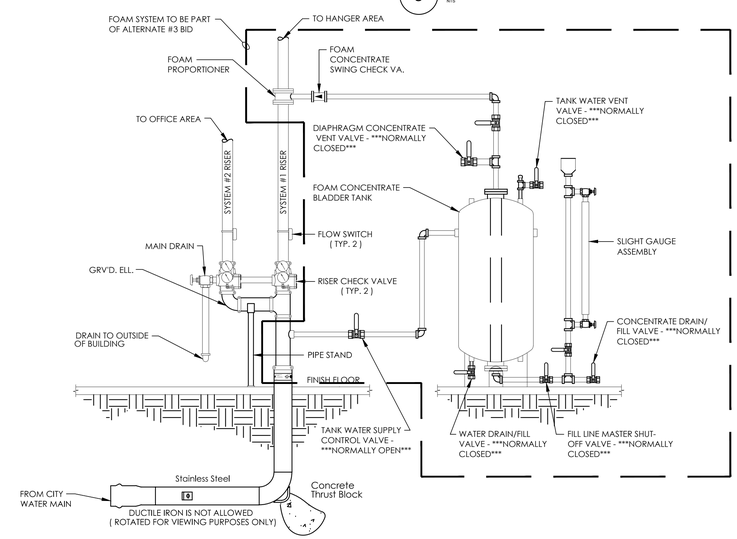
2 HANGER DETAIL

NTS



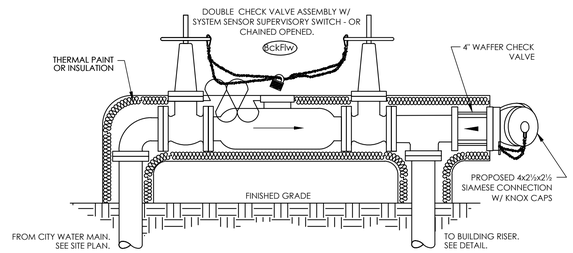
3 INSPECTOR'S TEST DETAIL

NTS



4 RISER ROOM DETAIL

NTS



5 BACKFLOW PREVENTER W/ F.D.C. DETAIL

NTS

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Texas Registered Engineering Firm - F10362
Project number:14.2.07

08/01/14
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CONSULTANTS:

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MAINTENANCE HANGAR FOR SOUTH TEXAS INTERNATIONAL AIRPORT AT EDINBURG CITY OF EDINBURG

EDINBURG, TEXAS

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FIRE PROTECTION SITE PLAN

FP1.1