MULTI-STEP BIDDING PROCESS
FOR
GENERAL CONTRACTORS

Single Project---Short-Listing

Request for Submittals

February 15, 2008

NEW DOWNTOWN SALT LAKE CITY WINE STORE

DEPARTMENT OF ALCOHOLIC BEVERAGE CONTROL
SALT LAKE CITY, UTAH

DFCM Project: Number 05051030

MJSA
357 West Pierpont Avenue
Salt Lake City, Utah 84101

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General Conditions dated May 25, 2005 --- By Reference

NOTICE TO CONTRACTORS

The State of Utah - Division of Facilities Construction and Management (DFCM) is requesting submissions for the following project:

Project Name: **New Downtown Salt Lake City Wine Store**
Department of Alcoholic Beverage Control – Salt Lake City, Utah

Project No. **05051030**

Project Description: The newly-constructed Downtown Salt Lake City Wine Store will provide approximately 12,000 gross square feet of space. It will be constructed on approximately one acre of property owned by the State of Utah. The site will be located at approximately 1563 South 300 West, Salt Lake City, Utah

Cost Estimate: **$1,300,000.00**

DFCM is entering into a Multi-Step Bidding Process for Construction services. A short-listing of contractors will be based on the selection criteria outlined in the bidding documents contained herein. Short-listed contractors will be invited to submit bids on the project described above. **The only contractors allowed to bid on this project will be contractors short-listed by the selection committee.**

All contractors responding to this procurement must comply with and require all of their subcontractors to comply with the license laws as required by the State of Utah.

The bidding documents including plans and specification, short-listing requirements and schedule will be available at 2:00 PM on Friday, February 15, 2008 on the DFCM web page at http://dfcm.utah.gov and from DFCM, 4110 State Office Building, Salt Lake City, Utah 84114, telephone (801) 538-3018. For questions regarding this solicitation, please contact Jim Russell, DFCM, at (801) 231-3489. No others are to be contacted regarding this solicitation.

A **mandatory** pre-submittal meeting to discuss the multi-step bidding process will be held at 10:00 AM on Wednesday, February 27, 2008 at the DFCM Office, 4110 State Office Building, Salt Lake City, Utah.

When bidding on this project, short-listed contractors will be required to submit a Bid Bond in the amount of five percent (5%) of the bid amount, made payable to the Division of Facilities Construction and Management on DFCM's Bid Bond Form. A Bid Bond must accompany each bid.

The Division of Facilities Construction & Management reserves the right to reject any or all submittals/bids or to waive any formality or technicality in any submittal/bid in the interest of the State.

DIVISION OF FACILITIES CONSTRUCTION AND MANAGEMENT
MARLA WORKMAN, CONTRACT COORDINATOR
4110 State Office Bldg., Salt Lake City, Utah 84114

DESCRIPTION OF WORK

The only contractors allowed to bid on this project will be contractors short-listed by the selection committee.

The newly constructed Downtown Salt Lake City Wine Store will provide approximately 12,000 gross square feet of space. It will be constructed on approximately one acre of property owned by the State of Utah. This project will include site improvements. The site will be located at approximately 1563 South 300 West, Salt Lake City, Utah

Individual contractors or alliances between two or more contractors are allowed in this process to form a team. However, one contractor or firm MUST be declared as the lead firm representing the team. If the team is short-listed through this multi-step process, the state will only enter into contracts with the lead contractor or firm. The lead contractor or firm must be licensed by the State of Utah and comply with and require all of its subcontractors to comply with the license laws as required by the State of Utah.

MULTI-STEP BIDDING PROCESS
SHORT-LISTING OF GENERAL CONTRACTORS

The short-listing of contractors will be based on the selection criteria outlined in this document.

1. Multi-Step Bidding Documents

The Multi-Step bidding documents consist of all of the information contained in this solicitation and all documents listed in the Table of Contents. All said documents are incorporated in this document by reference.

2. Availability of Documents

Bidding documents are available free of charge at the locations stated on the Schedule. The bidding documents are also available at DFCM's internet web site at http://dfcm.utah.gov.

3. Drawings and Specifications and Interpretations

Drawings, specifications and other contract documents may be obtained as stated in the Notice to Contractors. If any firm is in doubt as to the meaning or interpretation of any part of the drawings, specifications, scope of work or contract documents, they shall submit, in writing, a request for interpretation to the authorized DFCM representative by the deadline identified in the schedule. Answers to questions and interpretations will be made via addenda issued by DFCM. Neither DFCM nor the designer shall be responsible for incorrect information obtained by contractors from sources other than the official drawings/specifications and addenda issued by DFCM.

4. Contact Information

Except as authorized by the DFCM Representative or as otherwise stated in the bidding documents or the pre-submittal meeting, communication during the multi-step bidding process shall be directed to the specified DFCM's Representative. In order to maintain the fair and equitable treatment of everyone, contractors shall not unduly contact or offer gifts or gratuities to owners, users or selection committee members in an effort to influence the selection process or in a manner that gives the appearance of influencing the selection process. This prohibition applies before the bidding documents are issued as the project is developed, and extends through the award of a contract. Failure to comply with this requirement may result in a disqualification from the multi-step bidding process. Contractors should be aware that selection committee members will be required to certify that they have not been contacted by any of the contractors in an attempt to influence the selection process.

5. Requests for Information

All requests for information shall be in writing and directed to:

Project Manager Jim Russell
Division of Facilities Construction and Management
4110 State Office Building
Salt Lake City, Utah 84114
E-mail: jimrussell@utah.gov
Phone: 801-231-3489
Facsimile: (801) 538-3267

6. Schedule

The Schedule lists the important events, dates, times and locations of meetings and submittals that must be met by the contractor.

7. Pre-Submittal Meeting

A **mandatory** pre-submittal meeting will be held on the date and time and at the location listed on the Schedule. During the meeting, questions will be answered about the multi-step bidding process. Questions about the project, plans and specifications will also be addressed. Attendance at this meeting is mandatory for General Contractors.

8. Submittal Due Dates and Times

All required submittals must be delivered to, and received by, the Division of Facilities Construction and Management by the time deadline established in the Schedule. Submittals received after the specified time deadline will not be accepted. Please allow adequate time for delivery. If using a courier service, the contractor is responsible for ensuring that delivery will be made directly to the required location prior to the deadline.

9. Last Day to Submit Questions

Questions must be submitted in writing to the DFCM project manager by the deadline listed on the Schedule.

10. Addendum

All clarifications will be in writing and issued as addenda to the RFS. Addenda will be posted on DFCM's web site at http://dfcm.utah.gov. **Contractors are responsible for obtaining information contained in the addenda from the web site. Any addenda issued prior to the submittal deadline shall become part of the multi-step bidding process and any information required must be included in the contractor's submittal.** Addenda issued prior to the submittal deadline shall become part of the bidding process and must be acknowledged on the bid form. Failure to acknowledge addenda may result in disqualification from bidding. DFCM shall be responsible for incorrect information obtained by contractors from sources other than official addenda issued by DFCM.

11. Bid Bond Requirements

Short-listed contractors will be required to submit a bid bond in the amount of five percent (5%) of the bid amount made payable to the Division of Facilities Construction and Management on all bids. **The bid bond must be on the "Bid Bond Form" provided in this RFS (procurement documents) in order to be considered an acceptable bid.** If the bid bond security is submitted on a form other than DFCM's required "Bid Bond Form" and the bid security meets all other legal requirements, the contractor will be allowed to provide an acceptable bid bond by the close of business on the next business day following notification by DFCM of submission of a defective bid bond security.

12. Performance and References

DFCM will rate each firm's performance on every project worked on (rating scale: 1 = low; 5 = high). The rating may include comments from agencies. The firm will have an opportunity to review and comment on their ratings. Ratings on DFCM projects over the previous five years will be provided to the selection committee for their consideration in evaluating and scoring the past performance of each firm. If a firm has not completed at least three DFCM projects in the last five years, they shall provide by the time indicated on the Schedule, a list of references on additional projects for a total of five projects. References should include: (a) name and address of the project; (b) name and phone number of the person able to answer questions about the project; (c) date of when the work was completed; (d) the cost of the project and the type of project (school, office, warehouse, etc).

13. Statement of Qualifications

The Contractor (firm) shall provide three copies of a statement of qualifications by the time indicated on the Schedule. The statement should describe: (a) the financial viability of your firm; (b) the experience, skill level and qualifications of your firm - identify the specific project manager and site superintendent that will be assigned to this project; (c) provide examples of similar projects completed by your firm and the specific project manager and site superintendent that will be assigned to this project; (d) describe your firm's areas of expertise and other special qualifications as they pertain to this project; (e) document your firm's track record of completing projects on time and within budget; (f) explain your firm's reputation and commitment to high-quality workmanship; and (g) document your firm's ability to comply with the bonding requirements outlined earlier in this document. The statement of qualifications should be concise **(limit three pages)** yet contain sufficient information for evaluation by the selection committee. Note: If multiple firms combine to form a team, only the lead contractor or firm will be allowed to bid on projects. In addition, if any member of the team (contractor or firm) withdraws from the team, the entire team is disqualified and will not be allowed to bid.

14. Termination or Debarment Certification

Each firm must submit a certification that neither it nor its principals are presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from soliciting work by any governmental department or agency. The firm must also certify that neither the firm nor its principals have been terminated during the performance of a contract or withdrew from a contract to avoid termination. If the firm cannot certify to these statements, the firm shall submit a written explanation. Firms are to submit the certifications with their Statement of Qualifications.

15. Project Management Plan

Each Contractor (firm) shall provide three copies of a document describing their management plan by the time indicated on the Schedule. The document should include: (a) the process used for selecting and managing subcontractors; (b) a description of how the your firm is organized - pertaining to this project, document who will be in charge with decision making authority; (c) a project schedule detailing your firm's plan to ensure that the project will be completed on time (include timeline for ordering long lead materials and equipment); (d) a description of the process (action plan) your firm will take to bring the project back on schedule if it falls behind; (e) the procedures your firm has in place to minimize change orders; (f) the methodology used to ensure the accuracy of your bid; (g) your firm's approach to site security and project safety; (h) your firm's understanding of DFCM's construction general conditions and contract requirements; and (i) any other information that will assist the selection committee in evaluating your firm's approach to project management.

Include an organization chart of key personnel and a description of their duties. The management plan document should be concise **(limit three pages)** yet contain sufficient information for evaluation by the selection committee. The organization chart is a separate document and is not counted as one of the two pages.

16. Selection Committee

The selection committee will evaluate and score each firm/team. Committee members may include individuals from DFCM, User Agency/Institution, and a representative from the design or construction disciplines.

17. Interviews.

If interviews are required, firms will be notified of the date and time of their interview. Otherwise, the selection committee reserves the right to short-list firms/teams based on their submitted past performance ratings/references, statement of qualifications and project management plan.

If necessary, interviews will be conducted with all responsive and responsible contractors. Firms that are late or do not appear for the interview may be disqualified by the committee. The evaluation will be made using the selection criteria contained in this document. Information provided by the past performance/references, statement of qualifications, project management plan and the interview will be evaluated using the selection criteria as the basis for the selection. The purpose of the interview is to allow contractors an opportunity to present their qualifications, discuss past performance/references and describe their project management plan. It will also provide an opportunity for the selection committee to ask questions about these items. Firms may elect to have management personnel, project managers and superintendents in attendance. Attendance of subcontractors is at the discretion of the contractor. The method of presentation is at the discretion of the contractor.

18. Selection Criteria

The following criteria and weighting will be used in evaluating each firm/team. The selection committee will consider all criteria in performing a comprehensive evaluation of each firm/team. Each firm/team will be scored by each selection committee member in the categories listed below.

A. Performance Rating/References. The committee will receive a past performance rating and/or reference score for each firm/team. DFCM will compute the score for each firm/team based upon the information outlined earlier in this document. **Possible Points: 25**

B. Statement of Qualifications. The committee will evaluate and score each firm's/team's qualifications in accordance with the information outlined earlier in this document as well as additional information about the firm's/team's qualifications presented during the interview. **Possible Points: 40**

C. Project Management Plan. The committee will evaluate and score each firm's/team's project management approach in accordance with the information outlined earlier in this document as well as additional information about the firm's/team's project management approach presented during the interview. **Possible Points: 35**

TOTAL POINTS = 100 POINTS

19. Short-Listing

DFCM will **short-list up to four firms** receiving the highest score above the minimum score of 85 points from the selection committee. No firms receiving fewer than 85 points will be short-listed. Only short-listed firms will be invited to bid on this project. During the bidding process, the final contractor selection will be based on the lowest responsive and responsible bidder.

20. Product Approvals

Where reference is made to one or more proprietary products in the contract documents, but restrictive descriptive materials of one or more manufacturer(s) is referred to in the contract documents, the products of other manufacturers will be accepted, provided they equal or exceed the standards set forth in the drawings and specifications and are compatible with the intent and purpose of the design, subject to the written approval of the Designer. Such written approval must occur prior to the deadline established for the last scheduled addendum to be issued. The Designer's written approval will be included as part of the addendum issued by DFCM. If the descriptive material is not restrictive, the products of other manufacturers specified will be accepted without prior approval provided they are compatible with the intent and purpose of the design as determined by the Designer.

21. Trade Secrets or Confidential Matters

Any submitter may designate those portions of the submittals which contain trade secrets or other confidential matters that the Governmental Records and Access Management Act (GRAMA) would allow to be a protected record. Any disclosure of submittals or portions thereof shall be in accordance with GRAMA and State law.

22. Financial Responsibility of Contractors, Subcontractors and Sub-subcontractors

Contractors shall respond promptly to any inquiry in writing by DFCM to any concern of financial responsibility of the Contractor, Subcontractor or Sub-subcontractor. Failure to respond may result in the Contractor (firm) receiving a poor performance rating on this project.

23. Licensure

The Contractor shall comply with and require all of its Subcontractors to comply with the license laws as required by the State of Utah.

24. Permits

In concurrence with the requirements for permitting in the General Conditions, it is the responsibility of the Contractor to obtain the fugitive dust plan requirements from the Utah Division of Air Quality and the SWPPP requirements from the Utah Department of Environmental Quality and submit the completed forms and pay any permit fee that may be required for this specific project. Failure to obtain the required permit may result in work stoppage and/or fines from the regulating authority that will be the sole responsibility of the Contractor. Any delay to the project as a result of any such failure to obtain the permit or noncompliance with the permit shall not be eligible for any extension in the Contract Time.

25. Time is of the Essence

Time is of the essence in regard to all the requirements of the contract documents.

26. Bids

Before submitting a bid, each bidder shall carefully examine the contract documents; shall visit the site of the work; shall fully inform themselves as to all existing conditions and limitations; and shall include in the bid the cost of all items required by the contract documents including those added via addenda. If the bidder observes that portions of the contract documents are at variance with applicable laws, building codes, rules, regulations or contain obvious erroneous or uncoordinated information, the bidder shall promptly notify the DFCM Project Manager. Changes necessary to correct these issues will be made via addenda issued by DFCM.

The bid, bearing original signatures, must be typed or handwritten in ink on the Bid Form provided in the procurement documents and submitted in a sealed envelope at the location specified by the Notice to Contractor's prior to the published deadline for the submission of bids.

Bid bond security, in the amount of five percent (5%) of the bid, made payable to the Division of Facilities Construction and Management, shall accompany bid. THE BID BOND MUST BE ON THE BID BOND FORM PROVIDED IN THE PROCUREMENT DOCUMENTS IN ORDER TO BE CONSIDERED AN ACCEPTABLE BID.

If the bid bond security is submitted on a form other than the Owner's required bid bond form, and the bid security meets all other legal requirements, the bidder will be allowed to provide an acceptable bid bond by the close of business on the next business day following notification by DFCM of submission of a defective bid bond security. **A cashier's check cannot be used as a substitute for a bid bond.**

27. Listing of Subcontractors

Listing of Subcontractors shall be as summarized in the "Instructions and Subcontractors List Form", included as part of the contract documents. The Subcontractors List shall be delivered to DFCM or faxed to DFCM at (801)538-3677 within 24 hours of the bid opening. Requirements for listing additional subcontractors will be listed in the contract documents.

DFCM retains the right to audit or take other steps necessary to confirm compliance with requirements for the listing and changing of subcontractors. Any contractor who is found to not be in compliance with these requirements may receive a poor performance rating on this project.

28. Contract and Bond

The Contractor's Agreement will be in the form found in the specifications. The contract time will be as indicated in the bid. The successful bidder, simultaneously with the execution of the Contract Agreement, will be required to furnish a performance bond and a payment bond, both bearing original signatures, upon the forms provided in the procurement documents. The performance and payment bonds shall be for an amount equal to one hundred percent (100%) of the Contract Sum and secured from a company that meets the requirements specified in the requisite forms. Any bonding requirements for Subcontractors will be specified in the Supplementary General Conditions.

29. Award of Contract

The Contract will be awarded as soon as possible to the lowest, responsive and responsible bidder, based on the lowest combination of base bid and acceptable prioritized alternates, provided the bid is reasonable, is in the interests of DFCM to accept and after applying the Utah Preference Laws in U.C.A. Title 63, Chapter 56. DFCM reserves the right to waive any technicalities or formalities in any bid or in the bidding. Alternates will be accepted on a prioritized basis with Alternate 1 being highest priority, Alternate 2 having second priority, etc.

30. Right to Reject Bids

DFCM reserves the right to reject any or all Bids.

31. Withdrawal of Bids

Bids may be withdrawn on written request received from bidders within 24 hours after the bid opening if the contractor has made an error in preparing the bid.

MULTI-STEP PROJECT SCHEDULE

PROJECT NAME: **NEW DOWNTOWN SALT LAKE CITY WINE STORE**
DEPARTMENT OF ALCOHOLIC BEVERAGE CONTROL – SALT LAKE CITY, UTAH
DFCM PROJECT #: **05051030**

Event	Day	Date	Time	Place
Document Available, including Plans and Specifications	Friday	February 15, 2008	2:00 PM	DFCM 4110 State Office Building SLC, UT and DFCM web site*
Mandatory Pre-Submittal Meeting	Wednesday	February 27, 2008	10:00 AM	DFCM 4110 State Office Building SLC, UT
Last Day to Submit Questions (In Writing)	Friday	February 29, 2008	4:00 PM	Jim Russell- DFCM E-mail jimrussell@utah.gov Fax 801-538-3267
Final Addendum	Monday	March 3, 2008	2:00 PM	DFCM web site*
List of References, Statement of Qualifications, Project Management Plan, and Termination/Debarment Certification Due	Thursday	March 6, 2008	12:00 NOON	DFCM 4110 State Office Building SLC, UT
Interviews by Selection Committee (if necessary)	Tuesday	March 11, 2008	To Be Announced	
Short-List Announced	Thursday	March 13, 2008	2:00 PM	
Notice: Only Short-Listed Firms Will Be Allowed To Bid On This Project				
Prime Contractors Turn in Bid and Bid Bond/Bid Opening in DFCM Conference Room	Thursday	March 20, 2008	3:00 PM	DFCM 4110 State Office Building SLC, UT
Subcontractors List Due	Friday	March 21, 2008	3:00 PM	DFCM 4110 State Office Building SLC, UT Fax (801)-538-3677
Project Completion Date	Wednesday	October 15, 2008		

*** DFCM's web site address is http://dfcm.utah.gov**

BID FORM

NAME OF BIDDER _____ DATE _____

To the Division of Facilities Construction and Management
4110 State Office Building
Salt Lake City, Utah 84114

The undersigned, responsive to the "Notice to Contractors" and in accordance with the "Instructions to Bidders", in compliance with your invitation for bids for the **NEW DOWNTOWN SALT LAKE CITY WINE STORE DEPARTMENT OF ALCOHOLIC BEVERAGE CONTROL – SALT LAKE CITY, UTAH - DFCM PROJECT NO. 05051030** and having examined the Contract Documents and the site of the proposed Work and being familiar with all of the conditions surrounding the construction of the proposed Project, including the availability of labor, hereby proposes to furnish all labor, materials and supplies as required for the Work in accordance with the Contract Documents as specified and within the time set forth and at the price stated below. This price is to cover all expenses incurred in performing the Work required under the Contract Documents of which this bid is a part:

I/We acknowledge receipt of the following Addenda: _____

For all work shown on the Drawings and described in the Specifications and Contract Documents, I/we agree to perform for the sum of:

_____ DOLLARS ($_____)
(In case of discrepancy, written amount shall govern)

I/We guarantee that the Work will be Substantially Complete by **October 15, 2008** should I/we be the successful bidder, and agree to pay liquidated damages in the amount of **$2,000.00** per day for each day after expiration of the Contract Time as stated in Article 3 of the Contractor's Agreement.

This bid shall be good for 45 days after bid opening.

Enclosed is a 5% bid bond, as required, in the sum of _____

The undersigned Contractor's License Number for Utah is _____.

Upon receipt of notice of award of this bid, the undersigned agrees to execute the contract within ten (10) days, unless a shorter time is specified in the Contract Documents, and deliver acceptable Performance and Payment bonds in the prescribed form in the amount of 100% of the Contract Sum for faithful performance of the contract.

The Bid Bond attached, in the amount not less than five percent (5%) of the above bid sum, shall become the property of the Division of Facilities Construction and Management as liquidated damages for delay and additional expense caused thereby in the event that the contract is not executed and/or acceptable l00% Performance and Payment bonds are not delivered within the time set forth.

Type of Organization:

_____
(Corporation, Partnership, Individual, etc.)

Any request and information related to Utah Preference Laws:

_____

Respectfully submitted,

_____
Name of Bidder

ADDRESS:

_____

_____

_____
Authorized Signature

BID BOND

(Title 63, Chapter 56, U. C. A. l953, as Amended)

KNOW ALL PERSONS BY THESE PRESENTS:

That _____ hereinafter referred to as the "Principal," and_____, a corporation organized and existing under the laws of the State of _____, with its principal office in the City of _____ and authorized to transact business in this State and U. S. Department of the Treasury Listed, (Circular 570, Companies Holding Certificates of Authority as Acceptable Securities on Federal Bonds and as Acceptable Reinsuring Companies); hereinafter referred to as the "Surety," are held and firmly bound unto the STATE OF UTAH, hereinafter referred to as the "Obligee," in the amount of $_____(5% of the accompanying bid), being the sum of this Bond to which payment the Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that whereas the Principal has submitted to Obligee the accompanying bid incorporated by reference herein, dated as shown, to enter into a contract in writing for the _____Project.

NOW, THEREFORE, THE CONDITION OF THE ABOVE OBLIGATION IS SUCH, that if the said principal does not execute a contract and give bond to be approved by the Obligee for the faithful performance thereof within ten (10) days after being notified in writing of such contract to the principal, then the sum of the amount stated above will be forfeited to the State of Utah as liquidated damages and not as a penalty; if the said principal shall execute a contract and give bond to be approved by the Obligee for the faithful performance thereof within ten (10) days after being notified in writing of such contract to the Principal, then this obligation shall be null and void. It is expressly understood and agreed that the liability of the Surety for any and all defaults of the Principal hereunder shall be the full penal sum of this Bond. The Surety, for value received, hereby stipulates and agrees that obligations of the Surety under this Bond shall be for a term of sixty (60) days from actual date of the bid opening.

PROVIDED, HOWEVER, that this Bond is executed pursuant to provisions of Title 63, Chapter 56, Utah Code Annotated, 1953, as amended, and all liabilities on this Bond shall be determined in accordance with said provisions to same extent as if it were copied at length herein.

IN WITNESS WHEREOF, the above bounden parties have executed this instrument under their several seals on the date indicated below, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

DATED this _____ day of _____, 20_____ .

Principal's name and address (if other than a corporation):

_____

By:_____

Title: _____

Principal's name and address (if a corporation):

_____

By _____

Title: _____

(Affix Corporate Seal)

Surety's name and address:

_____

_____

By:_____

Attorney-in-Fact (Affix Corporate Seal)

STATE OF _____)
) ss.
COUNTY OF _____)

On this ____ day of _____, 20_____, personally appeared before me _____, whose identity is personally known to me or proved to me on the basis of satisfactory evidence, and who, being by me duly sworn, did say that he/she is the Attorney-in-fact of the above-named Surety Company, and that he/she is duly authorized to execute the same and has complied in all respects with the laws of Utah in reference to becoming sole surety upon bonds, undertakings and obligations, and that he/she acknowledged to me that as Attorney-in-fact executed the same.

Subscribed and sworn to before me this _____ day of _____, 20_____.
My Commission Expires: _____
Resides at: _____

_____

NOTARY PUBLIC

Agency: _____
Agent: _____
Address: _____
Phone: _____

Approved As To Form: May 25, 2005
By Alan S. Bachman, Asst Attorney General

INSTRUCTIONS AND SUBCONTRACTORS LIST FORM

The three low bidders, as well as all other bidders that desire to be considered, are required by law to submit to DFCM within 24 hours of bid opening a list of **ALL** first-tier subcontractors, including the subcontractor's name, bid amount and other information required by Building Board Rule and as stated in these Contract Documents, based on the following:

DOLLAR AMOUNTS FOR LISTING

PROJECTS UNDER $500,000: ALL FIRST-TIER SUBS $20,000 OR OVER MUST BE LISTED
PROJECTS $500,000 OR MORE: ALL FIRST-TIER SUBS $35,000 OR OVER MUST BE LISTED

- Any additional subcontractors identified in the bid documents shall also be listed.
- The DFCM Director may not consider any bid submitted by a bidder if the bidder fails to submit a subcontractor list meeting the requirements of State law.
- List subcontractors for base bid as well as the impact on the list that the selection of any alternate may have.
- Bidder may not list more than one subcontractor to perform the same work.
- If there are no subcontractors for the job that are required to be reported by State law (either because there are no subcontractors that will be used on the project or because there are no first-tier subcontractors over the dollar amounts referred to above), then you do not need to submit a sublist. If you do not submit a sublist, it will be deemed to be a representation by you that there are no subcontractors on the job that are required to be reported under State law. At any time, DFCM reserves the right to inquire, for security purposes, as to the identification of the subcontractors at any tier that will be on the worksite.

LICENSURE:

The subcontractor's name, the type of work, the subcontractor's bid amount, and the subcontractor's license number as issued by DOPL, if such license is required under Utah Law, shall be listed. Bidder shall certify that all subcontractors, required to be licensed, are licensed as required by State law. A subcontractor includes a trade contractor or specialty contractor and does not include suppliers who provide only materials, equipment, or supplies to a contractor or subcontractor.

'SPECIAL EXCEPTION':

A bidder may list 'Special Exception' in place of a subcontractor when the bidder intends to obtain a subcontractor to perform the work at a later date because the bidder was unable to obtain a qualified or reasonable bid under the provisions of U.C.A.Section 63A-5-208(4). The bidder shall insert the term 'Special Exception' for that category of work, and shall provide documentation with the subcontractor list describing the bidder's efforts to obtain a bid of a qualified subcontractor at a reasonable cost and why the bidder was unable to obtain a qualified subcontractor bid. The Director must find that the bidder complied in good faith with State law requirements for any 'Special Exception' designation, in order for the bid to be considered. If awarded the contract, the Director shall supervise the bidder's efforts to obtain a qualified subcontractor bid. The amount of the awarded contract may not be adjusted to reflect the actual amount of the subcontractor's bid. Any listing of 'Special Exception' on the sublist form shall also include amount allocated for that work.

GROUNDS FOR DISQUALIFICATION:

The Director may not consider any bid submitted by a bidder if the bidder fails to submit a subcontractor list meeting the requirements of State law. Director may withhold awarding the contract to a particular bidder if one or more of the proposed subcontractors are considered by the Director to be unqualified to do the Work or for

such other reason in the best interest of the State of Utah. Notwithstanding any other provision in these instructions, if there is a good faith error on the sublist form, at the sole discretion of the Director, the Director may provide notice to the contractor and the contractor shall have 24 hours to submit the correction to the Director. If such correction is submitted timely, then the sublist requirements shall be considered met.

CHANGES OF SUBCONTRACTORS SPECIFICALLY IDENTIFIED ON SUBLIST FORM:

Subsequent to twenty-four hours after the bid opening, the contractor may change its listed subcontractors only after receiving written permission from the Director based on complying with all of the following criteria.

(1) The contractor has established in writing that the change is in the best interest of the State and that the contractor establishes an appropriate reason for the change, which may include, but not is not limited to, the following reasons: the original subcontractor has failed to perform, or is not qualified or capable of performing, and/or the subcontractor has requested in writing to be released.
(2) The circumstances related to the request for the change do not indicate any bad faith in the original listing of the subcontractors.
(3) Any requirement set forth by the Director to ensure that the process used to select a new subcontractor does not give rise to bid shopping.
(4) Any increase in the cost of the subject subcontractor work is borne by the contractor.
(5) Any decrease in the cost of the subject subcontractor work shall result in a deductive change order being issued for the contract for such decreased amount.
(6) The Director will give substantial weight to whether the subcontractor has consented in writing to being removed unless the Contractor establishes that the subcontractor is not qualified for the work.

EXAMPLE:

Example of a list where there are only four subcontractors:

TYPE OF WORK	SUBCONTRACTOR, "SELF" OR "SPECIAL EXCEPTION"	SUBCONTRACTOR BID AMOUNT	CONTRACTOR LICENSE #
ELECTRICAL	ABCD Electric Inc.	$350,000.00	123456789000
LANDSCAPING	"Self" *	$300,000.00	123456789000
CONCRETE (ALTERNATE #1)	XYZ Concrete Inc	$298,000.00	987654321000
MECHANICAL	"Special Exception" (attach documentation)	Fixed at: $350,000.00	(TO BE PROVIDED AFTER OBTAINING SUBCONTRACTOR)

* Bidders may list "self", but it is not required.

PURSUANT TO STATE LAW - SUBCONTRACTOR BID AMOUNTS CONTAINED IN THIS SUBCONTRACTOR LIST SHALL NOT BE DISCLOSED UNTIL THE CONTRACT HAS BEEN AWARDED.

STATE OF UTAH - DEPARTMENT OF ADMINISTRATIVE SERVICES

Division of Facilities Construction and Management

DFCM

SUBCONTRACTORS LIST

FAX TO 801-538-3677

PROJECT TITLE: _____

Caution: You must read and comply fully with instructions.

TYPE OF WORK	SUBCONTRACTOR, "SELF" OR "SPECIAL EXCEPTION"	SUBCONTRACTOR BID AMOUNT	CONT. LICENSE #

We certify that:

l. This list includes all subcontractors as required by the instructions, including those related to the base bid as well as any alternates.
2. We have listed "Self" or "Special Exception" in accordance with the instructions.
3. All subcontractors are appropriately licensed as required by State law.

FIRM: _____

DATE: _____ SIGNED BY: _____

NOTICE: FAILURE TO SUBMIT THIS FORM, PROPERLY COMPLETED AND SIGNED, AS REQUIRED IN THESE CONTRACT DOCUMENTS, SHALL BE GROUNDS FOR OWNER'S REFUSAL TO ENTER INTO A WRITTEN CONTRACT WITH BIDDER. ACTION MAY BE TAKEN AGAINST BIDDERS BID BOND AS DEEMED APPROPRIATE BY OWNER. ATTACH A SECOND PAGE IF NECESSARY.

300/300/____/FVA/____/_____/__/_
Project No. _____

CONTRACTOR'S AGREEMENT

FOR:

_____
_____
_____

THIS CONTRACTOR'S AGREEMENT, made and entered into this __ day of _____, 2006, by and between the DIVISION OF FACILITIES CONSTRUCTION AND MANAGEMENT, hereinafter referred to as "DFCM", and _____, incorporated in the State of Utah and authorized to do business in the State of Utah, hereinafter referred to as "Contractor", whose address is _____Utah _____.

WITNESSETH: WHEREAS, DFCM intends to have _____ Work performed at _____
_____

WHEREAS, Contractor agrees to perform the Work for the sum stated herein.

NOW, THEREFORE, DFCM and Contractor for the consideration provided in this Contractor's Agreement, agree as follows:

ARTICLE 1. SCOPE OF WORK. The Work to be performed shall be in accordance with the Contract Documents prepared by _____ and entitled "_____."

The DFCM General Conditions ("General Conditions") dated May 25, 2005 on file at the office of DFCM and available on the DFCM website, are hereby incorporated by reference as part of this Agreement and are included in the specifications for this Project. All terms used in this Contractor's Agreement shall be as defined in the Contract Documents, and in particular, the General Conditions.

The Contractor Agrees to furnish labor, materials and equipment to complete the Work as required in the Contract Documents which are hereby incorporated by reference. It is understood and agreed by the parties hereto that all Work shall be performed as required in the Contract Documents and shall be subject to inspection and approval of DFCM or its authorized representative. The relationship of the Contractor to the DFCM hereunder is that of an independent Contractor.

ARTICLE 2. CONTRACT SUM. The DFCM agrees to pay and the Contractor agrees to accept in full performance of this Contractor's Agreement, the sum of _____**DOLLARS AND NO CENTS ($_____**), which is the base bid, and includes the cost of a 100%

Performance Bond and a 100% Payment Bond as well as all insurance requirements of the Contractor. Said bonds have already been posted by the Contractor pursuant to State law. The required proof of insurance certificates have been delivered to DFCM in accordance with the General Conditions before the execution of this Contractor's Agreement.

ARTICLE 3. TIME OF COMPLETION AND DELAY REMEDY. The Work shall be Substantially Complete by _____ after the date of the Notice to Proceed. Contractor agrees to pay liquidated damages in the amount of _____ per day for each day after expiration of the Contract Time until the Contractor achieves Substantial Completion in accordance with the Contract Documents, if Contractor's delay makes the damages applicable. The provision for liquidated damages is: (a) to compensate the DFCM for delay only; (b) is provided for herein because actual damages can not be readily ascertained at the time of execution of this Contractor's Agreement; (c) is not a penalty; and (d) shall not prevent the DFCM from maintaining Claims for other non-delay damages, such as costs to complete or remedy defective Work.

No action shall be maintained by the Contractor, including its or Subcontractor or suppliers at any tier, against the DFCM or State of Utah for damages or other claims due to losses attributable to hindrances or delays from any cause whatsoever, including acts and omissions of the DFCM or its officers, employees or agents, except as expressly provided in the General Conditions. The Contractor may receive a written extension of time, signed by the DFCM, in which to complete the Work under this Contractor's Agreement in accordance with the General Conditions.

ARTICLE 4. CONTRACT DOCUMENTS. The Contract Documents consist of this Contractor's Agreement, the Conditions of the Contract (DFCM General Conditions, Supplementary and other Conditions), the Drawings, Specifications, Addenda and Modifications. The Contract Documents shall also include the bidding documents, including the Notice to Contractors, Instructions to Bidders/Proposers and the Bid/Proposal, to the extent not in conflict therewith and other documents and oral presentations that are documented as an attachment to the contract.

All such documents are hereby incorporated by reference herein. Any reference in this Contractor's Agreement to certain provisions of the Contract Documents shall in no way be construed as to lessen the importance or applicability of any other provisions of the Contract Documents.

ARTICLE 5. PAYMENT. The DFCM agrees to pay the Contractor from time to time as the Work progresses, but not more than once each month after the date of Notice to Proceed, and only upon Certificate of the A/E for Work performed during the preceding calendar month, ninety-five percent (95%) of the value of the labor performed and ninety-five percent (95%) of the value of materials furnished in place or on the site. The Contractor agrees to furnish to the DFCM invoices for materials purchased and on the site but not installed, for which the

Contractor requests payment and agrees to safeguard and protect such equipment or materials and is responsible for safekeeping thereof and if such be stolen, lost or destroyed, to replace same.

Such evidence of labor performed and materials furnished as the DFCM may reasonably require shall be supplied by the Contractor at the time of request for Certificate of Payment on account. Materials for which payment has been made cannot be removed from the job site without DFCM's written approval. Five percent (5%) of the earned amount shall be retained from each monthly payment. The retainage, including any additional retainage imposed and the release of any retainage, shall be in accordance with UCA 13-8-5 as amended. Contractor shall also comply with the requirements of UCA 13-8-5, including restrictions of retainage regarding subcontractors and the distribution of interest earned on the retention proceeds. The DFCM shall not be responsible for enforcing the Contractor’s obligations under State law in fulfilling the retention law requirements with subcontractors at any tier.

ARTICLE 6. INDEBTEDNESS. Before final payment is made, the Contractor must submit evidence satisfactory to the DFCM that all payrolls, materials bills, subcontracts at any tier and outstanding indebtedness in connection with the Work have been properly paid. Final Payment will be made after receipt of said evidence, final acceptance of the Work by the DFCM as well as compliance with the applicable provisions of the General Conditions.

Contractor shall respond immediately to any inquiry in writing by DFCM as to any concern of financial responsibility and DFCM reserves the right to request any waivers, releases or bonds from Contractor in regard to any rights of Subcontractors (including suppliers) at any tier or any third parties prior to any payment by DFCM to Contractor.

ARTICLE 7. ADDITIONAL WORK. It is understood and agreed by the parties hereto that no money will be paid to the Contractor for additional labor or materials furnished unless a new contract in writing or a Modification hereof in accordance with the General Conditions and the Contract Documents for such additional labor or materials has been executed. The DFCM specifically reserves the right to modify or amend this Contractor's Agreement and the total sum due hereunder either by enlarging or restricting the scope of the Work.

ARTICLE 8. INSPECTIONS. The Work shall be inspected for acceptance in accordance with the General Conditions.

ARTICLE 9. DISPUTES. Any dispute, PRE or Claim between the parties shall be subject to the provisions of Article 7 of the General Conditions. DFCM reserves all rights to pursue its rights and remedies as provided in the General Conditions.

ARTICLE 10. TERMINATION, SUSPENSION OR ABANDONMENT. This Contractor’s Agreement may be terminated, suspended or abandoned in accordance with the General Conditions.

ARTICLE 11. DFCM'S RIGHT TO WITHHOLD CERTAIN AMOUNT AND MAKE USE THEREOF. The DFCM may withhold from payment to the Contractor such amount as, in DFCM's judgment, may be necessary to pay just claims against the Contractor or Subcontractor at any tier for labor and services rendered and materials furnished in and about the Work. The DFCM may apply such withheld amounts for the payment of such claims in DFCM's discretion. In so doing, the DFCM shall be deemed the agent of Contractor and payment so made by the DFCM shall be considered as payment made under this Contractor's Agreement by the DFCM to the Contractor. DFCM shall not be liable to the Contractor for any such payment made in good faith. Such withholdings and payments may be made without prior approval of the Contractor and may be also be prior to any determination as a result of any dispute, PRE, Claim or litigation.

ARTICLE 12. INDEMNIFICATION. The Contractor shall comply with the indemnification provisions of the General Conditions.

ARTICLE 13. SUCCESSORS AND ASSIGNMENT OF CONTRACT. The DFCM and Contractor, respectively bind themselves, their partners, successors, assigns and legal representatives to the other party to this Agreement, and to partners, successors, assigns and legal representatives of such other party with respect to all covenants, provisions, rights and responsibilities of this Contractor’s Agreement. The Contractor shall not assign this Contractor’s Agreement without the prior written consent of the DFCM, nor shall the Contractor assign any moneys due or to become due as well as any rights under this Contractor’s Agreement, without prior written consent of the DFCM.

ARTICLE 14. RELATIONSHIP OF THE PARTIES. The Contractor accepts the relationship of trust and confidence established by this Contractor's Agreement and covenants with the DFCM to cooperate with the DFCM and A/E and use the Contractor's best skill, efforts and judgment in furthering the interest of the DFCM; to furnish efficient business administration and supervision; to make best efforts to furnish at all times an adequate supply of workers and materials; and to perform the Work in the best and most expeditious and economic manner consistent with the interests of the DFCM.

ARTICLE 15. AUTHORITY TO EXECUTE AND PERFORM AGREEMENT. Contractor and DFCM each represent that the execution of this Contractor's Agreement and the performance thereunder is within their respective duly authorized powers.

ARTICLE 16. ATTORNEY FEES AND COSTS. Except as otherwise provided in the dispute resolution provisions of the General Conditions, the prevailing party shall be entitled to reasonable attorney fees and costs incurred in any action in the District Court and/or appellate body to enforce this Contractor's Agreement or recover damages or any other action as a result of a breach thereof.

IN WITNESS WHEREOF, the parties hereto have executed this Contractor's Agreement on the day and year stated hereinabove.

CONTRACTOR:

_____
Signature Date

Title: _____

_____
Please type/print name clearly

State of _____)
)
County of _____)

On this ____ day of _____, 20____, personally appeared before me, _____, whose identity is personally known to me (or proved to me on the basis of satisfactory evidence) and who by me duly sworn (or affirmed), did say that he (she) is the _____ (title or office) of the firm and that said document was signed by him (her) in behalf of said firm.

_____
Notary Public

(SEAL)

My Commission Expires _____

APPROVED AS TO AVAILABILITY
OF FUNDS:

_____
David D. Williams, Jr. Date
Date DFCM Administrative Services Director

DIVISION OF FACILITIES
CONSTRUCTION AND MANAGEMENT

_____
_____, Manager Date
Capital Improvements/Development

APPROVED AS TO FORM:
ATTORNEY GENERAL
May 25, 2005
By: Alan S. Bachman
Asst Attorney General

APPROVED FOR EXPENDITURE:

_____
Division of Finance Date

PERFORMANCE BOND

(Title 63, Chapter 56, U. C. A. 1953, as Amended)

That _____ hereinafter referred to as the "Principal" and _____, a corporation organized and existing under the laws of the State of _____, with its principal office in the City of _____ and authorized to transact business in this State and U. S. Department of the Treasury Listed (Circular 570, Companies Holding Certificates of Authority as Acceptable Securities on Federal Bonds and as Acceptable Reinsuring Companies); hereinafter referred to as the "Surety," are held and firmly bound unto the State of Utah, hereinafter referred to as the "Obligee, " in the amount of _____ DOLLARS ($_____) for the payment whereof, the said Principal and Surety bind themselves and their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written Contract with the Obligee, dated the _____ day of _____, 20____, to construct _____ in the County of _____, State of Utah, Project No. _____, for the approximate sum of _____ _____ Dollars ($_____), which Contract is hereby incorporated by reference herein.

NOW, THEREFORE, the condition of this obligation is such that if the said Principal shall faithfully perform the Contract in accordance with the Contract Documents including, but not limited to, the Plans, Specifications and conditions thereof, the one year performance warranty, and the terms of the Contract as said Contract may be subject to Modifications or changes, then this obligation shall be void; otherwise it shall remain in full force and effect.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the state named herein or the heirs, executors, administrators or successors of the Owner.

The parties agree that the dispute provisions provided in the Contract Documents apply and shall constitute the sole dispute procedures of the parties.

PROVIDED, HOWEVER, that this Bond is executed pursuant to the Provisions of Title 63, Chapter 56, Utah Code Annotated, 1953, as amended, and all liabilities on this Bond shall be determined in accordance with said provisions to the same extent as if it were copied at length herein.

IN WITNESS WHEREOF, the said Principal and Surety have signed and sealed this instrument this _____ day of _____, 20_____.

WITNESS OR ATTESTATION:

_____

PRINCIPAL:

_____

By: _____

(Seal)

Title: _____

WITNESS OR ATTESTATION:

_____

SURETY:

_____

By: _____
Attorney-in-Fact

(Seal)

STATE OF _____)
) ss.
COUNTY OF _____)

On this _____ day of _____, 20___, personally appeared before me _____, whose identity is personally known to me or proved to me on the basis of satisfactory evidence, and who, being by me duly sworn, did say that he/she is the Attorney in-fact of the above-named Surety Company and that he/she is duly authorized to execute the same and has complied in all respects with the laws of Utah inreference to becoming sole surety upon bonds, undertakings and obligations, and that he/she acknowledged to me that as Attorney-in-fact executed the same.

Subscribed and sworn to before me this _____ day of _____, 20_____.
My commission expires: _____
Resides at: _____

_____
NOTARY PUBLIC

Agency: _____
Agent: _____
Address: _____
Phone: _____

Approved As To Form: May 25, 2005
By Alan S. Bachman, Asst Attorney General

PAYMENT BOND

(Title 63, Chapter 56, U. C. A. l953, as Amended)

KNOW ALL PERSONS BY THESE PRESENTS:

That _____ hereinafter referred to as the "Principal," and _____ _____, a corporation organized and existing under the laws of the State of _____authorized to do business in this State and U. S. Department of the Treasury Listed (Circular 570, Companies Holding Certificates of Authority as Acceptable Securities on Federal Bonds and as Acceptable Reinsuring Companies); with its principal office in the City of _____, hereinafter referred to as the "Surety," are held and firmly bound unto the State of Utah hereinafter referred to as the "Obligee," in the amount of _____ _____ Dollars ($_____) for the payment whereof, the said Principal and Surety bind themselves and their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written Contract with the Obligee, dated the _____ day of _____, 20____, to construct _____ in the County of _____, State of Utah, Project No. _____ for the approximate sum of _____ _____ Dollars ($_____), which contract is hereby incorporated by reference herein.

NOW, THEREFORE, the condition of this obligation is such that if the said Principal shall pay all claimants supplying labor or materials to Principal or Principal's Subcontractors in compliance with the provisions of Title 63, Chapter 56, of Utah Code Annotated, l953, as amended, and in the prosecution of the Work provided for in said Contract, then, this obligation shall be void; otherwise it shall remain in full force and effect.

That said Surety to this Bond, for value received, hereby stipulates and agrees that no changes, extensions of time, alterations or additions to the terms of the Contract or to the Work to be performed thereunder, or the specifications or drawings accompanying same shall in any way affect its obligation on this Bond, and does hereby waive notice of any such changes, extensions of time, alterations or additions to the terms of the Contract or to the Work or to the specifications or drawings and agrees that they shall become part of the Contract Documents.

PROVIDED, HOWEVER, that this Bond is executed pursuant to the provisions of Title 63, Chapter 56, Utah Code Annotated, 1953, as amended, and all liabilities on this Bond shall be determined in accordance with said provisions to the same extent as if it were copied at length herein.

IN WITNESS WHEREOF, the said Principal and Surety have signed and sealed this instrument this _____ day of _____, 20____.

WITNESS OR ATTESTATION:

_____

(Seal)

PRINCIPAL:

_____

By: _____

Title: _____

WITNESS OR ATTESTATION:

_____

SURETY:

_____

By: _____

Attorney-in-Fact (Seal)

STATE OF _____)
) ss.
COUNTY OF _____)

On this _____ day of _____, 20_____, personally appeared before me _____ _____, whose identity is personally known to me or proved to me on the basis of satisfactory evidence, and who, being by me duly sworn, did say that he/she is the Attorney-in-fact of the above-named Surety Company, and that he/she is duly authorized to execute the same and has complied in all respects with the laws of Utah in reference to becoming sole surety upon bonds, undertakings and obligations, and that he/she acknowledged to me that as Attorney-in-fact executed the same.

Subscribed and sworn to before me this _____ day of _____, 20_____.
My commission expires: _____
Resides at: _____

_____
NOTARY PUBLIC

Agency: _____
Agent: _____
Address: _____
Phone:

Approved As To Form: May 25, 2005
By Alan S. Bachman, Asst Attorney General

DEPARTMENT OF ALCOHOLIC BEVERAGE CONTROL
NEW DOWNTOWN SALT LAKE CITY WINE STORE DFCM PROJECT # 05051030

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Gordon Spilker Huber
Geotechnical Consultants, Inc.

REPORT
GEOTECHNICAL STUDY
PROPOSED WINE STORE
EAST SIDE OF 300 WEST AT 1563 SOUTH
SALT LAKE CITY, UTAH

Submitted To:

MJSA Architects
357 West Pierpont Avenue
Salt Lake City, Utah 84101

Submitted By:

Gordon Spilker Huber Geotechnical Consultants, Inc.
4426 South Century Drive, Suite 100
Salt Lake City, Utah 84123

September 11, 2007

Job No. 0279-005-07

GSH
Gordon Spilker Huber
Geotechnical Consultants, Inc.

September 11, 2007
Job No. 0279-005-07

MJSA Architects
357 West Pierpont Avenue
Salt Lake City, Utah 84101

Attention: Mr. Kin Ng, PIC

Gentlemen:

Re: Report
Geotechnical Study
Proposed Wine Store
East Side of 300 West at 1563 South
Salt Lake City, Utah

1. INTRODUCTION

1.1 GENERAL

This report presents the results of our geotechnical study performed at the site of the proposed Wine Store facility, which is located on the east side of 300 West at 1563 South in Salt Lake City, Utah. The general location of the site with respect to major topographic features and existing facilities, as of 1998 and 1999, is presented on Figure 1, Vicinity Map. A more detailed layout of the site with respect to adjoining roadways and other facilities on an aerial photo base is presented on Figure 2, Area Map. A map showing the locations of the proposed building and pavement areas, along with existing buildings and streets is presented on Figure 3, Site Plan. The locations of the borings drilled in conjunction with this study are also presented on Figure 3.

1.2 OBJECTIVES AND SCOPE

The objectives and scope of our study were planned in discussions among Mr. Kin Ng of MJSA Architects, and Messrs. Bill Gordon and Hogan Wright of Gordon Spilker Huber Geotechnical Consultants, Inc. (GSH).

In general, the objectives of this study were to:

1. Accurately define and evaluate the subsurface soil and groundwater conditions across the site.

2. Provide appropriate foundation, earthwork, and pavement recommendations to be utilized in the design and construction of the proposed development.

In accomplishing these objectives, our scope has included the following:

1. A field program consisting of the drilling, logging, and sampling of 5 exploration borings extending to depths ranging from 5 to 31 feet.

2. A laboratory testing program.

3. An office program consisting of the correlation of available data, engineering analyses, and the preparation of this summary report.

1.3 AUTHORIZATION

Authorization was provided by returning a signed copy of our Professional Services Agreement No. 07-0254 dated February 28, 2007.

1.4 PROFESSIONAL STATEMENTS

Supporting data upon which our recommendations are based are presented in subsequent sections of this report. Recommendations presented herein are governed by the physical properties of the soils encountered in the exploration borings, projected groundwater conditions, and the layout and design data discussed in Section 2., Proposed Construction, of this report. If subsurface conditions other than those described in this report are encountered and/or if design and layout changes are implemented, GSH must be informed so that our recommendations can be reviewed and amended, if necessary.

Our professional services have been performed, our findings developed, and our recommendations prepared in accordance with generally accepted engineering principles and practices in this area at this time.

2. PROPOSED CONSTRUCTION

The proposed development includes a single-story building and paved driveways and parking areas. The building is to be located on the west side of the site as indicated on Figure 3.

General information provided by MJSA Architects indicates that the building will be approximately 12,000 square feet in area, one-level and of light steel-frame and masonry/block construction. The projected real wall loads will range from 2 to 3 kips per lineal foot. Projected real column loads will range from 50 to 80 kips. Real loads are defined as the total of all dead plus frequently applied (reduced) live loads.

The pavement areas will consist primarily of asphalt-paved driveways and parking areas. Pavements will include roadways entering and exiting the parking lot areas, as well as the driveway that circles the building. Traffic over the roadways will consist of a light to moderate volume of automobiles and light trucks, a light volume of medium-weight trucks, and occasional heavy-weight trucks.

Site grading cuts and fills of one to two feet are anticipated.

3. SITE INVESTIGATIONS

3.1 FIELD PROGRAM

In order to define and evaluate the subsurface soil and groundwater conditions within the area of the proposed building footprint, 5 borings were drilled to depths ranging from 5 to 31 feet with a truck-mounted drill rig equipped with hollow-stem augers. Locations of the borings drilled in conjunction with this study are presented on Figure 3. A boring was extended to a depth of 31 feet to address the liquefaction potential.

The field portion of our study was under the direct control and continual supervision of an experienced member of our geotechnical staff. During the course of the drilling operations, a continuous log of the subsurface conditions encountered was maintained. In addition, relatively undisturbed and small disturbed samples of the typical soils encountered were obtained for subsequent laboratory testing and examination. The soils were classified in the field based upon visual and textural examination. These classifications have been supplemented by subsequent inspection and testing in our laboratory. Detailed graphical representation of the subsurface conditions encountered is presented on Figures 4A through 4E, Log of Borings. Soils were classified in accordance with the nomenclature described on Figure 5, Unified Soil Classification System.

A 3.25-inch outside diameter, 2.42-inch inside diameter drive (Dames & Moore) sampler was utilized in the subsurface sampling at the site. The blow-counts recorded on the boring logs were those required to drive the sampler 12 inches with a 140-pound hammer dropping 30 inches.

Following completion of drilling operations, one and one-quarter-inch diameter slotted PVC pipe was installed in Borings B-1, B-2, and B-5 in order to provide a means of monitoring the groundwater fluctuations.

3.2 LABORATORY TESTING

3.2.1 General

In order to provide data necessary for our engineering analyses, a laboratory testing program has been performed. The testing program included moisture, density, and consolidation tests. The following paragraphs describe the tests and summarize the test data.

3.2.2 Moisture and Density Tests

To aid in classifying the soils and to help correlate the consolidation test data, moisture and density tests were performed on selected undisturbed samples. The results of these tests are presented on the boring logs, Figures 4A through 4E.

3.2.3 Consolidation Tests

To provide data necessary for our settlement analyses, a consolidation test was performed on each of two representative samples of the near-surface fine-grained cohesive soils. The results of the tests indicated that the soils are moderately over-consolidated and when loaded below the over-consolidation pressure will exhibit relatively low compressibility characteristics. Detailed results of the tests are maintained within our files and can be transmitted to you, upon your request.

4. SITE CONDITIONS

4.1 SURFACE

The site is located on the east side of 300 West Street at 1563 South in Salt Lake City, Utah. The site is rectangular in shape and is presently vacant.

The west property boundary is formed by 300 West Street, followed by commercial and light industrial shops. The north property line is occupied by a small single-story office building and a single-story warehouse-type building with an associated storage yard. The property to the east is occupied by a single-story home or small shop building. The south property boundary is formed by Harris Avenue, followed by light industrial-type buildings. The buildings on the property to the south are surrounded by paved driveways and parking areas. The site is fairly level with a gentle overall downward slope to the west. The relief across the site is approximately two to three feet.

No existing structures were observed on the site; however, widely scattered construction debris consisting of bricks and concrete pieces were identified on the ground surface. Sands and gravels were identified on the ground surface across the majority the site.

4.2 SUBSURFACE SOIL

The soil conditions encountered in each of the borings, to the depths penetrated, were relatively similar. The primary soil encountered was silty clay with some fine sand. The clays are brown, moist to saturated, and medium stiff to soft with depth. Fills consisting of silty fine and coarse gravel with some fine to coarse sand were encountered to depths of one-half to one foot. The fills exhibit variable and possibly poor engineering characteristics. The natural soils below the fill zone will exhibit moderate strength and compressibility characteristics within the anticipated loading range. A sand layer was identified between 13 and 16 feet in Boring B-5. The sands

were relatively loose as identified by the blow-counts of the sample retrieved at 15 feet below the ground surface.

The lines designating the interface between soil types on the boring logs generally represent approximate boundaries. In-situ, the transition between soil types may be gradual.

4.3 GROUNDWATER

To facilitate monitoring future groundwater fluctuations, before backfilling Borings B-1, B-2, and B-5, one and one-quarter-inch diameter slotted PVC pipe was installed. The following chart summarizes the groundwater levels measured:

Boring No.	Groundwater Depth (feet)	
	August 7, 2007	August 16, 2007
B-1	14.0	6.4
B-2	15.0	7.3
B-5	14.0	8.3

Seasonal and longer-term groundwater fluctuations on the order of one to two feet are projected with the highest seasonal levels generally occurring during the late spring and early summer months.

5. DISCUSSIONS AND RECOMMENDATIONS

5.1 SUMMARY OF FINDINGS

The most significant geotechnical aspect of the site is the surficial fills that range in depth from one-half to one foot at the boring locations. The existing fills, although granular, were observed to be inconsistent in composition and, in our opinion, should be considered non-engineered. Non-engineered fills generally exhibit variable and, in many cases, very poor engineering characteristics. Unless the fills can be shown to have been properly placed and compacted through documentation or in-place density testing, they should not be considered suitable to support footings or floor slabs.

Another concern is the moderately high groundwater level that was measured to be as shallow as 6.4 feet below the existing ground surface. Considering seasonal variations, we recommend a design water table of five feet below existing grade. It is our recommendation that the tops of all habitable slabs be established at least two feet above design water table. This would place the top of slabs a maximum of approximately three feet below existing grade.

The upper portions of the silty clays were found to be moderately stiff, moist to saturated, and brown.

The proposed structure can be supported upon conventional spread and continuous wall foundations proportioned utilizing a net bearing pressure of 2,000 pounds per square foot. The footings must be established directly upon the upper suitable natural near-surface clay soils and/or structural fill extending to suitable natural soil. The fill soils encountered may be re-utilized as structural fill within the building area.

In the following sections, detailed discussions pertaining to earthwork, spread and continuous wall foundations, lateral resistances, floor slabs, pavements, and the geoseismic setting of the site are provided.

5.2 EARTHWORK

5.2.1 Site Preparation

Prior to initiation of earthwork site preparation operations, all utility lines which pass through the footing portion of the proposed building must be abandoned or relocated. Subsequently, all surface vegetation, topsoil, and other deleterious material must be stripped from an area extending out at least three feet from the perimeter of all areas which will be structurally loaded. This includes the building footprint and areas of proposed outside flatwork and pavements. Topsoil is defined as the zone of soil containing major roots. Field data indicates that the depth of the topsoil is generally less than two to three inches. Surface fills must also be removed from an area extending out three feet from the building footprint. These granular fills may be left in place in other areas if properly prepared.

Subsequent to the stripping as described above and prior to the placement of any structural site grading fill, floor slabs, foundations, etc., the natural soil surface must be proofrolled by running over the surface continuously at least three times with moderate-weight rubber tire-mounted construction equipment. If any soft or unstable soil zones are encountered in pavement or outside flatwork areas, the unsuitable soils must be removed to a maximum depth of two feet and replaced with compacted granular fill. In foundation areas, all unsuitable soils must be removed. In proposed pavement and outside flatwork areas, the exposed fills must be scarified, moisture prepared, and recompacted to the requirements for structural fill.

Footings and floor slabs associated with previous structures must be removed to at least 12 inches below new construction.

5.2.2 Excavations

Temporary construction excavations not exceeding four feet in depth through cohesive soils above or below the water table may be constructed with near-vertical sideslopes. For excavations up to eight feet through cohesive soils above or below the water table, sideslopes

should be no steeper than one-half horizontal to one vertical. If granular soils are encountered above the water table, sideslopes should be flattened to three-quarters horizontal to one vertical. If below the water table, the slopes must be further flattened.

All excavations must be inspected periodically by qualified personnel. If any signs of instability or excessive sloughing are noted, immediate remedial action must be initiated.

5.2.3 Structural Fill

Structural fill may be required as site grading fill, possibly as replacement fill below some foundations, and as backfill over foundations and utilities. Either fine-grained and/or granular soils may be utilized as site grading fill. Site grading fill is defined as fill placed over fairly large open areas to raise overall site grade. The on-site fine-grained soils can be utilized as structural site grading fill but will require extremely close moisture control during placement and compaction. This will be very difficult, except during the late spring to mid fall months.

All structural fill must be free of sod, rubbish, construction debris, frozen soil, and other deleterious materials. The maximum particle size within structural site grading fill should generally not exceed four inches; although, occasional particles up to six to eight inches may be incorporated provided that they do not result in "honeycombing" or preclude the obtainment of the desired degree of compaction In confined areas, the maximum particle size should not exceed two and one-half inches. The maximum amount of fines within granular imported material should generally be restricted to 18 percent. Fine-grained soils utilized as structural site grading fill should have a plasticity index of 18 percent or less.

5.2.4 Fill Placement and Compaction

All structural fill placed beneath the building footprint must to be compacted to at least 95 percent of the maximum dry density as determined by the AASHTO[1] T-180 (ASTM[2] D-1557) compaction criteria. In proposed pavements and outside flatwork areas, fills can be compacted to 90 percent of the above-defined criteria provided that the fill thicknesses do not exceed 5 feet. The moisture content during placement and compaction of fine-grained soils should be maintained within 2 percent of optimum. Moisture content of granular soils should be such that the compaction criteria can be achieved.

Subsequent to stripping and prior to the placement of structural site grading fill, the subgrade should be prepared as discussed in Section 5.2.1, Site Preparation, of this report. In confined areas, subgrade preparation should consist of the removal of all loose or disturbed soils.

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1 American Association of State Highway and Transportation Officials
2 American Society for Testing and Materials

5.2.5 Utility Trenches

All utility trench backfill material below structurally loaded facilities (flatwork, floor slabs, roads, etc.) should be placed at the same density requirements established for structural fill. If the surface of the backfill becomes disturbed during the course of construction, the backfill should be proofrolled and/or properly compacted prior to the construction of any exterior flatwork over a backfilled trench. Proofrolling may be performed by passing moderately loaded rubber tire-mounted construction equipment uniformly over the surface at least twice. If excessively loose or soft areas are encountered during proofrolling, they should be removed to a maximum depth of two feet below design finish grade and replaced with structural fill.

Most utility companies and City-County governments are now requiring that Type A-1 or A-1a (AASHTO Designation – basically granular soils with limited fines) soils be used as backfill over utilities. These organizations are also requiring that in public roadways the backfill over major utilities be compacted over the full depth of fill to at least 96 percent of the maximum dry density as determined by the AASHTO T-180 (ASTM D-1557) method of compaction. We recommend that as the major utilities continue onto the site that these compaction specifications are followed.

5.3 SPREAD AND CONTINUOUS WALL FOUNDATIONS

5.3.1 Design Data

Our analyses indicate that the proposed structure may be supported upon conventional spread and continuous wall foundations. The footings can be established directly upon suitable near-surface clay soils using the 2,000 pounds per square foot utilized in design. The site soils are, in fact, capable of imposing higher pressures. For design, the following parameters are provided:

Minimum Recommended Depth of Embedment for Frost Protection	- 30 inches
Minimum Recommended Depth of Embedment for Non-frost Conditions	- 15 inches
Recommended Minimum Width for Continuous Wall Footings	- 18 inches
Minimum Recommended Width for Isolated Spread Footings	- 24 inches
Recommended Net Bearing Pressure for Real Load Conditions	- 2,000 pounds per square foot*

Bearing Pressure Increase
for Seismic Loading - 50 percent

* If required, higher bearing pressures are possible with granular structural replacement fill.

The term "net bearing pressure" refers to the pressure imposed by the portion of the structure located above lowest adjacent final grade. Therefore, the weight of the footing and backfill to lowest adjacent final grade need not be considered. Real loads are defined as the total of all dead plus frequently applied live loads. Total load includes all dead and live loads, including seismic and wind.

5.3.2 Installation

Under no circumstances should the footings be established upon loose or disturbed soil, sod, rubbish, construction debris, non-engineered fill, frozen soil, or other deleterious materials. If fine-grained soils become loose or disturbed, they must be totally removed and replaced with compacted granular fill. If granular soils become loose and disturbed, they must be recompacted to the requirements for structural fill before the footings are poured. The width of the replacement fill below footings should be equal to the width of the footing plus one foot for each foot of fill thickness.

5.3.3 Settlements

Settlements of foundations designed and installed in accordance with the above recommendations and supporting various loads are tabulated below:

Footing Type	Load	Net Bearing Pressure (psf)	Projected Maximum Settlements (inches)
Spread	Up to 80 kips	2,000	¼ to ⅝
Continuous Wall	Up to 5 kips per lineal foot	2,000	¼ to ½

Settlements will occur fairly rapidly with approximately 50 to 60 percent of the quoted settlements occurring during construction.

5.4 LATERAL RESISTANCE

Lateral loads imposed upon foundations due to wind or seismic forces may be resisted by the development of passive earth pressures and friction between the base of the footings and the supporting soils. In determining frictional resistance, a coefficient of 0.40 should be utilized for footings established upon natural soils. If established upon granular soil, a coefficient of 0.5 may

be used. Passive resistance provided by properly placed and compacted granular structural fill above the water table may be considered equivalent to a fluid with a density of 300 pounds per cubic foot. Below the water table, this granular soil should be considered equivalent to a fluid with a density of 150 pounds per cubic foot.

A combination of passive earth resistance and friction may be utilized provided that the friction component of the total is divided by 1.5.

5.5 FLOOR SLABS

Floor slabs may be established upon properly prepared existing suitable near-surface soils and/or upon structural fill extending to suitable natural soils. To act as a capillary break, it is recommended that floor slabs be directly underlain by at least four inches of "free-draining" fill, such as "pea" gravel or three-quarters to one-inch minus clean gap-graded gravel. Settlements of lightly to moderately loaded floor slabs are anticipated to be minor (less than one-quarter inch).

5.6 PAVEMENTS

The existing natural sand soils encountered at the site will exhibit moderately low pavement support characteristics when saturated or near saturated. With the subgrade soils and the projected traffic as discussed in Section 2., Proposed Construction, the following pavement sections are recommended:

Parking Areas

(Light Volume of Automobiles and Light Trucks,
Occasional Medium-Weight Trucks,
and No Heavy-Weight Trucks)
[2 equivalent 18-kip axle loads per day]

Flexible:

3.0 inches	Asphalt concrete
7.0 inches	Aggregate base course
Over	Properly prepared natural soils and/or structural site grading fill extending to suitable natural soils

Rigid:

5.0 inches	Portland cement concrete (non-reinforced)
4.0 inches	Aggregate base course
Over	Properly prepared natural soils and/or structural site grading fill extending to suitable natural soils

Primary Roadway Areas

(Moderate Volume of Automobiles and Light Trucks,
Light Volume of Medium-Weight Trucks,
and Occasional Heavy-Weight Trucks)
[10 equivalent 18-kip axle loads per day]

Flexible:

3.0 inches	Asphalt concrete
10.0 inches	Aggregate base course
Over	Properly prepared natural soils and/or structural site grading fill extending to suitable natural soils

Rigid:

6.0 inches	Portland cement concrete (non-reinforced)
6.0 inches	Aggregate base course
Over	Properly prepared natural soils and/or structural site grading fill extending to suitable natural soils

For dumpster pads, we recommend a pavement section consisting of six and one-half inches of Portland cement concrete, four inches of aggregate base course over properly prepared natural subgrade or site grading structural fills.

Rigid pavement sections are for non-reinforced Portland cement concrete. Construction of the rigid pavement should be in sections 10 to 12 feet in width with construction or expansion joints or one-quarter depth saw-cuts on no more than 12-foot centers. Saw-cuts must be completed within 24 hours of the "initial set" of the concrete and should be performed under the direction of the concrete paving contractor. The concrete should have a minimum 28-day unconfined compressive strength of 4,000 pounds per square inch and contain 6 percent ±1 percent air-entrainment.

5.7 GEOSEISMIC SETTING

5.7.1 General

Utah municipalities adopted the International Building Code (IBC) 2006 on January 1, 2007. The IBC 2006 code determines the seismic hazard for a site based upon 2002 mapping of bedrock accelerations prepared by the United States Geologic Survey (USGS) and the soil site class. The USGS values are presented on maps incorporated into the IBC code and are also available based on latitude and longitude coordinates (grid points).

The structure must be designed in accordance with the procedure presented in Section 1613, Earthquake Loads, of the IBC 2006 edition.

5.7.2 Faulting

Based upon our review of available literature, no active faults are known to pass through or immediately adjacent to the site. The site is located outside fault investigation zones identified by Salt Lake County. The nearest active fault is the Salt Lake portion of the Wasatch fault which is approximately 1.9 miles east of the site. The Wasatch fault zone is considered capable of generating earthquakes as large as magnitude 7.3[3].

5.7.3 Soil Class

For dynamic structural analysis, the Site Class D - Stiff Soil Profile as defined in Table 1613.5.2, Site Class Definitions, of the IBC 2006 can be utilized.

5.7.4 Ground Motions

The IBC 2006 code is based on 2002 USGS (United States Geologic Survey) mapping, which provides values of short and long period accelerations for the Site Class B-C boundary for the Maximum Considered Earthquake (MCE). This Site Class B-C boundary represents a

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[3] Arabasz, W.J., Pechmann, J.C., and Brown, E.D., 1992, Observational seismology and the evaluation of earthquake hazards and risk in the Wasatch Front area, Utah, in Gori, P.L., and Hays, W.W., eds., Assessment of regional earthquake hazards and risk along the Wasatch Front, Utah: U.S. Geological Survey Professional Paper 1500-D, 36 p.

hypothetical bedrock surface and must be corrected for local soil conditions. The following table summarizes the peak ground and short and long period accelerations for a MCE event and incorporates a soil amplification factor for a Site Class D soil profile in the second column. Based on the site latitude and longitude (40.735 degrees north and 111.899 degrees west, respectively), the values for this site are tabulated below:

Spectral Acceleration Value, T Seconds	**Site Class B-C Boundary [mapped values] (% g)**	**Site Class D [adjusted for site class effects] (% g)**
Peak Ground Acceleration	68.2	68.2
0.2 Seconds, (Short Period Acceleration)	$S_S = 170.6$	$S_{MS} = 170.6$
1.0 Seconds (Long Period Acceleration)	$S_1 = 68.8$	$S_{M1} = 103.2$

The IBC 2006 code design accelerations (S_{DS} and S_{D1}) are based on multiplying the above accelerations (adjusted for site class effects) for the MCE event by two-thirds (⅔).

5.7.5 Liquefaction

The site is located in an area that has been identified by Salt Lake County as having a "high" liquefaction potential. Liquefaction is defined as the condition when saturated, loose, finer-grained sand-type soils lose their support capabilities because of excessive pore water pressure which develops during a seismic event. The soils encountered within the majority our borings that extended to a maximum depth of 31 feet are fine-grained and cohesive and not susceptible to liquefaction, even during a major seismic event. However, one relatively thin layer of silty sand was encountered within Boring B-5 from a depth of approximately 13 to 16 feet below the existing ground surface. Liquefaction analyses on this layer indicate that the layer may liquefy during a major seismic event. Settlement related to liquefaction would be approximately one inch. It should be noted that the liquefiable sand layer was not encountered within the building area.

We appreciate the opportunity of providing this service for you. If you have any questions or require additional information, please do not hesitate to contact us.

Respectfully submitted,

GSH Geotechnical Consultants, Inc.

Hogan R. Wright, State of Utah No. 178699
Professional Engineer

Reviewed by:

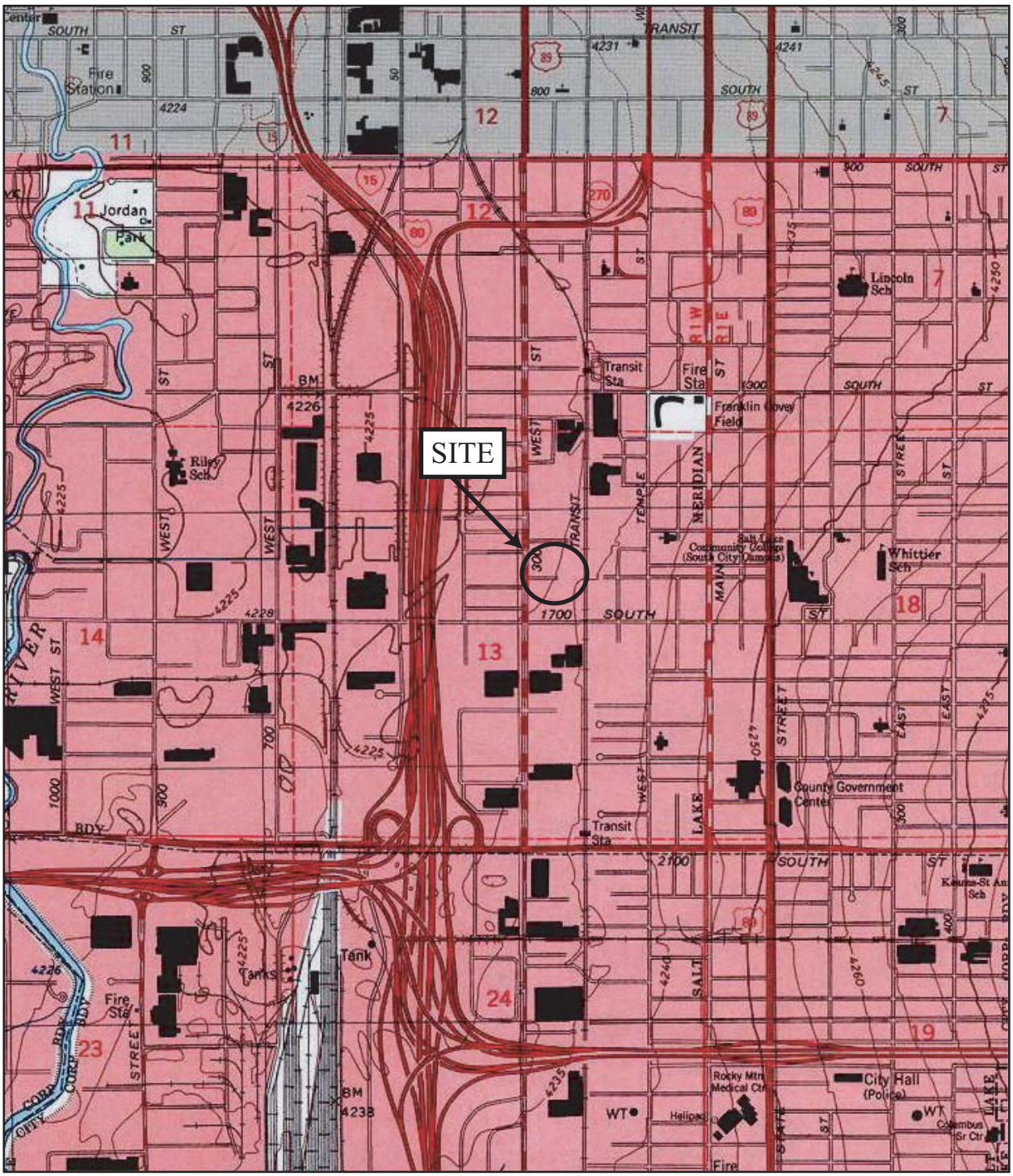
William J. Gordon, State of Utah No. 146417
Professional Engineer

HRW/WJG:sn

Encl. Figure 1, Vicinity Map
Figure 2, Area Map
Figure 3, Site Plan
Figures 4A through 4E, Log of Borings
Figure 5, Unified Soil Classification System

Addressee (3)

MJSA ARCHITECTS
JOB NO. 0279-005-07



SCALE IN FEET

1000 0 1000 2000

FIGURE 1
VICINITY MAP

REFERENCE:
USGS 7.5 MINUTE TOPOGRAPHIC AREA MAPS
TITLED "SALT LAKE CITY SOUTH, UTAH" DATED 1998
AND "SALT LAKE CITY NORTH, UTAH" DATED 1999

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Gordon Spilker Huber
Geotechnical Consultants, Inc.

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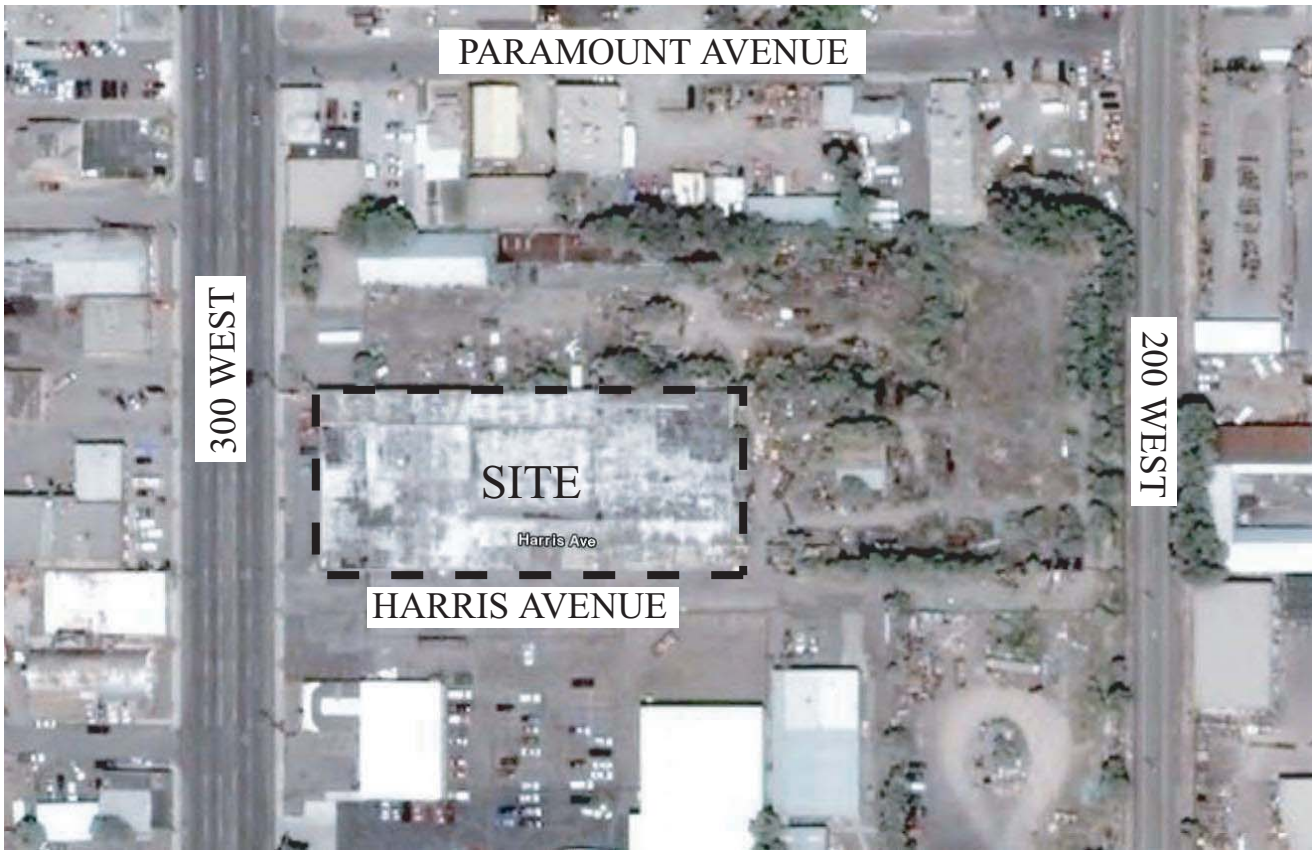
JOB NO. 0279-005-07



NOT TO SCALE

FIGURE 2
AREA MAP

REFERENCE:
ADAPTED FROM ARIAL PHOTOGRAPH
BY GOOGLE EARTH 2007

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JOB NO. 0279-005-07

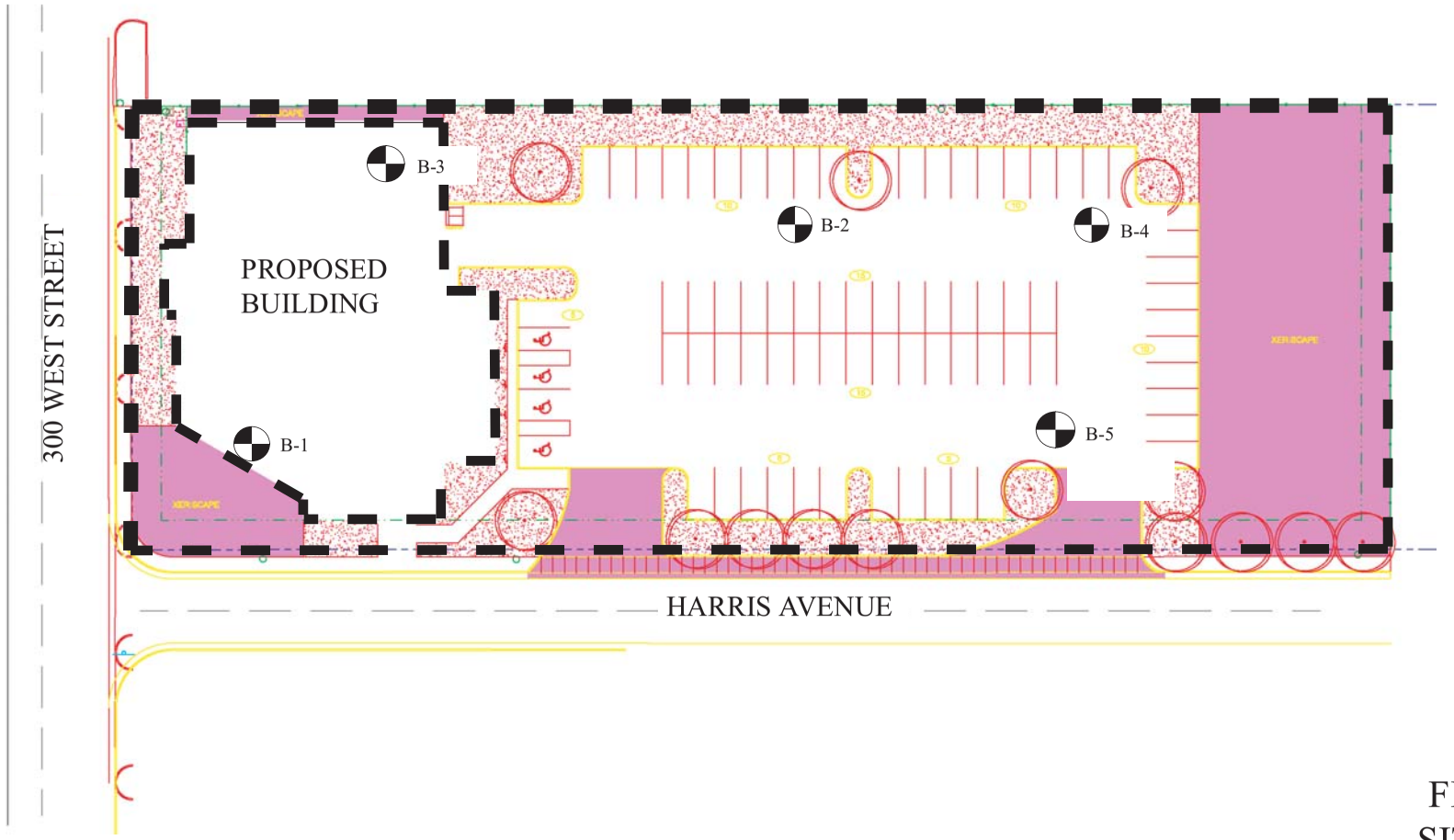

FIGURE 3
SITE PLAN

NOT TO SCALE

REFERENCE:
ADAPTED FROM PROVIDED BY CLIENT, NOT DATED

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Geotechnical Consultants, Inc.

Gordon Spilker Huber Geotechnical Consultants, Inc.
Salt Lake City, Utah 84123

Project Name: Proposed Wine Store
Project No.: 0279-005-07
Location: East side of 300 West at 1563 South, SLC, UT
Client: MJSA Architects
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 08-07-07
Elevation: Approximately 4240' +/-
Water Level: 14.0' (08-07-07) 6.4' (stabilized 08-16-07)
Remarks:

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		Ground Surface	0								
		SILTY GRAVEL, FILL with some fine sand; fine and coarse gravel; brown, FILL (GM)									moist
		SILTY CLAY with trace fine sand; brown (CL)									soft
				7		30.8		91			
			5	7		35.7		81			
			10	6							
											saturated medium stiff
		grades with occasional layers up to 2" thick of silty fine sand; grades to gray	15	16							
		grades without layers of fine sand; greenish-gray	20	9							
			25								

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 4A

Gordon Spilker Huber Geotechnical Consultants, Inc.
Salt Lake City, Utah 84123

Project Name: Proposed Wine Store
Project No.: 0279-005-07
Location: East side of 300 West at 1563 South, SLC, UT
Client: MJSA Architects
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 08-07-07
Elevation: Approximately 4240' +/-
Water Level: 14.0' (08-07-07) 6.4' (stabilized 08-16-07)
Remarks:

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		grades to gray		5							very soft
			30	2							
		Stopped driling at 29.5'.									
		Stopped sampling at 31.0'.									
		Installed 1-1/4" diameter slotted PVC pipe to 31.0'.									
			35								
			40								
			45								
			50								

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 4A
(con't)

Gordon Spilker Huber Geotechnical Consultants, Inc.
Salt Lake City, Utah 84123

Project Name: Proposed Wine Store
Project No.: 0279-005-07
Location: East side of 300 West at 1563 South, SLC, UT
Client: MJSA Architects
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 08-07-07
Elevation: Approximately 4240' +/-
Water Level: 15.0' (08-07-07) 7.3' (stabilized 08-16-07)
Remarks:

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		Ground Surface	0								
		SILTY GRAVEL, FILL with some fine sand; fine and coarse gravel; brown, FILL (GM)									
		SILTY CLAY with trace fine sand; brown (CL)									moist medium stiff
				13		26.7		93			
			5	6							soft
			10	8							
		SILTY SAND fine sand; brownish-gray (SM)									moist loose
			15	19							
		SILTY CLAY with numerous layers up to 1/8" thick of silt; gray (CL)									moist medium stiff
		Stopped drilling at 14.5'. Stopped sampling at 16.0'. Installed 1-1/4" diameter slotted PVC pipe to 16.0'.	20								
			25								

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 4B

Gordon Spilker Huber Geotechnical Consultants, Inc.
Salt Lake City, Utah 84123

Project Name: Proposed Wine Store
Project No.: 0279-005-07
Location: East side of 300 West at 1563 South, SLC, UT
Client: MJSA Architects
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 08-07-07
Elevation: Approximately 4240' +/-
Water Level: No groundwater encountered (08-07-07)
Remarks:

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		Ground Surface	0								
		SILTY GRAVEL, FILL with some fine sand; fine and coarse gravel; brown, FILL (GM)									moist "medium stiff"
		SILTY CLAY with trace fine sand; brown (CL)									
			5								
		Stopped drilling at 5.0'.									
		Stopped sampling at 3.5'.									
			10								
			15								
			20								
			25								

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 4C

Gordon Spilker Huber Geotechnical Consultants, Inc.
Salt Lake City, Utah 84123

Project Name: Proposed Wine Store
Project No.: 0279-005-07
Location: East side of 300 West at 1563 South, SLC, UT
Client: MJSA Architects
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 08-07-07
Elevation: Approximately 4240' +/-
Water Level: No groundwater encountered (08-07-07)
Remarks:

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		Ground Surface	0								
		SILTY GRAVEL, FILL with some fine sand; fine and coarse gravel; brown, FILL (GM)									moist "medium stiff"
		SILTY CLAY with trace fine sand; dark brown (CL)									
			5								
		Stopped drilling at 5.0'.									
		Stopped sampling at 2.5'.									
			10								
			15								
			20								
			25								

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 4D

Gordon Spilker Huber Geotechnical Consultants, Inc.
Salt Lake City, Utah 84123

Project Name: Proposed Wine Store
Project No.: 0279-005-07
Location: East side of 300 West at 1563 South, SLC, UT
Client: MJSA Architects
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 08-07-07
Elevation: Approximately 4240' +/-
Water Level: 14.0' (08-07-07) 8.3' (stabilized 08-16-07)
Remarks:

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		Ground Surface	0								
		SILTY GRAVEL, FILL with some fine sand; fine and coarse gravel; brown, FILL (GM)									
		SILTY CLAY with trace fine sand; dark brown (CL)									moist medium stiff
				11		22.7		95			
			5								
				11		32.3		89			
		grades to brownish-orange	10	6							soft
		SILTY SAND fine sand; gray (SM)									loose saturated
			15	20			40.3				no recovery
		Stopped drilling at 14.5'. Stopped sampling at 16.0'. Installed 1-1/4" diameter slotted PVC pipe to 16.0'.	20								
			25								

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 4E

UNIFIED SOIL CLASSIFICATION SYSTEM

FIELD IDENTIFICATION PROCEDURES				GRAPH SYMBOL	LETTER SYMBOL [1]	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS More than half of material is larger than No. 200 sieve size. [2] (The No. 200 sieve size is about the smallest particle visible to the naked eye)	GRAVELS More than half of coarse fraction is larger than No. 4 sieve size. (For visual classifications, the 1/4" size may be used as equivalent to the No. 4 sieve size.)	CLEAN GRAVELS (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes.		GW	Well graded gravels, gravel-sand mixtures, little or no fines.
			Predominantly one size or a range of sizes with some intermediate sizes missing.		GP	Poorly graded gravels, gravel-sand mixtures, little or no fines.
		GRAVELS WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below).		GM	Silty gravels, poorly graded gravel-sand-silt mixtures.
			Plastic fines (for identification procedures see CL below).		GC	Clayey gravels, poorly graded gravel-sand-clay mixtures.
	SANDS More than half of coarse fraction is smaller than No. 4 sieve size. (For visual classifications, the 1/4" size may be used as equivalent to the No. 4 sieve size.)	CLEAN SANDS (Little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate particle sizes.		SW	Well graded sands, gravelly sands, little or no fines.
			Predominantly one size or a range of sizes with some intermediate sizes missing.		SP	Poorly graded sands, gravelly sands, little or no fines.
		SANDS WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below).		SM	Silty sands, poorly graded sand-silt mixtures.
			Plastic fines (for identification procedures see CL below).		SC	Clayey sands, poorly graded sand-clay mixtures.

IDENTIFICATION PROCEDURES ON FRACTION SMALLER THAN No. 40 SIEVE SIZE		DRY STRENGTH (CRUSHING CHARACTERISTICS)	DILATANCY (REACTION TO SHAKING)	TOUGHNESS (CONSISTENCY NEAR PLASTIC LIMIT)			
FINE GRAINED SOILS More than half of material is smaller than No. 200 sieve size. (The No. 200 sieve size is about the smallest particle visible to the naked eye)	SILTS AND CLAYS Liquid limit less than 50	None to slight	Quick to slow	None		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sand with slight plasticity.
		Medium to high	None to very slow	Medium		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		Slight to medium	Slow	Slight		OL	Organic silts and organic silt-clays of low plasticity.
	SILTS AND CLAYS Liquid limit greater than 50	Slight to medium	Slow to none	Slight to medium		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
		High to very high	None	High		CH	Inorganic clays of high plasticity, fat clays.
		Medium to high	None to very slow	Slight to medium		OH	Organic clays of medium to high plasticity.
HIGHLY ORGANIC SOILS		Readily identified by color, odor, spongy feel and frequently by fibrous texture.				Pt	Peat and other highly organic soils.

[1] Boundary classifications: –Soils possessing characteristics of two groups are designated by combinations of group symbols. For example GW–GC, well graded gravel–sand mixture with clay binder.
[2] All sieve sizes on this chart are U.S. standard.

GENERAL NOTES

1. In general, Unified Soil Classification Designations presented on the logs were evaluated by visual methods only. There rore, actual designations (based on laboratory testing) may differ.

2. Lines seperating strata on the logs represent approximate boundaries only Actual transitions may be gradual.

3. Logs represent general soil conditions observed at teh point of exploration onthe date indicated.

4. No warranty is provided as to the continuity of soil conditions between individual sample locations.

FINE - GRAINED SOIL

CONSISTENCY	SPT (blows/ft)	TORVANE UNDRAINED SHEAR STRENGTH (tsf)	POCKET PENETROMETER UNCONFINED COMPRESSIVE STRENGTH (tsf)	FIELD TEST
Very Soft	<2	<0.125	<0.25	Easily penetrated several inches by Thumb. Squeezes through fingers.
Soft	2 - 4	0.125 - 0.25	0.25 - 0.5	Easily penetrated 1 " by Thumb . Molded by light finger pressure.
Medium Stiff	4 - 8	0.25 - 0.5	0.5 - 1.0	Penetrated over 1/2 " by Thumb with moerate effort. Molded by strong finger pressure.
Stiff	8 - 15	0.5 - 1.0	1.0 - 2.0	Indented about 1/2 " by Thumb but penetrated only with great effort
Very Stiff	15 - 30	1.0 - 2.0	2.0 - 4.0	Readily indented by Thumbnail
Hard	>30	>2.0	>4.0	Indented with difficulty by Thumbnail

LOG KEY SYMBOLS

- Bulk / Bag Sample
- Thin Wall
- Standard Penetration Split Spoon Sampler
- No Recovery
- Rock Core
- 3-3/4" ID D&M Sampler
- 3" ID D&M Sampler
- Water Level
- California Sampler

COARSE -GRAINDE SOIL

APPERENT DENSITY	SPT (blows/ft)	RELATIVE DENSITY (%)	FIELD TEST
Very Loose	<4	0 - 15	Easily penetrated with 1/2 " reinforcing rod pushed by hand
Loose	4 - 10	15 - 35	Difficult to penetrated with 1/2 " reinforcing rod pushed by hand
Medium Dense	10 - 30	35 - 65	Easily penetrated a foot with 1/2 " reinforcing rod driven with 5-lb hammer
Dense	30 - 50	65 - 85	Difficult to penetrated a foot with 1/2 " reinforcing rod driven with 5-lb hammer
Very Dense	>50	85 - 100	Penetrated only a few inches with 1/2 " reinforcing rod driven with 5-lb hammer

STRATIFICATION

DESCRIPTION	THICKNESS
SEAM	1/16 - 1/2 "
LAYER	1/2 - 12 "

DESCRIPTION	THICKNESS
Occasional	One or less per foot of thickness
Frequent	More than on per foot of thichness

CEMENTATION

DESCRIPTION	DESCRIPTION
Weakely	Crumbles or breaks with handling of slight finger pressure
Moderately	Crumbles or breaks with considerable finger pressure
Strongly	Will not crumbles or breaks with finger pressure

MODIFIERS

DESCRIPTION	%
Trace	<5
Some	5 - 12
With	>12

MOISTURE CONTENT

DESCRIPTION	FIELD TEST
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible water, usually soil below Water Table

FIGURE 5

GSH
Gordon Spilker Huber
Geotechnical Consultants, Inc.

SECTION 01100 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Work covered by the Contract Documents & Bid Packages
2. Type of the Contract.
3. Use of premises.
4. Owner's occupancy requirements.
5. Work restrictions.
6. Specification formats and conventions.

B. Related Sections include the following:

1. Division 1 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: NEW DOWNTOWN SALT LAKE CITY WINE STORE

1. Project Location: 300 WEST HARRIS AVE. (1563 SOUTH), SALT LAKE CITY, UTAH.

B. Owner: DFCM

4110 State Office Building, Salt Lake City, Utah 84114

Owner's Representative: Matthias Mueller

Tel.: (801) 538-3431 Office.

Tel.: (801) 554-4957 Cell.

Fax: (801) 538-3297

Email: mmueller@utah.gov

C. Tenant: DABC

1625 South 900 West, Salt Lake City, Utah 84130

Tenant's Representative: Gary Steinburg

Tel.: (801) 977-6821 Office.

Tel.: (801) 859-8934 Cell.

Fax: (801) 977-6889

Email: gsteinburg@utah.gov

D. Architect: MJSA Architects

357 West Pierpont Avenue, Salt Lake City, Utah 84101

Tel: (801) 364- 5161

Fax: (801) 364-5167

KIN NG, Principal in Charge

MARK WILKINS, Project Architect

Email: mwilkins@mjsaa.com

E. The Work consists of the following: The scope defined by the drawings and these specifications.

1.4 TYPE OF CONTRACT

A. Project will be constructed under a single prime contract for general construction.
Contracts to be performed by DFCM

1.5 WORK PHASES

A. The Work shall be conducted in ONE PHASE

1.6 USE OF PREMISES

A. General: Each Contractor shall have full use of premises for construction operations, including use of Project site, during construction period

1.7 WORK RESTRICTIONS

A. On-Site Work Hours: Work shall be generally performed during normal business working hours (8:00 a.m. to 5:00 p.m.), Monday through Friday, except as otherwise indicated.

B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Owner's written permission.

1.8 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the 16-division format and CSI/CSC's "MasterFormat" numbering system.

1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
2. Division 1: Sections in Division 1 govern the execution of the Work of all Sections in the Specifications.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

   a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01100

SECTION 01230 - ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for alternates.

1.2 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.3 PROCEDURES

A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate Add No. 1: Area #1 indicated on the plans.

B. Alternate Add No. 2: Area #12indicated on the plans.

C. Alternate Add No. 3: To take the tile work on all walls of both Restrooms to the ceiling.

D. Alternate Deduct No. 1: Exclude the roof walkway pad system.

E. Alternate Deduct No. 2: Plumbing - exclude mixing valve and lower the hot water heater operating temperature from 140 Deg/F. to 119 Deg/f.

F. Alternate Deduct No. 3: Plumbing – exclude the hose bibs in the two restrooms.

G. Alternate Deduct No. 4: Plumbing – run the hot and cold water to the Restrooms in PEX rather than copper.

H. Alternate Deduct No. 5: Plumbing – run the cold water to the sillcocks in PEX rather than copper..

I. Alternate Deduct No. 6: Change location of transformer and CT can from that shown to over by the North West corner of the building.

J. Alternate Deduct No. 7: Change location of gas meter from that shown to over by the North West corner of the building.

K. Alternate Deduct No. 8: Exclude the ships ladder up to the roof access hatch. Still include the actual roof hatch assembly.

L. Alternate Deduct No. 9: Change painted pine base to painted MDF.

M. Alternate Deduct No. 10: Change painted pine base to rubber base.

N. Alternate Deduct No. 11: Exclude concrete mow strip under all chain link fencing.

END OF SECTION 01230

SECTION 01250 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.

B. See Division 1 Section "Allowances" for procedural requirements for handling and processing allowances.

1.3 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    c. Include costs of labor and supervision directly attributable to the change.
    d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

C. Proposal Request Form: Use AIA Document G709 for Proposal Requests

1.5 ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, base each Change Order proposal on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

1. Include installation costs in purchase amount only where indicated as part of the allowance.
2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the Purchase Order amount or Contractor's handling, labor, installation, overhead, and profit. Submit claims within 21 days of receipt of the Change Order or Construction Change Directive authorizing work to proceed. Owner will reject claims submitted later than 21 days after such authorization.

1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

1.6 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701

1.7 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714 Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01250

SECTION 01270 - UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for unit prices.

1.3 DEFINITIONS

A. Unit price is an amount proposed by bidders, stated on the Bid Form, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

D. List of Unit Prices: A list of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 LIST OF UNIT PRICES

A. Unit Price No. <**Insert unit-price number**> - <**Insert unit-price item**>:

1. Description: <**Insert unit-price item description**> according to Division <**Insert Division number**> Section "<**Insert Section title**>."
2. Unit of Measurement: <**Insert unit of measurement.**>

END OF SECTION 01270

SECTION 01290 - PAYMENT PROCEDURES

PART 1 - GENERAL

RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.3 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule

1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including Application for Payment forms with Continuation Sheets Submittals Schedule and Contractor's Construction Schedule.
2. Submit the Schedule of Values to Architect at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the Schedule of Values:

   a. Project name and location.
   b. Name of Architect.
   c. Architect's project number.
   d. Contractor's name and address.
   e. Date of submittal.

2. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate
3. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
4. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
5. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by

measured quantity. Use information indicated in the Contract Documents to determine quantities.

6. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

   a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.

7. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.4 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as -certified by Architect and paid for by Owner.

   1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

   1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
   2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

E. Transmittal: Submit 3 signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

   1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.

   1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.

2. When an application shows completion of an item, submit final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.

G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of Values.
3. Contractor's Construction Schedule (preliminary if not final).
4. Schedule of unit prices.
5. Submittals Schedule (preliminary if not final).
6. List of Contractor's staff assignments.
7. List of Contractor's principal consultants.
8. Copies of building permits.
9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
10. Initial progress report.
11. Report of preconstruction conference.
12. Certificates of insurance and insurance policies.

H. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

I. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01290

SECTION 01310 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

RELATED DOCUMENTS

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

1..2. SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. Coordination Drawings.
2. Project meetings.

B. See Division 1 Section "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

1.3 COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.
4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts

and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.
9. Project closeout activities.

1.4 SUBMITTALS

1.5 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.

1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:

   a. Tentative construction schedule.
   b. Phasing.
   c. Critical work sequencing and long-lead items.
   d. Designation of key personnel and their duties.
   e. Procedures for processing field decisions and Change Orders.
   f. Procedures for requests for interpretations (RFIs).
   g. Procedures for testing and inspecting.
   h. Procedures for processing Applications for Payment.
   i. Distribution of the Contract Documents.

j. Submittal procedures.
k. LEED requirements.
l. Preparation of Record Documents.
m. Use of the premises and existing building.
n. Work restrictions.
o. Owner's occupancy requirements.
p. Responsibility for temporary facilities and controls.
q. Construction waste management and recycling.
r. Parking availability.
s. Office, work, and storage areas.
t. Equipment deliveries and priorities.
u. First aid.
v. Security.
w. Progress cleaning.
x. Working hours.

3. Minutes: Record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

a. The Contract Documents.
b. Options.
c. Related requests for interpretations (RFIs).
d. Related Change Orders.
e. Purchases.
f. Deliveries.
g. Submittals.
h. Review of mockups.
i. Possible conflicts.
j. Compatibility problems.
k. Time schedules.
l. Weather limitations.
m. Manufacturer's written recommendations.
n. Warranty requirements.
o. Compatibility of materials.
p. Acceptability of substrates.
q. Temporary facilities and controls.
r. Space and access limitations.
s. Regulations of authorities having jurisdiction.
t. Testing and inspecting requirements.
u. Installation procedures.
v. Coordination with other work.
w. Required performance results.

x. Protection of adjacent work.
y. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings: Conduct progress meetings at weekly > intervals. Coordinate dates of meetings with preparation of payment requests.

1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.
8) Temporary facilities and controls.
9) Work hours.
10) Hazards and risks.
11) Progress cleaning.
12) Quality and work standards.
13) Status of correction of deficient items.
14) Field observations.
15) Requests for interpretations (RFIs).
16) Status of proposal requests.
17) Pending changes.

18) Status of Change Orders.
19) Pending claims and disputes.
20) Documentation of information for payment requests.

3. Minutes: Record the meeting minutes.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.

   a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01310

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

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

1. Contractor's Construction Schedule.
2. Submittals Schedule.
3. Daily construction reports.
4. Field condition reports.

B. See Division 01 Section "Multiple Contract Summary" for preparing a combined Contractor's Construction Schedule.

C. See Division 01 Section "Payment Procedures" for submitting the Schedule of Values.

1.2 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: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

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 determine when activities can be performed and the critical path of Project.

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

D. 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.

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

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

1.3 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. Preliminary Network Diagram: Submit two opaque copies, large enough to show entire network for entire construction period. Show logic ties for activities.

C. Contractor's Construction Schedule: Submit two opaque copies of initial schedule, large enough to show entire schedule for entire construction period.

1. Submit an electronic copy of schedule, using software indicated, on CD-R, and labeled to comply with requirements for submittals. Include type of schedule (Initial or Updated) and date on label.

D. CPM Reports: Concurrent with CPM schedule, submit three copies of each of the following computer-generated reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

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.

E. Daily Construction Reports: Submit two copies at weekly intervals.

F. Field Condition Reports: Submit two copies at time of discovery of differing conditions.

1.4 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.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, 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. Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for commencement of the Work to date of Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.

3. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
4. Startup and Testing Time: Include not less than 7 days for startup and testing.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Work under More Than One Contract: Include a separate activity for each contract.
3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
4. Work Restrictions: Show the effect of the following items on the schedule:

a. Coordination with existing construction.

b. Limitations of continued occupancies.
c. Uninterruptible services.
d. Partial occupancy before Substantial Completion.
e. Use of premises restrictions.
f. Provisions for future construction.
g. Seasonal variations.
h. Environmental control.
i.

5. Work Stages: Indicate important stages of construction for each major portion of the

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion

E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. Preliminary Network Diagram: Submit diagram within 14 days of date established for commencement of the Work. Outline significant construction activities for the first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's Construction Schedule using a computerized, cost- and resource-loaded, time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 days after date established for commencement of the Work.

a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.

2. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
3. Use "one workday" as the unit of time. Include list of nonworking days and holidays incorporated into the schedule.

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

a. Preparation and processing of submittals.
b. Mobilization and demobilization.
c. Purchase of materials.
d. Delivery.
e. Fabrication.
f. Utility interruptions.
g. Installation.
h. Work by Owner that may affect or be affected by Contractor's activities.
i. Testing and commissioning.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

E. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Principal events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.

F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

2.4 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. Equipment at Project site.
3. Material deliveries.
4. High and low temperatures and general weather conditions.
5. Accidents.
6. Stoppages, delays, shortages, and losses.
7. Meter readings and similar recordings.
8. Orders and requests of authorities having jurisdiction.
9. Services connected and disconnected.
10. Equipment or system tests and startups.

B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a request for interpretation. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate Actual Completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

SECTION 01330 - SUBMITTAL PROCEDURES

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 administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Architect's responsive action.

B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements

C. See Division 1 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule.

D. See Division 1 Section "Quality Requirements" for submitting test and inspection reports.

E. See Division 1 Section "Closeout Procedures" for submitting warranties.

F.. See Division 1 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.

G. See Division 1 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.

H. See Division 1 Section "Demonstration and Training" for submitting videotapes of demonstration of equipment and training of Owner's personnel.

1.4 SUBMITTAL PROCEDURES

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

3. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

B. Submittals Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.

C. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 days for review of each resubmittal.

D. Identification: Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches (150 by 200 mm) on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information on label for processing and recording action taken:

   a. Project name.
   b. Date.
   c. Name and address of Architect.
   d. Name and address of Contractor.
   e. Name and address of subcontractor.
   f. Name and address of supplier.
   g. Name of manufacturer.
   h. Submittal number or other unique identifier, including revision identifier.

      1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 06100.01). Resubmittals

shall include an alphabetic suffix after another decimal point (e.g., 06100.01.A).

i. Number and title of appropriate Specification Section.
j. Drawing number and detail references, as appropriate.
k. Location(s) where product is to be installed, as appropriate.
l. Other necessary identification.

E. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.

F. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

1. Additional copies submitted for maintenance manuals will not be marked with action taken and will be returned.

G. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, discard submittals received from sources other than Contractor.

H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of revision in label or title block and clearly indicate extent of revision.
2. Resubmit submittals until they are marked "<Insert approval notation from Architect's action stamp."

I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

J. Use for Construction: Use only final submittals with mark indicating notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

a. Manufacturer's written recommendations.
b. Manufacturer's product specifications.
c. Manufacturer's installation instructions.
d. Manufacturer's catalog cuts.
e. Wiring diagrams showing factory-installed wiring.
f. Printed performance curves.
Operational range diagrams.
g. Compliance with specified referenced standards.
Testing by recognized testing agency.

4. Number of Copies: Submit four (4) copies of Product Data, unless otherwise indicated. Architect will return three (3)copies. Mark up and retain one returned copy as a Project Record Document.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

a. Dimensions.
b. Identification of products.
c. Fabrication and installation drawings.
d. Roughing-in and setting diagrams.
e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
f. Shopwork manufacturing instructions.
g. Templates and patterns.

h. Schedules.
i. Notation of coordination requirements.
j. Notation of dimensions established by field measurement.
k. Relationship to adjoining construction clearly indicated.
l. Seal and signature of professional engineer if specified.
m. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 30 by 40 inches (750 by 1000 mm).
3. Number of Copies: Submit four (4) opaque (bond) copies of each submittal. Architect will return two (2) copies.

B. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

a. Generic description of Sample.
b. Product name and name of manufacturer.
c. Sample source.
d. Number and title of appropriate Specification Section.

3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

4. Samples: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

a. Number of Samples: Submit three sets of Samples. Architect will retain one Sample sets; remainder will be returned.

C. Product Schedule or List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location.

1. Number of Copies: Submit three copies of product schedule or list, unless otherwise indicated. Architect will return two copies.

D. Submittals Schedule: Comply with requirements specified in Division 1 Section "Construction Progress Documentation."

E. Application for Payment: Comply with requirements specified in Division 1 Section "Payment Procedures."

F. Schedule of Values: Comply with requirements specified in Division 1 Section "Payment Procedures."

G. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design.

1. Number of Copies: Submit three copies of subcontractor list, unless otherwise indicated. Architect will return two copies.

H. General: Prepare and submit Informational Submittals required by other Specification Sections.

1. Number of Copies: Submit two copies of each submittal, unless otherwise indicated. Architect will not return copies.
2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
3. Test and Inspection Reports: Comply with requirements specified in Division 1 Section "Quality Requirements."

I. Coordination Drawings: Comply with requirements specified in Division 1 Section "Project Management and Coordination."

J. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

K. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

L. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

M. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

N. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

O. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

P. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

Q. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

R. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.

S. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

T. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

U. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

V. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment.

W. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

X. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer.

Y. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:

1. Statement on condition of substrates and their acceptability for installation of product.
2. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.

3. Results of operational and other tests and a statement of whether observed performance complies with requirements.

Z. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

AA. Material Safety Data Sheets (MSDSs): Submit information directly to Owner; do not submit to Architect.

1. Architect will not review submittals that include MSDSs and will return them for resubmittal.

2.2 DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit three copies of a statement, signed and sealed by the responsible design by design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

C. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

D. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:

1.Reviewed.

2. Make corrections noted.

3. Revise and re-submit.

E. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

F. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

G. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 01330

SECTION 01500 - TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. See Divisions 2 through 16 Sections for temporary heat, ventilation, and humidity requirements for products in those Sections.

1.3 DEFINITIONS

A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.4 USE CHARGES

A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, testing agencies, and authorities having jurisdiction.

B. Water Service: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

C. Electric Power Service: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.5 SUBMITTALS

A. Site Plan: Show temporary facilities, staging areas, and parking areas for construction personnel.

1.6 QUALITY ASSURANCE

A. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.7 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Pavement: Comply with Division 2 Section "Hot-Mix Asphalt Paving."

B. Portable Chain-Link Fencing: Minimum 2-inch (50-mm), 9-gage, galvanized steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top and bottom rails. Provide galvanized steel bases for supporting posts.

C. Lumber and Plywood: Comply with requirements in Division 6 Section "Rough Carpentry" "[

D. Gypsum Board: Minimum 1/2 inch (12.7 mm) thick by 48 inches (1219 mm) wide by maximum available lengths; regular-type panels with tapered edges. Comply with ASTM C 36/C 36M.

E. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. Heating Equipment: Unless Owner authorizes use of permanent heating system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service: Use of Owner's existing water service facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

1. Where installations below an outlet might be damaged by spillage or leakage, provide a drip pan of suitable size to minimize water damage. Drain accumulated water promptly from pans.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

E. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

F. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

G. Electric Power Service: Use of Owner's existing electric power service will be permitted, as long as equipment is maintained in a condition acceptable to Owner.

H. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
   1. Connect temporary service to Owner's existing power source, as directed by Owner.

I. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

   1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

   1. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines. Comply with NFPA 241.
   2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: maintain existing roads and paved areas adequate for construction operations.
   1. ."
   2. Recondition after use, including removing contaminated material, re-grading, proof rolling, compacting, and testing.

   3. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Division 2 Section "Hot-Mix Asphalt Paving."

C. Traffic Controls: Comply with requirements of authorities having jurisdiction.

   1. Protect existing site improvements to remain including curbs, pavement, and utilities.
   2. Maintain access for fire-fighting equipment and access to fire hydrants.

D. Parking: Provide temporary parking areas for construction personnel.

E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

F. Project Identification and Temporary Signs: Provide Project identification and other signs as indicated on Drawings. Install signs where indicated to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted.

1. Provide temporary, directional signs for construction personnel and visitors.
2. Maintain and touchup signs so they are legible at all times.

G. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Division 1 Section "Execution Requirements" for progress cleaning requirements.

H. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

I. Temporary Elevator Use: Refer to Division 14 Sections for temporary use of new elevators.

J. Existing Elevator Use: Use of Owner's existing elevators will be permitted, as long as elevators are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.

1. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

B. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.

C. Stormwater Control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

D. Site Enclosure Fence: Before construction operations begin furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
   1. Maintain security by limiting number of keys and restricting distribution to authorized personnel.

E. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

F. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

G. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

   1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.

H. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.

   1. Prohibit smoking in hazardous fire-exposure areas.
   2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
   3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
   4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

   1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 1 Section "Closeout Procedures."

END OF SECTION 01500

SECTION 01770 - CLOSEOUT PROCEDURES

1.1 GENERAL

A. RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.
2. Warranties.
3. Final cleaning.

B. See Division 1 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.

C. See Division 1 Section "Demonstration and Training" for requirements for instructing Owner's personnel.

D. See Divisions 2 through 16 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.

8. Complete startup testing of systems.
9. Submit test/adjust/balance records.
10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
11. Advise Owner of changeover in heat and other utilities.
12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
13. Complete final cleaning requirements, including touchup painting.
14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."
2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report and warranty.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

1.6 WARRANTIES

A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Remove snow and ice to provide safe access to building.
f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
h. Sweep concrete floors broom clean in unoccupied spaces.
i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
k. Remove labels that are not permanent.
l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

m. Wipe surfaces of mechanical and electrical equipment[**, elevator equipment,**] and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
n. Replace parts subject to unusual operating conditions.
o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
r. Leave Project clean and ready for occupancy.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.

D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 01770

SECTION 01781 - PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.

B. See Division 1 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.

C. See Divisions 2 through 16 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.3 SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set(s) of marked-up Record Prints.

B. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one copy of each Product Data submittal.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.

1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data,

whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

2. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
3. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
4. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
   a. Date.
   b. Designation "PROJECT RECORD DRAWINGS."
   c. Name of Architect.
   d. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. Note related Change Orders**,** Record Product Data**,**]and Record Drawings where applicable.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders**,** Record Specifications**,** and Record Drawings where applicable.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

END OF SECTION 01781

SECTION 01782 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Emergency manuals.
2. Operation manuals for systems, subsystems, and equipment.
3. Maintenance manuals for the care and maintenance of products, materials, and finishes systems and equipment.

B. See Divisions 2 through 16 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 SUBMITTALS

A. Manual: Submit one copy of each manual in final form at least 15 < days before final inspection. Architect will return copy with comments within 15 days after final inspection.

1. Correct or modify each manual to comply with Architect's comments. Submit 3 > copies of each corrected manual within 15 days of receipt of Architect's comments.

PART 2 - PRODUCTS

2.1 MANUALS, GENERAL

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain a title page, table of contents, and manual contents.

B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name, address, and telephone number of Contractor.

6. Name and address of Architect.
7. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

   a. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
4. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

   a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
   b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.2 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for type of emergency, emergency instructions, and emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component for fire, flood, gas leak, ,water leak, power failure, water outage, equipment failure, and chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include instructions on stopping, shutdown instructions for each type of emergency, operating instructions for conditions outside normal operating limits, and required sequences for electric or electronic systems.

2.3 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and equipment descriptions, operating standards, operating procedures, operating logs, wiring and control diagrams, and license requirements.

B. Descriptions: Include the following:

1. Product name and model number.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include start-up, break-in, and control procedures; stopping and normal shutdown instructions; routine, normal, seasonal, and weekend operating instructions; and required sequences for electric or electronic systems.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.4 PRODUCT MAINTENANCE MANUAL

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.

5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and inspection procedures, types of cleaning agents, methods of cleaning, schedule for cleaning and maintenance, and repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including maintenance instructions, drawings and diagrams for maintenance, nomenclature of parts and components, and recommended spare parts for each component part or piece of equipment:

D. Maintenance Procedures: Include test and inspection instructions, troubleshooting guide, disassembly instructions, and adjusting instructions**,** and demonstration and videotape if available training**,** that detail essential maintenance procedures:

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.

1. Do not use original Project Record Documents as part of operation and maintenance manuals.

F. Comply with Division 1 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01782

SECTION 01810 - GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes general requirements that apply to implementation of commissioning without regard to systems, subsystems, and equipment being commissioned.

B. See Division 15 Section "HVAC Commissioning Requirements" for specific requirements for commissioning HVAC systems.

1.3 DEFINITIONS

A. BoD: Basis of Design.

B. CxA: Commissioning Authority.

C. OPR: Owner's Project Requirements.

D. Systems, Subsystems, and Equipment: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, and equipment.

E. TAB: Testing, Adjusting, and Balancing.

1.4 COMMISSIONING TEAM

A. Members Appointed by Contractor(s): Individuals, each having authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated actions. The commissioning team shall consist of, but not be limited to, representatives of each Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists .

B. Members Appointed by Owner:
1. Representatives of the facility user and operation and maintenance personnel.
2. Architect and engineering design professionals.

1.5 OWNER'S RESPONSIBILITIES

A. Provide the OPR documentation to the Contractor for use in developing the commissioning plan; systems manual; operation and maintenance training plan; and testing plans and checklists.

B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities including, but not limited to, the following:

1. Coordination meetings.
2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Testing meetings.
4. Demonstration of operation of systems, subsystems, and equipment.

C. Provide utility services required for the commissioning process.

D. Provide the BoD documents, prepared by Architect and approved by Owner, to the CxA and each Contractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.

1.6 CONTRACTOR'S RESPONSIBILITIES

A. Each Contractor shall assign representatives with expertise and authority to act on behalf of the Contractor and schedule them to participate in and perform commissioning team activities including, but not limited to, the following:

1. Participate in design- and construction-phase coordination meetings.
2. Participate in maintenance orientation and inspection.
3. Participate in operation and maintenance training sessions.
4. Participate in final review at acceptance meeting.
5. Certify that Work is complete and systems are operational according to the Contract Documents, including calibration of instrumentation and controls.
6. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
7. Review and approve final commissioning documentation.

B. Subcontractors shall assign representatives with expertise and authority to act on behalf of subcontractors and schedule them to participate in and perform commissioning team activities including, but not limited to, the following:

1. Participate in design- and construction-phase coordination meetings.
2. Participate in maintenance orientation and inspection.
3. Participate in procedures meeting for testing.
4. Participate in final review at acceptance meeting.
5. Provide schedule for operation and maintenance data submittals, equipment startup, and testing for incorporation into the commissioning plan. Update schedule on a weekly basis throughout the construction period.
6. Provide information for developing construction-phase commissioning plan.
7. Participate in training sessions for Owner's operation and maintenance personnel.

8. Gather and submit operation and maintenance data for systems, subsystems, and equipment as specified in Division 1 Section "Operation and Maintenance Data."
9. Provide technicians who are familiar with the construction and operation of installed systems and who shall develop specific test procedures and participate in testing of installed systems, subsystems, and equipment.

1.7 COMMISSIONING DOCUMENTATION

A. Index of Commissioning Documents: Contractor shall prepare an index to include storage location of each document.

B. OPR: A written document, prepared by Owner, that details the functional requirements of Project and expectations of how it will be used and operated. This document includes Project and design goals, measurable performance criteria, budgets, schedules, success criteria, and supporting information.

C. BoD Document: A document, prepared by Architect, that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

D. Commissioning Plan: A document, that outlines the schedule, allocation of resources, and documentation requirements of the commissioning process, and shall include, but is not limited to the following:

1. Plan for delivery and review of submittals, systems manuals, and other documents and reports. Identification of the relationship of these documents to other functions and a detailed description of submittals that are required to support the commissioning processes. Submittal dates shall include the latest date approved submittals must be received without adversely affecting commissioning plan.
2. Description of the organization, layout, and content of commissioning documentation (including systems manual) and a detailed description of documents to be provided along with identification of responsible parties.
3. Identification of systems and equipment to be commissioned.
4. Description of schedules for testing procedures along with identification of parties involved in performing and verifying tests.
5. Identification of items that must be completed before the next operation can proceed.
6. Description of responsibilities of commissioning team members.
7. Description of observations to be made.
8. Description of requirements for operation and maintenance training, including required training materials.
9. Description of expected performance for systems, subsystems, equipment, and controls.
10. Schedule for commissioning activities with specific dates coordinated with overall construction schedule.
11. Identification of installed systems, subsystems, and equipment, including design changes that occurred during the construction phase.
12. Process and schedule for documenting changes on a continuous basis to appear in Project Record Documents.
13. Process and schedule for completing prestart and startup checklists for systems, subsystems, and equipment to be verified and tested.

14. Step-by-step procedures for testing systems, subsystems, and equipment with descriptions for methods of verifying relevant data, recording the results obtained, and listing parties involved in performing and verifying tests.

E. Test Checklists: Contractor shall develop test checklists for each system, subsystem, or equipment including interfaces and interlocks, and include a separate entry, with space for comments, for each item to be tested. Prepare separate checklists for each mode of operation and provide space to indicate whether the mode under test responded as required. Provide space for testing personnel to sign off on each checklist. Specific checklist content requirements are specified in Division 1 Section "HVAC Commissioning Requirements." Each checklist, regardless of system, subsystem, or equipment being tested, shall include, but not be limited to, the following:

1. Name and identification code of tested item.
2. Test number.
3. Time and date of test.
4. Indication of whether the record is for a first test or retest following correction of a problem or issue.
5. Dated signatures of the person performing test and of the witness, if applicable.
6. Individuals present for test.
7. Deficiencies.
8. Issue number, if any, generated as the result of test.

F. Certificate of Readiness: Certificate of Readiness shall be signed by each Contractor, Subcontractor(s), Installer(s), certifying that systems, subsystems, equipment, and associated controls are ready for testing. Completed test checklists signed by the responsible parties shall accompany this certificate.

G. Test and Inspection Reports: Contractor shall record test data, observations, and measurements on test checklists. Photographs, forms, and other means appropriate for the application shall be included with data. Compile test and inspection reports and test and inspection certificates and include them in systems manual and commissioning report.

H. Corrective Action Documents: Document corrective action taken for systems and equipment that fail tests. Include required modifications to systems and equipment and revisions to test procedures, if any. Retest systems and equipment requiring corrective action and document retest results.

I. Issues Log: Prepare and maintain an issues log that describes design, installation, and performance issues that are at variance with the OPR, BoD, and Contract Documents. Identify and track issues as they are encountered, documenting the status of unresolved and resolved issues.

J. Commissioning Report: Document results of the commissioning process including unresolved issues and performance of systems, subsystems, and equipment. The commissioning report shall indicate whether systems, subsystems, and equipment have been completed and are performing according to the OPR, BoD, and Contract Documents. The commissioning report shall include, but is not limited to, the following:

1. Lists and explanations of substitutions; compromises; variances in the OPR, BoD, and Contract Documents; record of conditions; and, if appropriate, recommendations for

resolution. This report shall be used to evaluate systems, subsystems, and equipment and shall serve as a future reference document during Owner occupancy and operation. It shall describe components and performance that exceed requirements of the OPR, BoD, and Contract Documents and those that do not meet requirements of the OPR, BoD, and Contract Documents. It may also include a recommendation for accepting or rejecting systems, subsystems, and equipment.

2. OPR and BoD documentation.
3. Commissioning plan.
4. Testing plans and reports.
5. Corrective modification documentation.
6. Issues log.
7. Completed test checklists.
8. Listing of off-season test(s) not performed and a schedule for their completion.

K. Systems Manual: Gather required information and compile systems manual. Systems manual shall include, but is not limited to, the following:

1. OPR and BoD, including system narratives, schematics, and changes made throughout the Project.
2. Project Record Documents as specified in Division 1 Section "Project Record Documents."
3. Final commissioning plan.
4. Commissioning report.
5. Operation and maintenance data as specified in Division 1 Section "Operation and Maintenance Data."

1.8 SUBMITTALS

A. Commissioning Plan: Contractor shall submit two hard copies and two sets of electronically formatted information of the commissioning plan. Deliver one hard copy and one set of discs to Owner, and one copy to Architect.

B. Test Checklists and Report Forms: Contractor shall submit sample checklists and forms to each Contractor quality-control manager and subcontractors for review and comment. Submit two copies of each checklist and report form.

C. Certificates of Readiness: shall submit Certificates of Readiness.

D. Test and Inspection Reports: Contractor shall submit test and inspection reports.

E. Corrective Action Documents: Contractor shall submit corrective action documents.

F. Commissioning Report: Contractor shall submit two hard copies and two sets of electronically formatted information of the final commissioning report. CxA shall deliver one hard copy and one set of discs to Owner, and one copy to Architect.

1.9 QUALITY ASSURANCE

A. Instructor Qualifications: Factory-authorized service representatives, experienced in training, operation, and maintenance procedures for installed systems, subsystems, and equipment.

B. Test Equipment Calibration: Comply with test equipment manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately whenever instruments have been repaired following damage or dropping. Affix calibration tags to test instruments. Instruments shall have been calibrated within six months prior to use.

1.10 COORDINATION

A. Coordinating Meetings: Contractor shall conduct weekly coordination meetings of the commissioning team to review progress on the commissioning plan, to discuss scheduling conflicts, and to discuss upcoming commissioning process activities.

B. Testing Coordination: Contractor shall coordinate sequence of testing activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

C. Manufacturers' Field Services: Contractor shall coordinate services of manufacturers' field services.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 OPERATION AND MAINTENANCE TRAINING REQUIREMENTS

A. Training Preparation Conference: Before operation and maintenance training, Contractor shall convene a training preparation conference to include Owner's operation and maintenance personnel, each Contractor, and subcontractors. In addition to requirements specified in Division 1 Section "Demonstration and Training," perform the following:

1. Review the OPR and BoD.
2. Review installed systems, subsystems, and equipment.
3. Review instructor qualifications.
4. Review instructional methods and procedures.
5. Review training module outlines and contents.
6. Review course materials (including operation and maintenance manuals).
7. Inspect and discuss locations and other facilities required for instruction.
8. Review and finalize training schedule and verify availability of educational materials, instructors, audiovisual equipment, and facilities needed to avoid delays.
9. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

B. Training Modules: Develop an instruction program that includes individual training modules for each system, subsystem, and equipment as specified in Division 1 Section "Demonstration and Training."

END OF SECTION 01810

SECTION 01820 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.

B. See Divisions 2 through 16 Sections for specific requirements for demonstration and training for products in those Sections.

1.3 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 1 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:

PART 3 - EXECUTION

3.1 INSTRUCTION

A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

END OF SECTION 01820

SECTION 02051*

GENERAL SITE CONSTRUCTION REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited to:
   1. General procedures and requirements for Site Work.

PART 2 - PRODUCTS: Not Used

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site Verification Of Conditions:
   1. 48 hours minimum prior to performing any work on site, contact Bluestake to arrange for utility location services.
   2. Perform minor, investigative excavations to verify location of various existing underground facilities at sufficient locations to assure that no conflict with the proposed work exists and sufficient clearance is available to avoid damage to existing facilities.
   3. Perform investigative excavating 10 days minimum in advance of performing any excavation or underground work.
   4. Upon discovery of conflicts or problems with existing facilities, notify Architect by phone or fax within 24 hours. Follow telephone or fax notification with letter and diagrams indicating conflict or problem and sufficient measurements and details to evaluate problem.

3.2 PREPARATION

A. Protection:
   1. Spillage:
      a. Avoid spillage by covering and securing loads when hauling on or adjacent to public streets or highways.
      b. Remove spillage and sweep, wash, or otherwise clean project, streets, and highways.
   2. Dust Control:
      a. Take precautions necessary to prevent dust nuisance, both on-site and adjacent to public and private properties.
      b. Correct or repair damage caused by dust.
   3. Existing Plants And Features: Do not damage tops, trunks, and roots of existing trees and shrubs on site that are intended to remain. Do not use heavy equipment within branch spread. Interfering branches may be removed only with permission of Architect. Do not damage other plants and features that are to remain.

B. If specified precautions are not taken or corrections and repairs not made promptly, Owner may take such steps as may be deemed necessary and deduct costs of such from monies due to Contractor. Such action or lack of action on Owner's part does not relieve Contractor from responsibility for proper protection of The Work.

3.3 REPAIR / RESTORATION

A. Adjust existing covers, boxes, and vaults to grade.

B. Replace broken or damaged covers, boxes, and vaults.

C. Independently confirm size, location, and number of covers, boxes, and vaults that require adjustment.

3.4 FIELD QUALITY CONTROL

A. Notify Architect 48 hours before performing excavation or fill work.

B. If weather, scheduling, or any other circumstance has interrupted work, notify Architect 24 hours minimum before intended resumption of grading or compacting.

C. Owner reserves right to require additional testing to re-affirm suitability of completed work including compacted soils that have been exposed to adverse weather conditions.

END OF SECTION

SECTION 02311

ROUGH GRADING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
1. Perform rough grading work required to prepare site for construction as described in Contract Documents.

B. Related Sections:
1. Section 02051: General Site Construction Requirements

1.2 QUALITY ASSURANCE

A. Pre-Installation Conference:
1. Schedule conference after completion of site clearing but before beginning grading work.
2. Identify benchmark to be used in establishing grades and review Contract Document requirements for grades, fill materials, and topsoil.
3. Examine site to pre-plan procedures for making cuts, placing fills, and other necessary work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials used for fill shall be as specified for backfill in Section 02315.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before making cuts, remove topsoil over areas to be cut and filled that was not previously removed by stripping specified in Section 02230. Stockpile this additional topsoil with previously stripped topsoil.

3.2 PERFORMANCE

A. Site Tolerances:
1. Maximum variation from required grades shall be 1/10 of one foot.
2. To allow for final finish grades of parking lot and planting areas, rough grade elevations before placing topsoil are:
   a. Sod Areas: 6 inches below top of walk or curb.
   b. Shrub Areas: 8 inches below top of walk or curb.

B. When existing grade around existing plants to remain is higher than new finish grade, perform regrading by hand. Do not expose or damage shrub or tree roots.

C. Compact fills as specified in Section 02315.

D. If soft spots, water, or other unusual and unforeseen conditions affecting grading requirements are encountered, stop work and notify Architect.

END OF SECTION

SECTION 02312

FINISH GRADING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
1. Perform fine grading work required to prepare site for finish grading and soil preparation for landscaping as described in Contract Documents.
2. Furnishing of imported topsoil for cast-in-place planters as described in Contract Documents.

B. Related Sections:
1. Section 02051: General Site Construction Requirements.
2. Section 02917: Final grading and soil preparation for landscaping

1.2 REFERENCES

A. American Society For Testing And Materials:
1. ASTM 1557-91, 'Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.'

1.3 QUALITY ASSURANCE

A. Pre-Installation Conference: Participate in pre-installation conference specified in Section 02813.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not commence work of this Section until grading tolerances specified in Section 02311 are met.

3.2 PREPARATION

A. Protection: Protect utilities and site elements from damage.

B. Surface Preparation:
1. Before grading, dig out weeds from planting areas by their roots and remove from site. Remove rocks larger than 1-1/2 inches in size and foreign matter such as building rubble, wire, cans, sticks, concrete, etc.
2. Remove imported paving base material present in planting areas down to natural subgrade or other material acceptable to Landscape Architect.
3. Limit use of heavy equipment to areas no closer than 6 feet from building or other permanent structures

3.3 PERFORMANCE

A. Site Tolerances:
1. Maximum variation from required grades shall be 1/10 of one foot.

B. Do not expose or damage existing shrub or tree roots.

C. Slope grade away from building for 12 feet minimum from walls at slope of 1/2 inch in 12 inches minimum unless otherwise noted. Direct surface drainage in manner indicated on Drawings by molding surface to facilitate natural run-off of water. Fill low spots and pockets with specified fill material and grade to drain properly.

END OF SECTION

SECTION 02315

EXCAVATION AND FILL

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
1. Perform Project excavating, trenching, backfilling, and compacting as described in Contract Documents, except as specified below.
2. Procedure and quality for excavating, trenching, backfilling, and compacting performed on Project under other Sections unless specifically specified otherwise.

B. Related Sections:
1. Section 02051: General Site Construction Requirements.
2. Section 02230: Site Clearing.
3. Sections Under 02500 Heading: Utility Services.
4. Section 02630: Storm Drainage.
5. Sections Under 02700 Heading: Compaction of sub-grade under walks and paving.
6. Performance of excavating, backfilling, and compacting inside and outside of building required for electrical and mechanical work is responsibility of respective Section doing work unless arranged differently by Contractor.

1.2 REFERENCES

A. American Society For Testing And Materials:
1. ASTM D 1557-00, 'Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.'
2. ASTM D 2216-98, 'Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock.'
3. ASTM D 2487-00, 'Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).'
4. ASTM D 2922-96, 'Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).'
5. ASTM D 3017-96, 'Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).'

1.3 DEFINITIONS

A. Relative Compaction: Ratio of field dry density as determined by ASTM D 2922 and ASTM D 3017 or 2216, and laboratory maximum dry density as determined by ASTM D 1557.

1.4 QUALITY ASSURANCE

A. Pre-Installation Conference: Participate in pre-installation conference specified in Section 02311.

1.5 SEQUENCING

A. Do not backfill against bituminous dampproofing for 24 hours after application of dampproofing.

B. Before backfilling, show utility and service lines being covered on record set of Drawings. Do not backfill until utilities involved have been tested and approved by Architect and until instructed by Architect.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Site Material: Existing excavated material on site is suitable for use as fill and backfill to meet Project requirements.

B. Imported Fill / Backfill:
1. Well graded material conforming to ASTM D 2487 free from debris, organic material, frozen materials, brick, lime, concrete, and other material which would prevent adequate performance of backfill.
   a. Under Building Footprint And Paved Areas: Fill shall comply with soil classification groups GW, GP, GM, SW, SP, or SM. Fill may not contain stones over 6 inches diameter and 90 percent minimum of fill shall be smaller than 1-1/2 inch in any direction.
   b. Under Landscaped Areas:
      1) Fill more than 36 inches below finish grade shall comply with soil classification groups GW, GP, GM, SW, SP, or SM. Fill may not contain stones over 6 inches diameter and 90 percent minimum of fill shall be smaller than 1-1/2 inch in any direction.
      2) Fill less than 36 inches below finish grade shall comply with soil classification groups SW, SP, SM, or SC. Fill may not contain stones larger than 1-1/2 inches in any direction and 90 percent minimum of fill shall be smaller than 3/8 inch in any direction.

C. Excavatable Slurry Fill / Backfill:
1. Contain maximum of 94 lbs of cement per yard of slurry fill / backfill.
2. Minimum stable air content of 20 percent, Darafill dosage as necessary.
3. Maximum water content of 36 gallons per yard of backfill.
4. Maximum compressive strength of 150 psi at 28 days.
5. Acceptable Products:
   a. Darafill by W R Grace & Co, Cambridge MA (800) 354-5414. www.gcp-grace.com
   b. Equal as approved by Architect before use. See Section 01600.

D. Engineered Fill:

PART 3 - EXECUTION

3.1 EXAMINATION

A. Carefully examine site and available information to determine type soil to be encountered. Discuss problems with Architect before proceeding with work.

3.2 PREPARATION

A. Protection of Existing Utilities:
1. Protect existing utilities identified in Contract Documents during excavation.
2. If existing utility lines not identified in Contract Documents are encountered, contact Architect before proceeding.

B. Before placing fill, base, or finish work, prepare sub-grade as follows:
1. Do not place fill or base over frozen sub-grade.
2. Under Building Slabs / Pads, Concrete Site Elements, And Portland Cement Concrete Driveways And Parking Areas: Scarify sub-grade 6 inches deep, moisture condition to uniform moisture content of between optimum and 4 percent over optimum, and mechanically tamp 6 inches deep to 90 percent minimum of relative compaction.
3. Under Asphalt Concrete Driveways And Parking Areas: Scarify sub-grade 6 inches deep, moisture condition to uniform moisture content between optimum and 4 percent over optimum, and mechanically tamp to 95 percent minimum of relative compaction.
4. Landscape Areas: Compact sub-grade to 85 percent relative compaction.

3.3 PERFORMANCE

A. Excavation:
1. Building Footings And Foundations:
   a. Excavate as necessary for proper placement and forming of footings and foundations.
   b. Bottom of excavations to receive footings shall be undisturbed soil.
   c. Excavation Carried Deeper Than Required:
      1) Under Footings: Fill with concrete specified for footings.
      2) Under Slabs: Use specified compacted backfill material.
2. Pavement And Concrete Site Elements:
   a. Excavate as necessary for proper placement and forming of concrete site elements and pavement structure. Remove vegetation and deleterious material and remove from site.
   b. Backfill over-excavated areas with compacted base material specified in Sections under 02700 heading.
   c. Remove and replace exposed material that becomes soft or unstable.
3. Utility Trenches:
   a. Unless otherwise indicated, excavation shall be open cut. Short sections of trench may be tunneled if pipe or duct can be safely and properly installed and backfill can be properly tamped in tunnel sections and if approved by Architect.
   b. Excavate to proper alignment, depth, and grade. Excavate to sufficient width to allow adequate space for proper installation and inspection of utility piping.
   c. If trenches are excavated deeper than required, backfill until trench bottom is proper depth with properly compacted native material.
   d. Pipe 4 Inches In Diameter Or Larger:
      1) Grade bottom of trenches to provide uniform bearing and support for each section of pipe on undisturbed soil at every point along its length.
      2) Except where rock is encountered, take care not to excavate below depths indicated.
         a) Where rock excavations are required, excavate rock with minimum over-depth of 4 inches below required trench depths.
         b) Backfill over-depths in rock excavation and unauthorized over-depths with loose, granular, moist earth, thoroughly compacted.
      3) Whenever wet or unstable soil incapable of properly supporting pipe, as determined by Architect, occurs in bottom of trench, remove soil to depth required and backfill trench to proper grade with coarse sand, fine gravel, or other suitable material acceptable to Architect.
4. If unusual excavating conditions are encountered, stop work and notify Architect.

B. Fill / Backfill:
1. General:
   a. Around Buildings And Structures: Slope grade away from building as specified in Section 02312. Hand backfill when close to building or where damage to building might result.
   b. Site Utilities:
      1) In Landscape Areas: Use backfill consisting of on-site soil.

2) Under Pavement And Concrete Site Elements: Extend excavatable slurry fill / backfill to elevation of subgrade. Do not place base material until excavatable slurry fill / backfill has cured 72 hours.

c. Do not use puddling or jetting to consolidate fill areas.

2. Compacting:

a. Fill / Backfill And Base:

1) Under Building Slabs or Pads, Driveways, And Parking Areas: Place in 8 inch maximum layers, dampen (do not soak), and mechanically tamp to 95 percent minimum of maximum density as established by ASTM D 1557.

2) Under Concrete Site Elements And Around Foundation Walls: Place in 8 inch maximum layers, dampen but do not soak, and mechanically tamp to 90 percent minimum of maximum density as established by ASTM D 1557.

3) Utility Trenches:

a) Site: Place fill in 12 inch layers and moisture condition to plus or minus 2 percent of optimum moisture content. Compact fill to 90 percent minimum relative compaction to within 12 inches of finish grade. Compact fill above 12 inches to 85 percent relative compaction.

b) Under Slabs: Place fill in 6 inch layers, moisture condition to plus or minus 2 percent of optimum moisture content, and compact to 95 percent minimum relative compaction to within 4 inches of finish grade. Final 4 inches of fill shall be granular base as specified in Section 02316.

4) Fill Slopes: Compact by rolling or using sheepsfoot roller.

5) Backfill Under Footings: Not allowed.

6) Other Backfills: Place other fills in 12 inch layers and compact to 90 percent relative compaction.

b. Engineered Fill:

3.4 REPAIR / RESTORATION

A. Repair damage to other portions of the Work resulting from work of this Section at no additional cost to Owner. On new work, arrange for damage to be repaired by original installer.

3.5 CLEANING

A. Debris and material not necessary for Project are property of Contractor and are to be removed before completion of Project. However, if material necessary for Project is hauled away, replace with specified fill / backfill material.

END OF SECTION

SECTION 02316

GRANULAR BASE

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
1. Furnish and install granular base under interior slabs-on-grade as described in Contract Documents.

B. Products Installed But Not Supplied Under This Section:
1. Under-slab vapor retarder and seam tape.

C. Related Sections
1. Section 02051: General Site Construction Requirements.
2. Section 02742: Base course under asphalt concrete paving.
3. Section 02753: Base course under Portland cement concrete paving.
4. Section 02776: Granular base under concrete site elements.
5. Section 07261: Furnishing of vapor retarder and seam tape.

1.2 REFERENCES

A. American Society For Testing And Materials:
1. ASTM E 1643-98, 'Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.'

1.3 SEQUENCING

A. Install vapor retarder and granular base system after application of termite control and before placing concrete. If termite control is disturbed or receives precipitation before being covered with vapor retarder, re-apply termite control.

PART 2 - PRODUCTS

2.1 GRANULAR BASE

A. Gravel: 1/4 inch minimum to one inch maximum well-graded, clean gravel or crushed rock.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install vapor retarder in accordance with ASTM E 1643 and following instructions:
1. Install vapor retarder over compacted sub-grade and tops of interior stem walls so entire area under slab is covered.
2. Lap joints 3 inches minimum and seal with specified seam tape.

3. Seal vapor retarder around pipes, conduits, and other utility items that penetrate vapor retarder using factory-fabricated boot installed as recommended by Manufacturer.
4. Except for punctures required for reinforcing and anchor bolts at top of stem walls, seal tears and punctures before placing granular base.

B. Place 4 inches minimum of granular base over vapor retarder, level, and compact with two passes of 2-1/2 ton minimum roller.

C. Do not allow water onto vapor retarder or granular base before placing concrete.

3.2 FIELD QUALITY CONTROL

A. Notify Architect 2 days before installation of concrete to allow inspection of vapor retarder and granular base installation.

END OF SECTION

SECTION 02513

FIRE SUPPRESSION WATER DISTRIBUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
1. Perform excavation and backfill required for installation of work of this Section.
2. Furnish and install fire water system as described in Contract Documents.
3. Furnish and install connection to water main.

B. Related Sections:
1. Section 02051: General Site Construction Requirements.
2. Section 02315: Procedure and quality of excavating, backfilling, and compacting.
3. Section 08712: Padlock for post indicator valve.

1.2 REFERENCES

A. American National Standards Institute / American Water Works Association:
1. ANSI A21.10 / AWWA C 110-93, 'Fittings, 3 inch through 48 inch, for Water and Other Liquids, Gray-Iron and Ductile-Iron.'
2. ANSI A21.11 / AWWA C 111-90, 'Rubber Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.'
3. ANSI A21.50 / AWWA C 150-91, 'Thickness Design of Ductile-Iron Pipe.'
4. ANSI A21.51 / AWWA C 151-91, 'Ductile-Iron Pipe, Centrifugally Cast, in Metal Molds or Sand-Lined Molds for Water or Other Liquids.'

B. American Society For Testing And Materials:
1. ASTM A 126-95, 'Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.'
2. ASTM A 197-00, 'Standard Specification for Cupola Malleable Iron.'
3. ASTM A 307-00, 'Standard Specification for Carbon Steel Bolts and Studs 60 000 psi Tensile Strength.'
4. ASTM A 506-00, 'Standard Specification for Steel, Sheet and Strip, Alloy, Hot-Rolled and Cold-Rolled, Regular Quality and Structural Quality.'
5. ASTM A 575-96, 'Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades.'

C. American Water Works Association:
1. AWWA C 502-85, 'Specification for Dry Barrel Fire Hydrants.'

D. National Fire Protection Association:
1. NFPA 13-1991, 'Standard for the Installation of Sprinkler Systems.'
2. NFPA 24-1992, 'Standard for the Installation of Private Fire Service Mains and Their Appurtenances.'

1.3 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:
1. Install exterior fire water system according to NFPA 13, NFPA 24, and Cast Iron Pipe Research Institute Procedures unless specified otherwise below.

2. Install hydrant in accordance with AWWA C 502.
3. Install exterior fire water system up to and including pipe flange 12 inches above floor inside building.

B. Pre-Installation Conference: Participate in pre-installation conference specified in Section 03313.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Pipe:
1. Ductile iron pipe in accordance with ANSI A21.51 / AWWA C 151 and ANSI A21.50 / AWWA C 150.

B. Fittings: Ductile iron pipe fitting in accordance with ANSI A21.10 / AWWA C 110 and rubber gaskets joints in accordance with ANSI A21.11 / AWWA C 111.

C. Hydrants:
1. Dry-barrel fire hydrant (base valve type) complying with AWWA C 502, with 150 psi working pressure with two 2-1/2 inch hose connections and one 4-1/2 inch pumper connection with caps and chains. Nozzle cap nuts to match operating stem nuts.
2. Acceptable Products:
   a. Hydrants accepted by authority having jurisdiction are approved.

D. Gate Valves:
1. Cast iron body with bolted bonnet.
2. Indicator post pattern.
3. Non-rising stem.
4. 175 psi working pressure.
5. Approved Products:
   a. Nibco:
      1) Model M-609 with mechanical connection.
      2) Model F-609 with flanged connection.
   b. Mueller:
      1) Model A-2052-5 with mechanical connection.
      2) Model A-2052-6 with flanged connection.

E. Indicator Post Valve:
1. UL / ULC / FM Approved.
2. Adjustable type.
3. Cast iron body.
4. Approved Products:
   a. Nibco: Model NIP1A Vertical Post.
   b. Mueller: Model A-20800

F. Tamper Switch:
1. UL / ULC / FM Approved.
2. Weather and tamper resistant.
3. Single Pole Double Throw Switch.
4. Approved Product:
   a. Potter Electric Signal: Model PCVS

G. Anchorages:
1. Provide anchorages for tees, plugs, caps, bends, and hydrants in accordance with NFPA 24.

2. Miscellaneous Fittings:
   a. Clamps, Straps, And Washers: Steel, meeting requirements of ASTM A 506.
   b. Rods: Steel, meeting requirements of ASTM A 575.
   c. Rod Couplings: Malleable iron, meeting requirements of ASTM A 197.
   d. Bolts: Steel, meeting requirements of ASTM A 307.
   e. Cast Iron Washers: Meeting requirements of ASTM A 126, Class A.
   f. Thrust Block: 2500 psi concrete.

2.2 MANUFACTURERS

A. Contact Information:
1. Mueller Company, Decatur, IL (800) 423-1323 or (217) 423-4471. www.muellerflo.com
2. Nibco Inc, Elkhart, IN (800) 234-0227 or (219) 295-3000. www.nibco.com
3. Potter Electric Signal Company, St Louis, MO (800) 325-3936 or (314) 878-4321. www.pottersignal.com
4. Potter-Roemer, Santa Ana, CA (800) 366-3473 or (714) 530-5300. www.potterroemer.com

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before installation, inspect pipe for defects and cracks. Do not use defective, damaged, or unsound pipe.

3.2 PREPARATION

A. Excavate and backfill as specified in Section 02315 with following additional requirements:
1. Runs shall be as close as possible to those shown on Drawings.
2. Excavate to required depth.
3. Grade to obtain fall required.
4. Bottom of trenches shall be hard. Tamp as required.
5. Remove debris from trench prior to laying of pipe.
6. Do not cut trenches near footings without consulting Architect.
7. Excavate trenches so outside pipe will be 12 inches minimum below frost line or 48 inches minimum below finish grade, whichever is deeper.
8. Cover pipe only after testing is complete and accepted by Architect.

3.3 INSTALLATION

A. General:
1. When work is not in progress, close open ends of pipe and fittings so no trench water, soil, or other substances will enter pipes or fittings.
2. Keep trenches free from water until pipe jointing material has set. Do not lay pipe when condition of trench or weather is unsuitable for such work.

B. Placing And Laying of Underground Pipe:
1. Deflections from straight line or grade, as required by vertical curves, horizontal curves, or offsets, shall not exceed 6/D inches per linear foot of pipe where D represents nominal diameter of pipe expressed in inches
2. Deflections to be determined between center lines extended of two connecting pipes.

3. If alignment requires deflection in excess of these limitations, provide special bends or sufficient number of shorter lengths of pipe to provide angular deflections within limits approved by Architect.
4. Laying:
   a. Shape trench bottom to give substantially uniform circumferential support to lower third of each pipe.
   b. Pipe laying shall proceed up-grade with spigot ends of bell-and-spigot pipe pointing in direction of flow.
   c. Lay each pipe true to line and grade and in such manner as to form close concentric joint with adjoining pipe and to prevent sudden offsets of flow line.
   d. Support fittings at bends in pipe line by concrete thrust blocks firmly wedged against vertical face of trench. Blocks shall be at least two cu ft in size.
   e. As work progresses, clear interior of pipe of dirt and superfluous materials. Where cleaning after laying is difficult because of small pipe, keep suitable swab or drag in pipe and pull forward past each joint immediately after jointing has been completed.

C. Make joints between ductile iron and cast iron pipe and other types of pipe with standard manufactured cast-iron adapters and fittings.

D. Provide cast iron valve box for fire protection valve. Encase valve box in concrete.

E. Install ductile iron pipe to flange connection 12 inches above floor. Provide 2 inch minimum clearance around pipe at penetration through floor. Fill clearance with mastic.

F. Make joints between ductile iron and other types of pipe with standard manufactured adapters and fittings. Make connections between new work and existing mains using specials fittings to suit actual conditions.

G. Incidental Items of Work:
1. Valve, plug, or cap, as directed by Architect, where pipe ends are left for future connections.
2. Make key for unlocking valve handle identical to key used to open doors to building.

3.4 FIELD QUALITY CONTROL

A. Test system according to 'Contractor's Material & Test Certification for Underground Piping' NFPA 13, figure 1-10.1(b).2.

END OF SECTION

SECTION 02517

WATER SUPPLY / COPPER

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
1. Perform trenching and backfilling required for work of this Section.
2. Furnish and install piping for potable water supply from water main to within 5 feet of building as described in Contract Documents complete with meter, shut-off valve, and connections.
3. Furnish and install piping from water main to meter inside of building as described in Contract Documents complete with shut-off valve and connections.

B. Related Sections:
1. Section 02051: General Site Construction Requirements.
2. Section 02315: Procedure and quality of excavating, backfilling, and compacting.

1.2 REFERENCES

A. American National Standards Institute / American Welding Society:
1. ANSI / AWS A5.8-92, 'Standard Specification for Brazing Alloys.'

B. American Society For Testing and Materials:
1. ASTM B 88-99, 'Standard Specification for Seamless Copper Water Tube.'

PART 2 - PRODUCTS

2.1 MATERIALS

A. Pipe: Type K copper meeting requirements of ASTM B 88 with wrought copper, brazed fittings.

B. Water Meter: As required by local agency furnishing water.

C. Connection Material:
1. Brazing Rods In accordance with ANSI / AWS A5.8:
   a. Classification BCuP-4 Copper Phosphorus (6 percent silver).
   b. Classification BCuP-5 Copper Phosphorus (15 percent silver).
   c. Classification BAg-5 Silver (45 percent silver).
   d. Do not use rods containing Cadmium.
2. Flux:
   a. Approved Products:
      1) Stay-Silv white brazing flux by J W Harris Co, Cincinnati, OH (800) 733-4533 or (513) 891-2000. www.jwharris.com.
      2) High quality silver solder flux by Handy & Harmon, Fairfield, CT (800) 245-2728 or (203) 259-8321. www.handyharmon.com.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Excavate and backfill as specified in Section 02315 with following additional requirements:
1. Runs shall be as close as possible to those shown on Drawings.
2. Excavate to required depth.
3. Bottom of trenches shall be hard. Tamp as required.
4. Remove debris from trench before laying pipe.
5. Do not cut trenches near footings without consulting Architect.
6. Excavate trenches so outside pipe will be 12 inches minimum below frost line or 24 inches minimum below finish grade, whichever is deeper.
7. Backfill only after pipe lines have been tested and inspected, and approved by Architect.

B. Install piping system so it may contract and expand freely. Completely eliminate cross connections, backflow, and water hammer.

C. Install shut-off valve at meter.

3.2 FIELD QUALITY CONTROL

A. Site Tests
1. Sterilization And Negative Bacteriological Test:
   a. Sterilize potable water system with solution containing 200 parts per million minimum of available chlorine and maintaining a pH of 7.5 minimum. Introduce chlorinating materials into system in manner approved by Architect. Allow sterilization solution to remain for 24 hours and open and close valves and faucets several times during that time.
   b. After sterilization, flush solution from system with clean water until residual chlorine content is less than 0.2 parts per million.
   c. Water system will not be accepted until negative bacteriological test is made on water taken from system. Repeat dosing as necessary until such negative test is accomplished.
2. Pressure Test: Before covering pipes, test system in presence of Architect or governing agency at 100 psi hydrostatic pressure for two hours and show no leaks.

3.3 CLEANING

A. Remove excess earth from site or place as directed by Architect.

END OF SECTION

SECTION 02535

SANITARY SEWAGE SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
1. Perform excavating and backfilling required for work of this Section.
2. Furnish and install sanitary sewage system as described in Contract Documents beginning at 5 feet from where it enters building and connecting to serving sewer system.

B. Related Sections:
1. Section 02051: General Site Construction Requirements.
2. Section 02315: Procedure and quality of excavating, backfilling, and compacting.
3. Section 15150: Sanitary sewage system within building and within 5 feet of building.

1.2 REFERENCES

A. American Society For Testing And Materials:
1. ASTM A 74-98, 'Standard Specification for Cast Iron Soil Pipe and Fittings.'
2. ASTM C 564-97, 'Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.'
3. ASTM D 2235-96a, 'Standard Specification for Solvent Cement for Acrylonitrille-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.'
4. ASTM D 2321-00, 'Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.'
5. ASTM D 2564-96a, 'Standard Specification for Solvent Cements for Poly (Vinyl Chloride)(PVC) Plastic Piping Systems.'
6. ASTM D 2661-97a, 'Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings.'
7. ASTM D 2665-00, 'Standard Specification for Poly (Vinyl Chloride)(PVC) Plastic Drain, Waste, and Vent Pipe Fittings.'
8. ASTM D 3034-00, 'Standard Specification for Type PSM Poly Vinyl Chloride)(PVC) Sewer Pipe and Fittings.'
9. ASTM F 656-96a, 'Standard Specification for Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride)(PVC) Plastic Pipe and Fittings.'
10. ASTM F 789-95a, 'Standard Specification for Type PSM Poly (Vinyl Chloride)(PVC) Plastic Gravity Flow Sewer Pipe and Fittings.'

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Install cleanouts in accordance with local governing authority and State codes.

PART 2 - PRODUCTS

2.1 COMPONENTS

A. Cast Iron Soil Pipe And Fittings:
1. Meet requirements of ASTM A 74, Service Grade:
   a. Cast iron for bell and spigot fittings.
   b. Cast iron for no-hub joints.
2. Approved Joint Material And Manufacturers::
   a. For Bell And Spigot Pipe: Rubber gaskets meeting requirements of ASTM C 564 and compatible with pipe used.
   b. For No-Hub Pipe:
      1) Approved Products:
         a) Neoprene gaskets with type 304 stainless steel clamp and 24 ga type 304 stainless steel housing by Clamp-All Corp, Haverhill, MA (800) 762-7255 or (978) 372-9010. www.clampall.com
         b) SuperGrip 304 by AB&I - American Brass & Iron, Oakland, CA (800) 468-4766 or (510) 632-3467. www.abifoundry,com
         c) Husky SD 4000 coupling by ANACO, Anaheim, CA (707) 259-0602.
         d) MG Coupling by MG Piping Products Co, Stanton, CA (800) 761-8055 or (714) 761-8055, www.mgcoupling.com

B. ABS Schedule 40 solid wall plastic pipe and fittings meeting requirements of ASTM D 2661 joined with pipe cement meeting requirements of ASTM 2235.

C. PVC:
1. Schedule 40 solid wall plastic pipe and fittings meeting requirements of ASTM D 2665 joined using cement primer meeting requirements of ASTM F 656 and pipe cement meeting requirements of ASTM D 2564.
2. Gasket joint gravity sewer pipe and fittings meeting requirements of ASTM D 3034 or ASTM F 789. Joints shall be integral wall and elastomeric gasket.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before installation, inspect pipe for defects and cracks. Do not use defective, damaged, or unsound pipe.

3.2 PREPARATION

A. Excavate and backfill as specified in Section 02315 with following additional requirements:
1. Runs shall be as close as possible to those shown on Drawings.
2. Excavate to required depth and grade to obtain fall required.
3. Bottom of trenches shall be hard. Tamp as required.
4. Remove debris from trench before laying pipe.
5. Do not cut trenches near footings without consulting Architect.
6. Excavate trenches so outside pipe will be 12 inches minimum below frost line or 18 inches minimum below finish grade, whichever is deeper.

3.3 INSTALLATION

A. General:
1. When work is not in progress, close open ends of pipe and fittings so no trench water, soil, or other substances will enter pipes or fittings.
2. Keep trenches free from water until pipe jointing material has set. Do not lay pipe when condition of trench or weather is unsuitable for such work.
3. Trench width at top of pipe:
   a. Minimum: 18 inches or diameter of pipe plus one foot, whichever is greater.
   b. Maximum: Outside diameter of pipe plus two feet.

B. Placing And Laying of Underground Pipe:
1. Deflections from straight line or grade, as required by vertical curves, horizontal curves, or offsets, shall not exceed 6/D inches per linear foot of pipe where D represents nominal diameter of pipe expressed in inches
2. Deflections to be determined between center lines extended of two connecting pipes.
3. If alignment requires deflection in excess of these limitations, provide special bends or sufficient number of shorter lengths of pipe to provide angular deflections within limits approved by Architect.
4. Laying:
   a. Pipe laying shall proceed up-grade with spigot ends of bell-and-spigot pipe pointing in direction of flow.
   b. Lay each pipe true to line and grade and in such manner as to form close concentric joint with adjoining pipe and to prevent sudden offsets of flow line.
   c. As work progresses, clear interior of pipe of dirt and superfluous materials. Where cleaning after laying is difficult because of small pipe, keep suitable swab or drag in pipe and pull forward past each joint immediately after jointing has been completed.
5. Make joints between cast iron pipe and other types of pipe with standard manufactured cast-iron adapters and fittings.
6. Valve, plug, or cap, as directed by Architect, where pipe ends are left for future connections.

C. Cast Iron Pipe And Fittings:
1. Shape trench bottom to give substantially uniform circumferential support to lower third of each pipe. Provide depression under bell of each joint to maintain even bearing of sewer pipe.
2. Connect to street main as required by local authorities.
3. Use jacks to make-up gasketed joints.

D. Thermoplastic Pipe And Fittings:
1. Install in accordance with Manufacturer's recommendations and ASTM D 2321.
2. Stabilize unstable trench bottoms.
3. Bed pipe true to line and grade with continuous support from firm base.
   a. Bedding depth: 4 to 6 inches.
   b. Material and compaction to meet ASTM standard noted above.
4. Excavate bell holes into bedding material so pipe is uniformly supported along its entire length. Blocking to grade pipe is forbidden.
5. Piping and joints shall be clean and installed according to Manufacturer's recommendations. Break down contaminated joints, clean seats and gaskets and reinstall.
6. Do not use back hoe or power equipment to assemble pipe.
7. Initial backfill shall be 12 inches above top of pipe with material specified in referenced ASTM standard.
8. Minimum cover over top of pipe:
   a. 36 inches before allowing vehicular traffic over pipe.
   b. 48 inches before use of compaction equipment other than hand or impact tampers.

3.4 FIELD QUALITY CONTROL

A. Failure to install joints properly shall be cause for rejection and replacement of piping system.

END OF SECTION

SECTION 02630

STORM DRAINAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
1. Perform excavating and backfilling required for work of this Section.
2. Furnish and install storm drainage system as described in Contract Documents from point of water collection to terminating point.

B. Related Sections:
1. Section 02051: General Site Construction Requirements.
2. Section 02315: Procedure and quality of excavating, backfilling, and compacting.

1.2 REFERENCES

A. American Association Of State Highway And Transportation Officials:
1. AASHTO M-252, 4 to 10 inch pipe, 'Specifications for Corrugated Polyethylene Pipe.'
2. AASHTO M-294, 12 to 48 inch pipe, 'Specifications for Corrugated Polyethylene Pipe.'

B. American Society For Testing And Materials:
1. ASTM A 74-98, 'Standard Specification for Cast Iron Soil Pipe and Fittings.'
2. ASTM A 536-84 (99), 'Standard Specification for Ductile Iron Castings.'
3. ASTM A 929-97, 'Standard Specification for Steel Sheet, Metallic-Coated by the Hot-Dip Process for Corrugated Steel Pipe.'
4. ASTM C 14-99, 'Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe.'
5. ASTM C 76-00, 'Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.'
6. ASTM C 564-97, 'Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.'
7. ASTM D 2321-00, 'Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.'
8. ASTM D 3034-00, 'Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.'
9. ASTM D 3212-96a, 'Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.'
10. ASTM F 794-99, 'Standard Specification for Poly(Vinyl Chloride)(PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.'
11. ASTM F 1336-00, 'Standard Specification for Poly(Vinyl Chloride)(PVC) Gasketed Sewer Fittings.'

PART 2 - PRODUCTS

2.1 MATERIAL

A. Bedding Material: 3/8 inch crushed gravel.

2.2 COMPONENTS

A. Catch Basins, Curb Inlets, Etc:
1. Concrete:
   a. Construct of 4000 psi minimum concrete.
   b. Include cover inlet with cast iron frame and grate as shown on Drawings.
2. PVC:
   a. Comply with requirements of ASTM D 3212. ASTM F 794, and ASTM F 1336.
   b. Metal grates, Frames, and hoods shall comply with ASTM A 536, Grade 70-50-05.
   c. Acceptable Products:
      1) Nyloplast-ADS, Buford, GA (866) 888-8479. www.nyloplast-us.com
      2) Equal as approved by Architect before bidding. See Section 01600.

B. Concrete Pipe:
1. Non-Reinforced: Meet requirements of ASTM C 14.
2. Reinforced:
   a. Meet requirements of ASTM C 76, plain end.
   b. Determine class of pipe by depth of cover over pipe at rough-graded elevations as follows:

1) Depth Of Cover	Class Of Pipe
a) Under 2 feet	V
b) 2 feet to 3 feet	IV
c) 3 feet to 6 feet	III
d) Over 6 feet	II

C. PVC Pipe And Fittings:
1. Meet requirements of ASTM D 3034, SDR 35.
2. Fittings: Slip Joint type with elastomeric seals.

D. Corrugated Polyethylene Pipe And Fittings:
1. Meet requirements of AASHTO M-252 or M-294, Type S.
   a. Corrugated, helical or annular, exterior with smooth interior and gasketed connectors.
   b. Corrugated, annular, with silt and watertight joints for storm sewers.

E. Corrugated Metal Pipe:
1. Meet requirements of ASTM A 929.
2. 16 gauge, standard round, galvanized with 2 ounces zinc per square foot sheet steel.
3. Corrugations:
   a. 6 to 10 Inch Pipe: 1-1/2 by 1/4 inch depth helical corrugations.
   b. 12 to 60 Inch Pipe: 2-2/3 by 1/2 inch depth helical corrugations.

F. Cast Iron Soil Pipe And Fittings:
1. Meet requirements of ASTM A 74.
2. Joint Material: Rubber gaskets meeting requirements of ASTM C 564 and compatible with pipe used.

PART 3 - EXECUTION

3.1 PREPARATION

A. Excavate and backfill as specified in Section 02315 with following additional requirements:
1. Runs shall be as close as possible to those shown on Drawings.
2. Excavate to required depth.
3. Grade to obtain fall required.
4. Remove debris from trench before laying bedding and pipe.

5. Do not cut trenches near footings without consulting Architect.
6. Backfill only after pipe lines have been tested, inspected, and approved by Architect.

3.2 INSTALLATION

A. Concrete Pipe:
1. Provide 3 inches of uncompacted bedding material below pipe.
2. After installation of pipe, provide additional bedding material up to springline of pipe.

B. PVC / Polyethylene Pipe:
1. Install in accordance with ASTM D 2321.
2. Minimum cover for corrugated polyethylene pipe and fittings shall be 12 inches for H-20 load.

C. Use jacks to make-up gasketed joints.

3.3 FIELD QUALITY CONTROL

A. Failure to install joints properly shall be cause for rejection and replacement of piping system.

3.4 CLEANING

A. Remove excess earth from site or place as directed by Architect.

END OF SECTION

SECTION 02742*

ASPHALTIC CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
1. Prepare pavement sub-grade as described in Contract Documents to receive pavement base and paving.
2. Furnish and install pavement base and asphaltic concrete paving in driveways and parking areas as described in Contract Documents.

B. Related Sections:
1. Section 02051: General Site Construction Requirements.
2. Section 02315: Compaction procedures and tolerances.

1.2 REFERENCES

A. American Society For Testing And Materials:
1. ASTM C 131-96, 'Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.'
2. ASTM D 977-98, 'Standard Specification for Emulsified Asphalt.'
3. ASTM D 1075-96 (2000), 'Standard Test Method for the Effect of Water on Compressive Strength of Compacted Bituminous Mixtures.'
4. ASTM D 1188-96, 'Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens.'
5. ASTM D 1559-89, 'Standard Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus.'
6. ASTM D 2027-97, 'Standard Specification for Cutback Asphalt (Medium-Curing Type).'
7. ASTM D 2041-00, 'Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures.'
8. ASTM D 2397-98, 'Standard Specification for Cationic-Emulsified Asphalt.'
9. ASTM D 2726-00, 'Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Saturated Surface-Dry Specimens.'
10. ASTM D 3381-92 (1999), 'Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction.'

1.3 SUBMITTALS

A. Product Data: Manufacturer's published product data on pre-emergent herbicide.

B. Quality Assurance / Control:
1. Mix design of asphalt concrete mixture.
2. Copies of test results from tests conducted to assure compliance to Contract Document requirements.
3. Manufacturer's application instructions for pre-emergent herbicide.

1.4 QUALITY ASSURANCE

A. Qualifications: Pre-emergent herbicide shall be applied by applicator certified by State in which Project is located as an applicator of agricultural chemicals.

B. Pre-Installation Conferences:
1. Participate in pre-installation conference specified in Section 02311.
2. Schedule paving pre-installation conference after staking of parking areas and installation of sleeves, but before installation of base and paving.

1.5 PROJECT CONDITIONS

A. Environmental Requirements:
1. Do not perform work during following conditions:
   a. Ambient temperature or temperature of base below 50 deg F.
   b. Presence of free surface water.
   c. Over-saturated base and sub-grade materials.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Pre-emergent herbicide:
1. Selective type pre-emergence control chemical containing 60 percent Trifluralin minimum.
2. Labeled for under-pavement use.
3. Acceptable Products:
   a. Treflan or Spike 80W by Dow AgroSciences, Indianapolis, IN (800) 905-7326 or (317) 337-3000. www.dowagro.com
   b. Trust 4EC by Agriliance LLC, St Paul, MN (800) 535-4635 or (651) 451-5000.
   c. Equal as approved by Architect before installation. See Section 01600.

B. Base:
1. New Aggregate Base:
   a. Road Base type gravel or crushed stone, graded as follows:

Sieve	Percent by Weight Passing Sieve
a) 1 inch	100
b) 3/4 inch	85 - 100
c) No. 4	45 - 60
d) No. 10	30 - 50
e) No. 200	5 - 10 (non-plastic)

2. Recycled Aggregate Base:
   a. Pulverized existing Portland cement or asphalt cement concrete paving mixed uniformly with existing aggregate base.
   b. Conform to following gradation:

Sieve	Percent by Weight Passing Sieve
a) 2 Inch	100
b) 1-1/2 inch	85 – 100
c) 3/4 inch	60 – 80
d) No. 4	30 – 50
e) No. 200	5 – 12

   c. Quality Requirements as established by testing:
      1) R-value: 70 minimum.
      2) Sand Equivalent: 25 minimum.

3) Durability Index: 35 minimum.

C. Asphalt Cement Primer: Meet requirements of ASTM D 2027, MC 70, plus or minus one grade.

D. Tack Coat: Emulsified asphalt meeting requirements of either ASTM D 977, Grade SS-1H, or ASTM D 2397, Grade CSS-1H.

E. Pavement:
1. Asphalt Cement:
   a. Meet requirements of ASTM D 3381, Viscosity grade (Original Asphalt) as follows:
      1) AC5 in cold climatic conditions.
      2) AC10 in moderate climatic conditions.
      3) AC20 in hot climatic conditions.
2. Aggregates:
   a. Fine to coarse mineral aggregates with wear less than 40 percent as determined by ASTM C 131 and mineral filler suitable for pavement meeting following gradation requirements:
      1)

Sieve	Percent by Weight Passing Sieve
a) 1/2 inch	100
b) 3/8 inch	85 – 100
c) No. 4	65 – 80
d) No. 8	50 – 60
e) No. 30	25 – 40
f) No. 80	18 – 30
g) No. 200	3 – 8 (non-plastic)

   b. Up to 15 percent by weight of total aggregates may consist of pulverized, recycled asphalt cement concrete pavement, providing aggregate grading requirements are met.

2.2 MIXES

A. Central plant hot mix.

B. Develop mix design according to Marshall Method to achieve optimum asphalt content as shown by test data curves based on testing samples containing 1/2 percent increments of asphalt content. Samples shall include minimum of two with asphalt content above optimum and two with asphalt content below optimum.
1. Make tests in accordance with ASTM D 1559 and ASTM D 1075 (50 blow count Marshall).
2. Final design shall meet following criteria:
   a. Stability: 1200 pounds minimum.
   b. Flow: 8 minimum, 18 maximum.
   c. Air voids: 2 percent minimum, 4 percent maximum.
   d. Voids in mineral aggregate: 15 percent minimum.
   e. Asphalt cement by weight of total: 5 percent minimum.
   f. Dry Strength: 200 psi.
   g. Index of Retained Strength: 75 percent.

PART 3 - EXECUTION

3.1 PREPARATION

A. Survey and stake parking surfaces to show grading required by Contract Documents.

B. Sub-Grade:
1. Fine grade parking surface area to grades required by Contract Documents.
2. Compact sub-grade as specified in Section 02315.

C. Pre-emergent Herbicide:
1. Apply to prepared subgrade dispersed in liquid. Concentrate shall be such that Manufacturer's full recommended rate of chemical will be applied to every 1000 sq ft and liquid will penetrate a minimum of 2 inches.
2. Application shall be no more than one day before installation of base.
3. Take necessary precautions to protect adjoining property and areas designated for planting on building site.

3.2 INSTALLATION

A. Site Tolerances:
1. Sub-Grade: 0.00 inches high. Measure using string line from curb to curb, gutter, flat drainage structure, or grade break.
2. Base:
   a. Base shall be 6 inches thick minimum after compaction, except where shown thicker on Drawings.
   b. Measure using string line from curb to curb, gutter, flat drainage structure, or grade break.
3. Paving:
   a. Apply asphaltic concrete paving in single lift 3 inches thick minimum after compaction, except where shown thicker on Drawings. Paving thicker than 3 inches may be applied in two lifts, the first 2 inches thick minimum and the second 1-1/2 inches thick minimum.
   b. Paving adjacent to cast-in-place concrete site elements shall be between 1/4 inch higher than concrete and flush with concrete.
   c. Surface texture of hand worked areas shall match texture of machine-laid areas.

B. Base:
1. If roller is smaller than 8 ton, lay gravel and compact in two courses.
2. Compact as specified in Section 02315.
3. Priming: Prime base with application of 0.2 to 0.5 gallons of asphalt cement primer per square yardif pavement will be laid more than three days after compaction of base, or if precipitation is anticipated between completion of compaction of base and laying of pavement.
4. Recompact unprimed base if it receives precipitation before pavement is laid.
5. Remove or repair improperly prepared areas as directed by Architect.

C. Asphaltic Concrete Paving:
1. Tack coat vertical concrete surfaces that will be in contact with paving.
2. Uniformly mix materials so aggregate is thoroughly coated with asphalt.
3. Place at temperatures between 250 and 325 deg F with a self-propelled laydown machine.
4. Longitudinal bituminous joints shall be vertical and properly tack coated if cold. Transverse joints shall always be tack coated.
5. Compaction:
   a. Compact asphaltic concrete paving to 96 percent minimum. Determine percent compaction by dividing density of test cores as determined by either ASTM D 1188 or ASTM D 2726 by laboratory compacted density as determined by ASTM D 1559. Maximum total air voids in completed asphaltic concrete shall be 8 percent as determined by ASTM D 2041.
   b. Roll with powered equipment capable of obtaining specified density.
   c. Begin breakdown rolling immediately after asphalt is placed when asphalt temperature is at maximum. Complete breakdown rolling before mix temperature drops below 240 deg F . Complete handwork compaction concurrently with breakdown rolling.

d. Complete intermediate rolling as soon as possible after breakdown rolling and before mix temperature drops below 185 deg F. Do not roll paving for compaction purposes after asphalt temperature falls below 185 deg F.
e. Execute compaction so visibility of joints is minimized. Complete finish rolling to improve asphalt surface as soon as possible after intermediate rolling and while asphalt paving is still warm. Do not use vibration for finish rolling.

6. Surface shall be uniform with no 'birdbaths.' Leave finished surfaces clean and smooth. Variations from specified grades shall not exceed 1/2 inch.

3.3 FIELD QUALITY CONTROL

A. Site Tests: When tested with 10 foot straight edge, surface of completed work shall not contain irregularities in excess of 1/4 inch.

B. Laboratory Tests:

1. Arranage and pay for an independent testing laboratory, approved by the Project Manager, and select test locations, an equal number from near edges of paving and at random in field.
2. Arrange for selected laboratory to make tests after completion of work of this Section. After testing, repair test locations as necessary and remove and replace work not in compliance with Contract Documents at no additional cost to Owner.
3. Testing laboratory will perform one test series for every 10,000 sq ft of parking.
   a. Tests reports will show compliance with Contract Documents regarding type of sub base, depth and density of base, depth and density of paving, and in materials used. Reports will also give test procedures used by testing laboratory.
   b. Testing laboratory will forward three copies of test report to Architect.
4. All spills, spotting, or soiling of asphalt or liquid emulsion on concrete, sidewalks, curbs, wateways, buildings, etc., will be cleaned off thoroughly to Owner's satisfaction and will require approval by the Project Manager.

END OF SECTION

SECTION 02763

PAVEMENT MARKING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
1. Furnish material and apply pavement and curb markings as described in Contract Documents.

1.2 REFERENCES

A. Canadian General Standards Board:
1. CGSB 1-GP-74M, 'Paint, Traffic, Alkyd.'

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Paint handicap spaces to conform to ADA Standards and local code requirements.

1.4 PROJECT CONDITIONS

A. Project Environmental Requirements:
1. Apply only on dry surfaces, during favorable weather, and when damage by rain, fog, or condensation not anticipated.
2. Latex Paint:
   a. Atmospheric temperature above 50 deg F.
   b. When temperature is not anticipated to drop below 50 deg F during drying period.
3. Alkyd or Chlorinated Rubber Paint:
   a. Atmospheric temperature above 40 deg F.
   b. When temperature is not anticipated to drop below 40 deg F during drying period.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Paint:
1. Non-reflectorized, meeting requirements of CGSB 1-GP-74M plus Amendment 81 or Provincial or local highway departments.
2. Color meeting CGSB 1-GP-12C + Amendment Dec 84 'Alkyd Traffic Paint'
   a. Yellow - 505-308.
   b. White - 513-301.
3. Acceptable Products:
   a. 442XX Traffic Marking Paint by ICI Devoe, Cleveland, OH (888) 681-6353 or (216) 344-8000. www.devoepaint.com
   b. Set-Fast Traffic Marking Paint by Sherwin-Williams, Cleveland, OH (800) 321-8194 or (216) 566-2000. www.sherwin-williams.com
   c. Equal as approved by Architect before application. See Section 01600.

B. Preformed Thermoplastic:
1. Reflectorized.
2. Colors:
   a. Yellow: Parking stripes, crosswalk stripes, and safety markings.
   b. Blue And White: Handicapped markings.
   c. Red: Fire lanes and no parking zones.
3. Approved Product:
   a. Premark Plus by Flint Trading Inc, Thomasville, NC (336) 475-6600. www.flinttrading.com

PART 3 - EXECUTION

3.1 PREPARATION

A. Do not apply acrylic latex system until paving has cured 7 days minimum. Do not apply alkyd or chlorinated rubber systems until paving has cured 3 months minimum.

B. Surfaces shall be dry and free of grease and loose dirt particles. Scrape and wire brush chipped or damaged paint on existing curbs.

C. Perform layout with chalk or lumber crayon only.

3.2 APPLICATION

A. Site Tolerances:
1. General: Make lines parallel, evenly spaced, and with sharply defined edges.
2. Line Widths:
   a. Plus or minus 1/4 inch variance on straight segments.
   b. Plus or minus 1/2 inch variance on curved alignments.

B. Provide two coat application, each coat applied at 150 sq ft per gal. Apply second coat after three hours minimum or when first coat is thoroughly dried, whichever is longer.

3.3 CLEANING

A. Remove drips, overspray, improper markings, and paint material tracked by traffic by sand blasting, wire brushing, or other method approved by Architect prior to performance.

END OF SECTION

SECTION 02776

CAST-IN-PLACE CONCRETE SITE ELEMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
1. Compact sub-base for cast-in-place concrete site elements as described in Contract Documents.
2. Furnish and install granular base for cast-in-place concrete site elements as described in Contract Documents.
3. Furnish and install cast-in-place concrete site elements as described in Contract Documents.
4. Furnish and install sealants as described in Contract Documents.

B. Related Sections:
1. Section 02051: General Site Construction Requirements.
2. Section 02315: Compaction procedures and tolerances.
3. Section 02813: Sleeves for underground irrigation system.

1.2 REFERENCES

A. American Society For Testing And Materials:
1. ASTM D 1751-99, 'Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).'

1.3 QUALITY ASSURANCE

A. Pre-Installation Conferences:
1. Participate in pre-installation conference specified in Section 02311.
2. Schedule concrete site element pre-installation conference after installation of sleeves, placing of base, and installation of forms, but before placing of concrete.

B. Meet quality assurance / control requirements specified in Section 03313.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Formwork: Meet requirements specified in Section 03120.

B. Granular Base:
1. Road Base type gravel or crushed rock, graded as follows:
   a.

Sieve	Percent by Weight Passing Sieve
1) 1 inch	100
2) 3/4 inch	85 - 100
3) No. 4	45 - 60
4) No. 10	30 - 50
5) No. 200	5 - 10 (non-plastic)

C. Expansion Joints:
1. 1/2 inch thick.

2. Manufactured commercial fiber type:
   a. Meet requirements of ASTM D 1751.
   b. Acceptable Products:
      1) Conflex by Masonite Building & Industrial Products Group, Chicago, IL (800) 257-7885. www.masonite.com
      2) Sealtight by W R Meadows Inc, Hampshire, IL (800) 342-5976. www.meadows.com
      3) Equal as approved by Architect before installation.
3. Recycled Vinyl:
   a. Light gray color.
   b. Approved Products:
      1) Proflex by Oscoda Plastics Inc, Oscoda, MI (800) 544-9538. www.oscodaplastics.com

D. Concrete: Meet requirements specified in Section 03313 for exterior concrete.

PART 3 - EXECUTION

3.1 PREPARATION

A. Sub-Base: Compact sub-base as specified in Section 02315.

3.2 INSTALLATION

A. Granular Base: Except under mow strips, place 4 inches minimum of granular base, level, and compact as specified in Section 02315.

B. Joints:
1. Align joints of sidewalk and curb and gutter.
2. Expansion And Contraction Joints:
   a. Spacing:
      1) Sidewalks And Curbs: 50 feet on center.
      2) Mow Strips: 100 feet on center.
      3) Flat Drainage Structures: 50 feet on center.
      4) Retaining Walls:
         a) 36 feet on center at walls with guardrails.
         b) 50 feet on center at walls with chain link fencing.
   b. Install so top of expansion joint material is 1/4 inch below finished surface of concrete.
   c. No expansion joint required between curbs and walks parallel to curb.
   d. Provide expansion joint at end of walks perpendicular to and terminating at curb.
3. Scored Control Joints:
   a. Spacing:
      1) Curbs: 10 feet on center.
      2) Sidewalks: 5 feet on center.
      3) Mow Strips: 5 feet on center.
      4) Flat Drainage Structures: 10 feet on center.
      5) Retaining Walls:
         a) 6 feet on center at walls with guardrails.
         b) 10 feet on center at walls with chain link fencing.
   b. Depth of control joints shall be approximately one quarter of concrete slab thickness, but not less than one inch.

C. Finish:
1. Curb, Gutter, Sidewalks, Mow Strips, Flat Drainage Structures, Stairs, And Miscellaneous:
   a. Broom finish.
   b. Round edges including edges formed by expansion joints.
   c. Remove edger marks.

2. Retaining Walls:
   a. Immediately after removing forms, remove joints, marks, bellies, projections, loose materials, and cut back metal ties from surfaces to be exposed.
   b. Point up voids with cement mortar, 1:2 mix, and rub exposed surface with carborundum to smooth, even surface.

D. Special Requirements:
1. Form vertical surfaces full depth. Do not allow concrete to flow out from under forms in any degree.
2. Sidewalks, Exterior Stairs, And Landings:
   a. Slope sidewalks with cross slope of 1/8 to 1/4 inch per ft in direction of intended drainage.
   b. Slope sidewalks away from building one percent minimum.
   c. Do not dust with cement.

3.3 FIELD QUALITY CONTROL

A. Inspection: To allow Architect's verification of grades and elevations, notify Architect three days minimum before placing concrete for specified concrete site elements.

END OF SECTION

SECTION 02810

UNDERGROUND IRRIGATION SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
1. Furnish and install underground sprinkler irrigation system as described in Contract Documents complete with accessories necessary for proper function.

1.2 SUBMITTALS

A. Product Data:
1. Manufacturer's cut sheets for each element of system.
2. Parts lists for operating elements of system.
3. Manufacturer's printed literature on operation and maintenance of operating elements of system.

B. Quality Assurance / Control: Results of service pressure test before beginning work on system.

C. Closeout:
1. Record Drawings:
   a. As installation occurs, prepare accurate record drawing to be submitted before final inspection, including:
      1) Detail and dimension changes made during construction.
      2) Significant details and dimensions not shown in original Contract Documents.
      3) Field dimensioned locations of valve boxes, manual drains, quick-coupler valves, control wire runs not in mainline ditch, and both ends of sleeves.
      4) Take dimensions from permanent constructed surfaces or edges located at or above finish grade.
      5) Take and record dimensions at time of installation.
   b. Reduce copy of record drawing to half-size, color key circuits, and laminate both sides with 5 mil thick or heavier plastic. Mount on 1/4 inch plywood board. Drill two 1/2 inch holes at top of board and hang on hooks in Custodial Room or as directed by Landscape Architect.
2. Operations And Maintenance Manual Data:
   a. Modify and add to requirements of Section 01700 as follows:
      1) Instruction manual that lists complete instructions for system operation and maintenance, including winterizing.
      2) Complete instructions on how to drain entire backflow preventer to prevent freezing.

1.3 QUALITY ASSURANCE

A. Qualifications:
1. Use only trained personnel familiar with required irrigation system installation procedures.
2. Perform installation under direction of foreman or supervisor (certified in writing by Owner of Landscape Contractor License) with five years minimum experience in sprinkling system installations.

B. Regulatory Requirements: Work and materials shall be in accordance with latest rules and regulations, and other applicable state or local laws. Nothing in Contract Documents is to be construed to permit work not conforming to these codes.

C. Pre-Installation Conference: Schedule pre-installation conference after excavation of trenches and installation of sleeves, but before installation of pipe.

1.4 DELIVERY, STORAGE, AND HANDLING

A. During delivery, installation, and storage protect materials from damage and prolonged exposure to sunlight.

1.5 SEQUENCING

A. Install sleeves before installation of cast-in-place concrete site elements and paving.

1.6 WARRANTY

A. Standard one year guarantee shall include:
1. Filling and repairing depressions and replacing plantings due to settlement of irrigation trenches.
2. Adjusting system to supply proper coverage of areas to receive water.
3. Ensuring system can be adequately drained.

1.7 OWNER'S INSTRUCTIONS

A. After system is installed and approved, instruct Owner's designated personnel in complete operation and maintenance procedures.

1.8 MAINTENANCE

A. Extra Materials:
1. Furnish following items at Substantial Completion Meeting:
   a. One heavy-duty key for stop and waste or main shut-off valve.
   b. Two valve box cover keys.
   c. 5 each of each different type of head used.
   d. One each of each size of automatic valve used.

B. Maintenance Service
1. Train Owner's designated personnel by having them assist in winterizing procedure.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Rock-Free Soil:
1. Backfill soil around PVC pipe.
2. Soil having rocks no larger than 1/2 inch in any dimension.

B. Pea Gravel:
1. For use around drains, valves, quick couplers, and impact rotor heads.
2. 1/2 inch maximum round, water worn, washed rock.

C. Sand: Fine granular material naturally produced by rock disintegration and free from organic material, mica, loam, clay, and other deleterious substances.

D. Native Material: Soil native to project site free of wood and other deleterious materials and rocks over 1-1/2 inches.

E. Topsoil: Existing in-place topsoil material. Remove rocks, roots, sticks, clods, debris, and other foreign matter over 1-1/2 inches longest dimension encountered during trenching.

2.2 COMPONENTS

A. Pipe, Pipe Fittings, And Connections:
1. Pipe shall be continuously and permanently marked with Manufacturer's name, size, schedule, type, and working pressure.
2. Pipe sizes shown on Drawings are minimum. Larger sizes may be substituted without additional cost to Owner.
3. Pipe:
   a. Pressure Lines: Schedule 40 PVC.
   b. Lateral Lines: Schedule 40 PVC.
   c. Backflow Assembly Piping: Red brass.
   d. Quick Coupler Piping: Galvanized steel.
4. Fittings: Same material as pipe, except where detailed otherwise.
5. Sleeves:
   a. Under Parking Area And Driveway Paving: Schedule 40 PVC Pipe.
   b. All Other: Class 200 PVC Pipe.
   c. Sleeve diameter shall be two times larger than pipe installed in sleeve.

B. Sprinkler Heads:
1. Each type of head shall be product of single manufacturer.
2. Conform to requirements shown on Drawings as to type, size, radius of throw, pressure, and discharge. Equals as approved by Landscape Architect before bidding.

C. Sprinkler Risers:
1. Pop-up rotor and impact sprinklers shall have adjustable riser assembly, three ell swing joint assembly, unless detailed otherwise on Drawings. These swing joint fittings shall be of schedule 40 PVC plastic and nipples schedule 80 gray PVC unless otherwise designated on Drawings. Horizontal nipple parallel to side of lateral line shall be 8 inches long minimum. All other nipples on swing joint riser shall be of length required for proper installation of sprinkler heads.
2. Pop-up sprinkler heads, shrub spray heads, bubbler heads, and stationary spray sprinkler heads shall have risers made up one of the following ways:
   a. Three schedule 40 street ells or Marlex street ells connected to lateral tee to form an adjustable riser or pop-up riser as detailed.
   b. Risers for sprinkler heads 14 inches long minimum and 24 inches maximum.
      1) Acceptable Products:
         a) Rainbird swing pipe with spiral barb fittings and street ell as detailed.
         b) Equal as approved by Landscape Architect before installation.

D. Automatic Sprinkler Control Wiring And Controller:
1. Control wire shall be UF-UL listed, color coded PVC insulated copper conductor direct burial size 14 or PE insulated 14 AWG color coded wire. Do not use green color coded wire.
2. Waterproof Wire Connectors:
   a. Acceptable Products:
      1) DBY or DBR by 3M
      2) 'One Step' 20111SP by King Safety
      3) Equal as approved by Landscape Architect before installation.

3. Automatic Controller: Make and model shown on Drawings.

E. Valves:
1. Manual Drain Valves: Brass ball valve with 'T' handle on main lines and in valve boxes on lateral lines.
2. Electric Valves: Make and model shown on Drawings.
3. Gate Valves:
   a. Bronze construction, angle type, 150 pound class, threaded connections, with cross-type operating handle designed to receive operating key.
   b. Quality Standard: Nibco T-113 non-rising stem gate valve.
4. Backflow Preventer: Make and Model shown on Drawings or as required by local code.
5. Pressure Reducing Valve: Make and model shown on Drawings or as required by local code.

F. Valve Accessories:
1. Valve Boxes:
   a. Rectangular heavy duty
   b. Lock top or snap top lids.
   c. Large enough for easy removal or maintenance of valves.
   d. Use extensions as required.
   e. Acceptable Manufacturers:
      1) Carson Industries.
      2) Plymouth Products, Div Ametek.
      3) Equal as approved by Landscape Architect before installation.
2. Valve Box Supports: Standard size fired clay paving bricks without holes.

G. Drip Components:
1. Distribution Tubing – Salco ½" dia. Non-rigid algae resistant PVC hose or approved equal.
2. Emitter –Salco PST granite FIPT base threaded onto granite Salco male adapter or approved equal.
3. Stake – Salco PVC coated metal tubing stake or approved equal.
4. Glue – Salco approved glue (Check with manufacture)

H. Other Components:
1. Recommended by Manufacturer and subject to Landscape Architect's review and acceptance before installation.
2. Provide components necessary to complete system and make operational.

2.3 MANUFACTURERS

A. Contact Information:
1. Carson Industries LLC, Glendora, CA (800) 735-5566 or (909) 592-6272. www.carsonind.com
2. King Safety Products, St Charles, MO (800) 633-0232. www.kingsafety.com
3. Nibco Inc, Elkhart, IN (800) 234-0227 or (219) 295-3000. www.nibco.com
4. Plymouth Products, Div Ametek, Sheboygan, MI (800) 645-5426 or (920) 457-9435. www.plymouthwater.com
5. Rain Bird Sprinkler Manufacturing Corp, Glendora, CA (800) 458-3005 or (626) 963-9311. www.rainbird.com
6. 3M, Austin, TX (800) 276-0049. www.3m.com/elpd

PART 3 - EXECUTION

3.1 ACCEPTABLE INSTALLERS

A.

Star Landscape	Alan Noall	801-295-5500
Erickson Landscaping	Ron Tatton	801-263-2462
Miller Landscape	Don Miller	801-571-9256
Behunin Horticulture	Eric Behunin	801-969-8381

3.2 EXAMINATION

A. Site Verification Of Conditions: Perform pressure test at stub-out on main water line provided for irrigation system, or at near-by fire hydrant. Notify Landscape Architect if pressures over 90 psi or under 60 psi are found to determine if some re-design of system is necessary before beginning work on system.

3.3 PREPARATION

A. Protection:
1. Repair or replace work of this Section damaged during course of the Work at no additional cost to Owner. If damaged work is new, installer of original work shall perform repair or replacement.
2. Do not cut existing tree roots measuring over 2 inches in diameter in order to install sprinkler lines.

B. Layout of Irrigation Heads:
1. Location of heads and piping shown on Drawings is approximate. Actual placement may vary slightly as is required to achieve full, even coverage without spraying onto buildings, sidewalks, fences, etc.
2. During layout, consult with Landscape Architect to verify proper placement and make recommendations, where revisions are advisable.
3. Minor adjustments in system layout will be permitted to avoid existing fixed obstructions.
4. Make certain changes are documented on record drawings.

3.4 INSTALLATION

A. Trenching And Backfilling:
1. Pulling of pipe is not permitted.
2. Excavate trenches to specified depth. Remove rocks larger than 1-1/2 inch in any direction from bottom of trench. Separate out rocks larger than 1-1/2 inch in any direction uncovered in trenching operation from excavated material and remove from areas to receive landscaping.
3. Cover pipe both top and sides with 2 inches of rock-free soil as specified under PRODUCTS. Remainder of backfill to within 5 inches of finish grade. Top 5 inches of backfill shall be topsoil.
4. Do not cover pressure main, sprinkler pipe, or fittings until Landscape Architect has inspected and approved system.

B. Sleeving:
1. Sleeve water lines and control wires under walks and paving using boring equipment only**. No digging or concrete and/or asphalt cutting will be allowed**. Extend sleeves 6 inches minimum beyond walk or pavement edge. Cap sleeves until pipes and wires are installed to keep sleeve clean and free of dirt and debris.
2. Position sleeves with respect to buildings and other obstructions so pipe can be easily removed.

C. Grades And Draining:

1. In localities where winterization is required, grade piping so system can be completely drained.
   a. Slope pipe to drain to control valve box where possible.
   b. Where this is not possible, slope pipe to a minimum number of low points. At these low points, install:
      1) 3/4 inch brass ball valve for manual drain..
      2) Install 2 inch Class 200 PVC pipe over top of drain and cut at finish grade.
      3) Provide rubber valve cap marker.
      4) Provide one cu ft pea gravel sump at outlet of each drain.
      5) Automatic drain valves, Manufacture. King Drains (red-mainline) (white-lateral line)
   c. Slope pipes under parking areas or driveways to drain outside these areas.
   d. Provide and install quick-coupling valve or valves in location for easy blowout of entire system. Install quick coupler valves with 4 lineal feet minimum of galvanized pipe between valve and main line.

D. Installation of Pipe:
1. Install pipe in manner to provide for expansion and contraction as recommended by Manufacturer.
2. Unless otherwise indicated on Drawings, install main lines and lateral lines connecting pop-up rotor and impact sprinklers with minimum cover of 18 inches based on finished grade. Install remaining lateral lines with minimum of 12 inches of cover based on finish grade.
3. Install pipe and wires under driveways or parking areas in specified sleeves 15 inches below finish grade or as shown on Drawings.
4. Locate no sprinkler head closer than 12 inches from building foundation. Heads immediately adjacent to mow strips, walks, or curbs shall be one inch below top of mow strip, walk, or curb and have one to 3 inches clearance between head and mow strip, walk, or curb.
5. Cut plastic pipe square. Remove burrs at cut ends before installation so unobstructed flow will result.
6. Make solvent weld joints as follows:
   a. Do not make solvent weld joints if ambient temperature is below 35 deg F.
   b. Clean mating pipe and fitting with clean, dry cloth and apply one coat of P-70 primer to each.
   c. Apply uniform coat of 711 solvent to outside of pipe.
   d. Apply solvent to fitting in similar manner.
   e. Give pipe or fitting a quarter turn to insure even distribution of solvent and make sure pipe is inserted to full depth of fitting socket.
   f. Allow joints to set at least 24 hours before applying pressure to PVC pipe.
   g. For Salco use manufacturer's recommendations.
7. Tape threaded connections with teflon tape.
8. If pipe is larger than 4 inches, install concrete thrust blocks wherever change of direction occurs on PVC main pressure lines, unless otherwise detailed on Drawings.

E. Control Valves And Controller
1. Install valves in plastic boxes with reinforced heavy duty plastic covers. Locate valve boxes within 12 inches of sidewalks and shrub bed edges with tops at finish grade. Do not install more than two valves in single box.
2. Place 3 inches minimum of pea gravel below bricks supporting valve boxes to drain box. Set valve boxes over valve so all parts of valve can be reached for service. Set cover of valve box even with finish grade. Valve box cavity shall be reasonably free from dirt and debris.
3. Wiring:
   a. Tape control wire to side of main line every 10 feet. Where control wire leaves main or lateral line, enclose it in Class 200 PVC conduit.
   b. Use waterproof wire connectors at splices and locate all splices within valve boxes.
   c. Use white or gray color for common wire and other colors for all other wire. Each common wire may serve only one controller.
   d. Run one extra control wire from panel continuously from valve to valve throughout system similar to common wire for use if a wire fails. Wire shall be different color than all other wires, except use of green wire is not acceptable. Mark extra control wire in control box as an extra wire. Extend extra control wires 24 inches and leave coiled in each valve box.

F. Backflow Preventer:
1. Install 24 inches minimum from structures or hardscaping.
2. When installed adjacent to any structure, mount test cocks on side away from structure.
3. After installation, remove handles and turn over to Owner together with extra maintenance materials.

G. Drip Equipment:
1. Prior to placing nozzles flush out system to eliminate particulate buildup.
2. Place nozzles toward plants and in an inconspicuous location.
3. When nozzles have been installed check each one for proper operation. Un-plug and continue to check until proper operation has been verified.

H. Sprinkler Heads:
1. Before installation of sprinkler heads, open control valves and use full head of water to flush out system.
2. Set sprinkler heads and quick-coupling valves perpendicular to finish grade.
3. Do not install sprinklers using side inlets. Install using base inlets only, unless approved otherwise in writing by Landscape Architect.
4. Set sprinkler heads at a consistent distance from existing walks, curbs, and other paved areas and to grade.

I. Arrange valve stations to operate in an easy-to-view progressive sequence around building. Tag valves with waterproof labels showing final sequence station assignments.

3.5 FIELD QUALITY CONTROL

A. Site Tests: Before backfilling system, test pressure lines at 100 psi minimum for 2 hours minimum and make certain there are no leaks. Notify Landscape Architect 2 working days minimum before conducting test.

B. Inspections: Landscape Architect's irrigation design consultant, or certified water auditor recommended by consultant and approved in writing by Landscape Architect, will review irrigation system at time of substantial completion. Contractor will repair all deficiencies prior to acceptance.

3.6 ADJUSTING

A. Adjust heads to proper grade when turf is sufficiently established to allow walking on it without appreciable harm. Such lowering and raising of heads shall be part of original contract with no additional cost to Owner.

B. Adjust sprinkler heads for proper distribution and trim so spray does not fall on building.

C. Adjust watering time of valves to provide proper amounts of water to all plants.

END OF SECTION

SECTION 02821 - CHAIN-LINK FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Chain-Link Fences: Industrial.
2. Gates: swing.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show locations, components, materials, dimensions, sizes, weights, and finishes of components. Include plans, gate elevations, sections, details of post anchorage, attachment, bracing, and other required installation and operational clearances.

C. Samples:

1. Polymer-coated steel wire for fabric.
2. Polymer coating on framing and accessories.
3. Slats.

PART 2 - PRODUCTS

2.1 CHAIN-LINK FENCE FABRIC

A. General: 6’-6” height. Comply with ASTM A 392, CLFMI CLF 2445, and requirements indicated below:

1. Steel Wire Fabric: Polymer-coated wire with a diameter of 0.148 inch .

a. Mesh Size: 2 inches.
b. Polymer Coating: ASTM F 668, Class 1 over metallic-coated steel wire.

1) Color: As selected by Architect from manufacturer's full range, complying with ASTM F 934.

2. Selvage: Knuckled at both selvages.

2.2 INDUSTRIAL FENCE FRAMING

A. Posts and Rails: Comply with ASTM F 1043 for framing, ASTM F 1083 for Group IC round pipe, and the following:

1. Group: IA, round steel pipe, Schedule 40.
2. Fence Height: 6’-6”.
3. Strength Requirement: Heavy industrial according to ASTM F 1043.
4. Coating for Steel Framing:
   a. Polymer coating over metallic coating.

2.3 TENSION WIRE

A. Metallic-Coated Steel Wire: 0.177-inch- diameter, marcelled tension wire complying with ASTM A 817 and ASTM A 824.

1. Metallic Coating: Type III, Zn-5-Al-MM alloy.

2.4 INDUSTRIAL SWING GATES

A. General: Comply with ASTM F 900 for single swing gate types.

1. Metal Pipe and Tubing: Galvanized steel. Comply with ASTM F 1083 and ASTM F 1043 for materials and protective coatings.

B. Frames and Bracing: Fabricate members from round, galvanized steel tubing with outside dimension and weight according to ASTM F 900 and the following:

1. Gate Fabric Height: 6’-6”.
2. Leaf Width: 36 inches.
3. Frame Members:

   a. Tubular Steel: 1.90 inches round.

C. Frame Corner Construction:

1. Welded.

D. Hardware: Latches permitting operation from both sides of gate, hinges Fabricate latches with integral eye openings for padlocking; padlock accessible from both sides of gate.

2.5 FITTINGS

A. General: Comply with ASTM F 626.

B. Finish:

1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz. /sq. ft. zinc.

2.6 PRIVACY SLATS

A. Material: PVC, UV-light stabilized.

B. Color: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install chain-link fencing to comply with ASTM F 567 and more stringent requirements specified.

B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.

C. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.

1. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.

D. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment.

E. Line Posts: Space line posts uniformly at 10 feet o.c.

F. Post Bracing and Intermediate Rails: Install according to ASTM F 567. Install braces at end and gate posts and at both sides of corner and pull posts.

G. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fencing.

H. Top Rail: Install according to ASTM F 567.

I. Bottom Rails: Install, spanning between posts.

J. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 2 inches between finish grade or surface and bottom selvage, unless otherwise indicated.

K. Tie Wires: Attach wire per ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.

L. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

M. Privacy Slats: Install slats in direction indicated, securely locked in place.

3.2 GATE INSTALLATION

A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

END OF SECTION 02821

SECTION 02901

GENERAL PLANTING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. General procedures and requirements for landscaping work.

B. Related Sections:
   1. Section 02051: General Site Construction Requirements.
   2. Section 02312: Finish Grading.
   3. Section 02810: Underground Irrigation System.

1.2 QUALITY ASSURANCE

A. Qualifications:
   1. Trained personnel familiar with required planting procedures and Contract Documents shall perform planting.
   2. Planting shall be performed under direction of foreman or supervisor with minimum five years experience in landscape installations.

B. Pre-Installation Conferences:
   1. Participate in pre-installation conference specified in Section 02311.
   2. Schedule planting pre-installation conference after completion of finish grading but before beginning landscape work. In addition to requirements of Section 01300, establish responsibility for maintenance of new landscaping during all phases of construction period.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Deliver packaged materials in containers showing weight, analysis, and name of Manufacturer. Protect materials from deterioration during delivery and while stored at site.

B. Deliver sod, plants, trees, and shrubs in healthy and vigorous condition and store in location on site where they will not be endangered and where they can be adequately watered and kept in healthy and vigorous condition.

1.4 SEQUENCING

A. Do not plant trees and shrubs until major construction operations are completed. Do not commence landscaping work until work of Sections 02312 and 02813 has been completed and approved.

B. Coordinate installation of planting materials during normal planting seasons for each type of plant material required.

PART 2 - PRODUCTS: Not Used

PART 3 - EXECUTION

3.1 ACCEPTABLE INSTALLERS

A.	Star Landscape	Alan Noall	801-295-5500
	Erickson Landscaping	Ron Tatton	801-263-2462
	Miller Landscape	Don Miller	801-571-9256
	Behunin Horticulture	Eric Behunin	801-969-8381

3.2 EXAMINATION

A. Inspect site and Contract Documents to become thoroughly acquainted with locations of irrigation, ground lighting, and utilities. Repair damage to these and other items adjacent to landscaping caused by work of this Section or replace at no additional cost to Owner.

3.3 PREPARATION

A. Before proceeding with work, verify dimensions and quantities. Report variations between Drawings and site to Architect before proceeding with landscape work.
   1. Plant totals are for convenience of Contractor only and are not guaranteed. Verify amounts shown on Drawings.
   2. All planting indicated on Drawings is required unless indicated otherwise.

B. Protection:
   1. Take care in performing landscaping work to avoid conditions that will create hazards. Post signs or barriers as required.
   2. Provide adequate means for protection from damage through excessive erosion, flooding, heavy rains, etc. Repair or replace damaged areas.
   3. Keep site well drained and landscape excavations dry.

3.4 INSTALLATION

A. Hand excavate as required.

B. Maintain grade stakes until parties concerned mutually agree upon removal.

C. When conditions detrimental to plant growth are encountered, such as rubble fill or adverse drainage conditions, notify Architect before planting.

3.5 FIELD QUALITY CONTROL

A. Inspection: Architect will inspect landscaping installation approximately 2 weeks before Substantial Completion. Replace landscaping that is dead or appears dead as directed by Architect within 10 days of notification and before Substantial Completion.

3.6 ADJUSTING

A. Replace damaged plantings at no additional cost to Owner.

3.7 CLEANING

A. Immediately clean up soil or debris spilled onto pavement and dispose of deleterious materials.

3.8 PROTECTION

A. Protect planted areas against traffic or other use immediately after planting is completed by placing adequate warning signs and barricades.

B. Provide adequate protection of planted areas against trespassing, erosion, and damage of any kind. Remove this protection after Architect has accepted planted areas.

END OF SECTION

SECTION 02917

SOIL PREPARATION

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Perform finish grading and soil preparation work required to prepare site for installation of landscaping as described in Contract Documents.
   2. Furnish and apply soil additives as described in Contract Documents.

1.2 REFERENCES

A. American Society For Testing And Materials:
   1. ASTM 1557-91, 'Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.'

1.3 SUBMITTALS

A. Product Data: Product literature and chemical / nutrient analysis of soil amendments and fertilizers.

B. Samples: Sample of soil conditioner for approval before delivery to site. Include product analysis list.

C. Quality Assurance / Control:
   1. Delivery slips indicating amount of soil conditioner delivered to Project site.
   2. Submit test on imported topsoil by licensed laboratory before use, using criteria on Owner Form 3332. Imported topsoil shall meet minimum specified requirements and be approved by Architect before use.
   3. Submit report stating location of source of imported topsoil and account of recent use.

1.4 QUALITY ASSURANCE

A. Pre-Installation Conference: Participate in pre-installation conference specified in Section 02311.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Imported Topsoil
   1. Fertile, loose, friable soil meeting following criteria:
      a. Chemical Characteristics:
         1) Acidity / alkalinity range: pH 5.5 to 7.7
         2) Soluble Salts: less than 2.0 mmhos/cm
         3) Sodium Absorption Ratio (SAR): less than 3.0
         4) Organic Matter: greater than one percent
      b. Physical Characteristics:
         1) Gradation as defined by USDA triangle of physical characteristics as measured by hydrometer.

a) Sand: 15 to 60 percent.
b) Silt: 10 to 60 percent.
c) Clay: 5 to 30 percent.

2) Clean and free from toxic minerals and chemicals, noxious weeds, rocks larger than 1-1/2 inch 38 mm in any dimension, and other objectionable materials.
3) Soil shall not contain more than 2 percent of particles measuring over 1/16 inch 1.5 mm in largest size.

B. Acceptable Soil Conditioners And Application Rates:
1. Provide at a rate of 4 cubic yards per 1,000 square feet.
a. EPA Class 'A' co-compost or compost with SAR less than 3.0, EC less than 4.0, and CN ratio of 15 to 25:1 passing through 1/2 inch mesh screen as approved by Architect prior to use. See Section 01 6000.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not commence work of this Section until grading tolerances specified in Section 02312 are met.

3.2 PREPARATION

A. Protection: Protect utilities and site elements from damage.

B. Surface Preparation:
1. Disk, till, or aerate with approved agricultural aerator to depth of 6 inches 150 mm.
2. Seven days maximum before beginning seeding and planting:
a. Loosen area 4 inches 100 mm deep, dampen thoroughly, and cultivate to properly break up clods and lumps.
b. Rake area to remove clods, rocks, weeds, roots, and debris.
c. Grade and shape landscape area to bring surface to true uniform planes free from irregularities and to provide drainage and proper slope to catch basins.
3. Limit use of heavy equipment to areas no closer than 6 feet 1800 mm from building or other permanent structures. Use hand held tillers for preparation of subsoil in areas closer then 6 feet 1800 mm.

3.3 PERFORMANCE

A. Site Tolerances:
1. Total Topsoil Depth:
a. Lawn And Groundcover Planting Areas: 4 inches minimum.
b. Shrub Planting Areas: 3 inches minimum throughout entire shrub bed area.
2. Elevation of topsoil relative to walks or curbs before adding soil amendments.
a. Sodded Lawn Areas: 2 inches below.
b. Shrub And Ground Cover Areas: 5 inches below.
3. Finish grade of planting areas before planting and after addition of soil additives shall be specified distances below top of adjacent pavement of any kind:
a. Sodded Areas: 2 inches 50 mm below.
b. Shrub And Ground Cover Areas: 4 inches below.

B. Do not expose or damage existing shrub or tree roots.

C. Redistribute approved existing topsoil stored on site as a result of work of Section 31 1413. Remove organic material, rocks and clods greater than 1-1/2 inch 38 mm in any dimension, and other objectionable materials. Provide additional approved imported topsoil required to bring surface to specified elevation relative to concrete site element.

D. Where topsoil depth is 12 inches 300 mm or greater, place topsoil in layers not to exceed 12 inches 300 mm and, to prevent settling, compact to 85 percent relative density in accordance with ASTM D 1557. Do not place topsoil whose moisture content makes it prone to compaction during placement process.

E. Slope grade away from building for 12 feet 3600 mm minimum from walls at slope of 1/2 inch in 12 inches 13 mm in 300 mm minimum unless otherwise noted. High point of finish grade at building foundation shall be 6 inches 150 mm minimum below finish floor level. Direct surface drainage in manner indicated on Drawings by molding surface to facilitate natural run-off of water. Fill low spots and pockets with topsoil and grade to drain properly.

F. Add specified chemical soil amendments at specified rates.
   1. Roto-till or otherwise mix amendments evenly into top 4 inches 100 mm of topsoil.
   2. Incorporate and leach chemical soil amendments, which require leaching, such as gypsum, within such time limits that soil is sufficiently dry to allow proper application of fertilizer and soil conditioners.

G. Apply fertilizers and soil conditioners over lawn and planting areas. Roto-till fertilizer and soil conditioner into top 4 inches 100 mm of topsoil until homogeneous mixture results.

H. After landscape areas have been prepared, take no heavy objects over them except lawn rollers. Immediately before planting lawn and with topsoil in semi-dry condition, roll areas that are to receive lawn in two directions at approximately right angles with water ballast roller weighing 100 to 300 lbs 45 to 135 kg, depending on soil type. Rake or scarify and cut or fill irregularities that develop as required until area is true and uniform, free from lumps, depressions, and irregularities.

END OF SECTION

SECTION 02920

LAWN SODDING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
1. Furnish and install sodded lawn as described in Contract Documents.

1.2 DELIVERY, STORAGE, AND HANDLING

A. Harvest, deliver, store, and handle sod in accordance with requirements of 'American Sod Producers (ASPA) Specifications for Turfgrass Sod Materials and Transplanting / Installing.'

B. Cut and lift sod by method acceptable to Architect. Cut sod in pieces approximately 3/4 to one inch thick. Roll or fold sod so it may be lifted and handled without breaking or tearing and without loss of soil.

C. Schedule deliveries to coincide with topsoil operations and laying. Keep storage at job site to minimum without causing delays.
1. Deliver, unload, and store sod on pallets within 24 hours of being lifted.
2. Do not deliver small, irregular or broken pieces of sod.

D. During wet weather, allow sod to dry sufficiently to prevent tearing during lifting and handling. During dry weather, protect sod from drying before installation. Water as necessary to insure vitality and to prevent excess loss of soil in handling. Sod that dries out before installation will be rejected.

1.3 SEQUENCING

A. Do not commence work of this Section until work of Section 02810 has been completed and approved.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Certified Sod:
1. Superior sod grown from certified, high quality, seed of known origin or from plantings of certified grass seedlings or stolons:
   a. Assure satisfactory genetic identity and purity.
   b. Assure over-all high quality and freedom from noxious weeds or an excessive amount of other crop and weedy plants at time of harvest.
2. Sod shall be composed of two varieties minimum of Kentucky Bluegrass.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Site Tolerances: Final grade of soil after sodding of lawn areas is complete shall be one inch below top of adjacent pavement of any kind.

B. Laying of Sod:
1. Lay sod during growing season. Sodding during dry summer period, at freezing temperatures, or over frozen soil is not acceptable.
2. Lay sod within 36 hours of being lifted.
3. Lay sod in rows with joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with a sharp knife.
4. Lay sod flush with adjoining existing sodded surfaces.
5. Do not sod slopes steeper than 3:1. Consult with Landscape Architect for alternate treatment.

C. After Sodding Is Complete:
1. Roll horizontal surface areas in two directions perpendicular to each other.
2. Repair and re-roll areas with depressions, lumps, or other irregularities. Heavy rolling to correct irregularities in grade will not be permitted.
3. Water sodded areas immediately after laying sod to obtain moisture penetration through sod into top 4 inches of topsoil.

3.2 FIELD QUALITY CONTROL

A. Inspection:
1. Sodded areas will be accepted at final inspection if:
   a. Sodded areas are properly established.
   b. Sod is free of bare and dead spots and is without weeds.
   c. No surface soil is visible when grass has been cut to height of 2 inches.
   d. Sodded areas have been mowed a minimum of twice.
2. Areas sodded after November 1st will be accepted following spring (May 1st) approximately one month after start of growing season if specified conditions have been met.

END OF SECTION

SECTION 02930

EXTERIOR PLANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
1. Furnish and install landscaping plants as described in Contract Documents.

1.2 REFERENCES

A. American National Standards Institute:
1. ANSI Z60.1-1990, 'American Standard for Nursery Stock.'

1.3 SUBMITTALS

A. Samples: Top dressing mulch for approval before delivery to site.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver healthy and vigorous trees and shrubs.
1. Do not prune before delivery, except as approved by Landscape Architect.
2. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping and other handling and tying damage.
3. Do not bend or bind-tie trees or shrubs in such a manner as to destroy natural shape.
4. Provide protective covering during delivery.

B. Handle balled stock by root ball or container. Do not drop trees and shrubs during delivery.

C. Deliver trees, shrubs, ground covers, and plants after preparations for planting have been completed and install immediately.
1. If planting is delayed more than six hours after delivery, set planting materials in shade and protect from weather and mechanical damage.
2. Set balled stock on ground and cover ball with soil, peat moss, saw dust, or other acceptable material approved by Landscape Architect. Do not place on pavement.
3. Do not remove container-grown stock from containers before time of planting.
4. Water root systems of trees and shrubs stored on site with fine mist spray. Water as often as necessary to maintain root systems in moist condition.

1.5 SEQUENCING

A. Do not commence work of this Section until work of Section 02810 and 02920 has been completed and approved.

1.6 WARRANTY

A. Guarantee furnished shrubs, ground covers, and vines to live and remain in strong, vigorous, and healthy condition for 30 days minimum from date landscape installation is accepted as complete.

B. Guarantee trees to live and remain in strong, vigorous, and healthy condition for one year from date landscape installation is accepted as complete.

1.7 OWNER'S INSTRUCTIONS

A. Provide written instructions covering maintenance requirements by Owner for first 60 days.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Plants:
1. Conform to requirements of Plant List and Key on Drawings and to ANSI Z60.1.
2. Nomenclature: Plant names used in Plant List conform to 'Standardized Plant Names' by American Joint Committee on Horticultural Nomenclature except in cases not covered. In these instances, follow custom of nursery trade. Plants shall bear a tag showing the genus, species, and variety of at least 10 percent of each species delivered to site.
3. Quality:
   a. Plants shall be sound, healthy, vigorous, free from plant disease, insect pests or their eggs, noxious weeds, and have healthy, normal root systems. Container stock shall be well established and free of excessive root-bound conditions.
   b. Do not prune plants or top trees prior to delivery.
   c. Plant materials shall be subject to approval by Landscape Architect as to size, health, quality, and character.
   d. Bare root trees are not acceptable.
   e. Provide plant materials from licensed nursery or grower.
4. Measurements:
   a. Measure height and spread of specimen plant materials with branches in their normal position as indicated on Drawings or Plant List.
   b. Measurement should be average of plant, not greatest diameter. For example, plant measuring 15 inches in widest direction and 9 inches in narrowest would be classified as 12 inch stock.
   c. Plants properly trimmed and transplanted should measure same in every direction.
   d. Measure caliper of trees 6 inches above surface of ground.
   e. Where caliper or other dimensions of plant materials are omitted from Plant List, plant materials shall be normal stock for type listed.
   f. Plant materials larger than those specified may be supplied, with prior written approval of Landscape Architect, and:
      1) If complying with Contract Document requirements in all other respects.
      2) If at no additional cost to Owner.
      3) If sizes of roots or balls are increased proportionately.
5. Shape and Form:
   a. Plant materials shall be symmetrical or typical for variety and species and conform to measurements specified in Plant List.
   b. Well grown material will generally have height equal to or greater than spread. However, spread shall not be less than 2/3's of height.

B. Planting Mix: Mixture of three parts good topsoil and one part composted.

C. Planting Tablets: 21 gram Agriform 20-10-5.

D. Tree Stakes:
1. 2 inch diameter Lodgepole Pine.

E. Tree Staking Ties:
1. Acceptable Products:
   a. 32 inch Cynch-Tie tree ties.
   b. Equal as approved by Landscape Architect before installation.

F. Tree Guys:
1. Acceptable Products:
   a. Duckbill Model 68DTS guying kit.
   b. Equal as approved by Landscape Architect before installation.

G. Pre-Emergent Herbicide:
1. Approved Products:
   a. Elanco XL.
   b. Ronstar.
   c. Surflan.

H. Weed Barrier:
1. Acceptable Products:
   a. De-Whitt PRO-5 Weed Barrier.
   b. Equal as approved by Landscape Architect before bidding

I. Bark Or Wood Top Dressing Mulch:
1. Approved Products:
   a. 'Walk-on-Bark' Fir bark.
   b. Medium or large size Redwood bark.
   c. Shredded pine bark.
   d. Shredded Cedar.

J. Rock Mulch:
1. See Plan.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before proceeding with work, check and verify dimensions and quantities. Report variations between Drawings and site to Landscape Architect before proceeding with work of this Section.

B. Plant totals are for convenience only and are not guaranteed. Verify amounts shown on Drawings. All planting indicated on Drawings is required unless indicated otherwise.

3.2 PREPARATION

A. Layout individual tree and shrub locations and areas for multiple plantings. Stake locations and outline areas. Secure Landscape Architect's acceptance before planting. Make minor adjustments as may be requested.

3.3 INSTALLATION

A. Excavation:
1. If underground construction work or obstructions are encountered in excavation of planting holes, Landscape Architect will select alternate locations.
2. Plant Excavation Size:
   a. Diameter: Twice diameter of root ball or container minimum.
   b. Depth:
      1) Shrubs: Deep enough to allow 6 inches minimum of tamped planting mix beneath root ball.
      2) Trees: 12 inches minimum deeper than bottom of root ball.
3. Unless excavated material meets topsoil requirements, remove from landscape areas and do not use for landscaping purposes.
4. Roughen sides and bottoms of excavations.
5. After tree planting holes are excavated to proper depth, auger 8 inch diameter hole 6 feet deep in center of each excavation and fill with tamped planting mix.
6. Fill holes to receive shrubs with tamped planting mix sufficient to bring plant to proper elevation after watering and settling. In holes to receive trees, provide mound of tamped planting mix of height sufficient to bring tree to proper elevation.

B. Planting:
1. Before planting, fill hole with water and verify that water drains away within two hours. Inform Landscape Architect in writing if water does not drain properly. Do not plant trees or shrubs in holes that do not properly drain.
2. Removing Binders And Containers:
   a. Remove wire basket, burlap, plastic, and twine binders from around root ball.
   b. Remove wood boxes from around root ball. Remove box bottoms before positioning plant in hole. After plant is partially planted, remove remainder of box without injuring root ball.
3. Plant immediately after removing binding material and containers. Place trees and shrubs in holes so, after watering and settling, top of root ball shall be approximately one inch higher than finished grade.
4. Properly cut off broken or frayed roots.
5. Center plant in hole and backfill with specified planting mix. Except in heavy clay soils, make ring of mounded soil around hole perimeter to form watering basin.
6. Add planting tablets in plant pit as follows. Place tablets in relation to root ball as recommended by Manufacturer.
   a. One Gallon Shrub: 1 tablet.
   b. 5 Gallon Shrub / Tree: 3 tablets.
   c. 15 Gallon Tree: 4 tablets.
   d. 24 inch Box Tree: 6 Tablets.
7. Settle by firming and watering to bring top of ball down to one inch higher than surrounding soil.
8. Do not use muddy soil for backfilling.
9. Make adjustments in positions of plants as directed by Landscape Architect.
10. Thoroughly water trees and shrubs immediately after planting.
11. At base of each tree, leave 36 inch diameter circle free of any grass.

C. Supports for New Trees:
1. Provide new supports for trees noted on Drawings to be staked.
   a. Remove nursery stakes delivered with and attached to trees.
   b. Support shall consist of at least two tree stakes driven into hole base before backfill so roots are not damaged. Place stakes vertically and run parallel to tree trunk. Install stakes so 3 feet of stake length is below finish grade.
   c. Place tree ties 6 to 12 inches below crotch of main tree canopy. Second set of tree ties may be required 18 to 24 inches above finish grade, if directed by Landscape Architect.
   d. Remove tops of tree stakes so top of stake is 6 inches below main tree canopy to prevent damage to tree branches and canopy growth.

2. Provide guying kits to support 24 inch box and larger trees.

D. Vines: Remove from stakes, untie, and securely fasten to wall or fence next to which they are planted.

E. Ground Covers: Container-grown unless otherwise specified on Drawings. Space evenly to produce a uniform effect, staggered in rows and intervals shown.

F. Post Planting Weed Control:
1. Apply specified pre-emergent herbicide to shrub and ground cover planting areas and grass-free areas at tree bases after completion of planting.
2. Areas shall be free of existing weed growth prior to application of herbicide.

G. Weed Barrier Fabric:
1. After planting and application or herbicide in shrub beds, apply covering of specified weed barrier fabric with fuzzy side down.
2. Achieve 100 percent coverage over ground areas.
3. Overlap seams 6 inches minimum.

H. Mulching:
1. After application of herbicide, mulch shrub and ground cover planting areas with 3 inches deep layer of specified top dressing mulch.
2. Cover grass-free area at tree bases with weed barrier and 3 inches of top dressing mulch.
3. Place top dressing mulch to uniform depth and rake to neat finished appearance.

END OF SECTION

SECTION 02970

ASPHALT PAVEMENT REPAIR

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
1. Remove and replace paving and base in specific areas as described in Contract Documents.

B. Related Sections:
1. Section 02051: General Site Construction Requirements.

1.2 REFERENCES

A. American Society For Testing And Materials:
1. ASTM C 131-96, 'Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.'
2. ASTM D 1557-00, 'Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.'
3. ASTM D 1559-89, 'Standard Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus.'
4. ASTM D 3381-92 (1999), 'Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction.'

PART 2 - PRODUCTS

2.1 MATERIALS

A. Soil Sterilant:
1. Approved Products:
   a. Arsenal.
   b. Mixture of Roundup and Surflan.

B. Base:
1. Road Base type gravel or crushed rock, graded as follows:
   a.

Sieve	Percent by Weight Passing Sieve
1) 1 inch	100
2) 3/4 inch	85 - 100
3) No. 4	45 - 60
4) No. 10	30 - 50
5) No. 200	5 - 10 (non-plastic)

C. Asphaltic Concrete
1. Asphalt Cement:
   a. Meet requirements of ASTM D 3381, Viscosity grade (Original Asphalt) as follows:
      1) AC5 in cold climatic conditions.
      2) AC10 in moderate climatic conditions.
      3) AC20 in hot climatic conditions.
2. Aggregates:

a. Fine to coarse mineral aggregates with wear less than 40 percent as determined by ASTM C 131 and mineral filler suitable for pavement meeting following gradation requirements:

1)

	Sieve	Percent by Weight Passing Sieve
a)	3/4 inch	100
b)	1/2 inch	95 - 100
c)	3/8 inch	80 - 95
d)	No. 4	54 - 71
e)	No. 8	38 - 54
f)	No. 30	17 - 32
g)	No. 200	3 - 8 (non-plastic)

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Repair Of Deteriorated Areas

1. Cut edges of pavement in rectangular shape and for one foot minimum beyond damaged material. Make vertical cuts using pavement saw or cold planer.
2. Base:
   a. 6 inches thick compaction.
   b. Compact to 95 percent minimum density as determined by ASTM D 1557.
   c. Finished base course shall be true to line and grade within plus or minus 1/4 inch in 10 feet .
3. Apply soil sterilant at maximum rate recommended by Manufacturer.
4. Apply emulsion to base and tack coat to vertical edges of existing asphalt and curbs.
5. Paving:
   a. Place full depth at temperatures between 250 and 325 deg F.
   b. Longitudinal bituminous joints shall be vertical and properly tack coated if cold. Transverse joints shall always be tack coated.
   c. Compaction:
      1) Compact asphaltic concrete paving to 96 percent minimum of design density as determined by ASTM D 1559.
      2) Roll with powered equipment capable of obtaining specified density. Vibratory plate compactor may be used for areas too small for large power equipment.
      3) Begin breakdown rolling immediately after asphalt is placed when asphalt temperature is at maximum. Complete breakdown rolling before mix temperature drops below 240 deg F. Complete handwork compaction concurrently with breakdown rolling.
      4) Complete intermediate rolling as soon as possible after breakdown rolling and before mix temperature drops below 185 deg F. Do not roll paving for compaction purposes after asphalt temperature falls below 185 deg F.
      5) Execute compaction so visibility of joints is minimized. Complete finish rolling to improve asphalt surface as soon as possible after intermediate rolling and while asphalt paving is still warm. Do not use vibration for finish rolling.
   d. Surface shall be uniform with no 'birdbaths.' Leave finished surfaces clean and smooth. Variations from specified grades shall not exceed 1/2 inch.

3.2 CLEANING

A. Upon completion of repair operations, clean up and remove debris.

END OF SECTION

SECTION 02977

ASPHALT JOINT AND CRACK SEALING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
1. Repair cracks in existing asphalt pavement as described in Contract Documents.

B. Related Sections:
1. Section 02051: General Site Construction Requirements.

1.2 REFERENCES

A. American Society For Testing And Materials:
1. ASTM D 36-95 (2000), 'Standard Test Method for Softening Point of Bitumen (Ring-and-Ball Apparatus).'
2. ASTM D 113-99, 'Standard Test Method for Ductility of Bituminous Materials.'
3. ASTM D 5329-96, 'Standard Test Methods for Sealants and Fillers, Hot-Applied, for Joints and Cracks in Asphaltic and Portland Cement Concrete Pavements.'

1.3 SUBMITTALS

A. Quality Assurance / Control: Certification from manufacturer confirming crack sealant properties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Crack Sealant:
1. Homogeneous blend of asphalt cement and plasticizers combined in such a manner as to produce material with following properties:
   a. Material shall pour readily and penetrate large cracks at temperatures below 400 deg F.
   b. Cone Penetration at 77 deg F: 50 Maximum.
   c. Flow at 140 deg F when tested in accordance with ASTM D 3407: 1/ 8 inch maximum.
   d. Resilience at 77 deg F when tested in accordance with ASTM D 3407: 30 percent minimum.
   e. Softening Point when tested in accordance with ASTM D 36: 195 deg F minimum in cold climates and 220 deg F in hot climates.
   f. Ductility at 77 deg F, 2 inches per min when tested in accordance with ASTM D 113: 12 inches.
   g. Flexibility: 1/8 inch thick specimen of product conditioned to minus 20 deg Fshall be capable of being bent to 90 deg angle over one inch mandrel in two seconds without cracking.
   h. Asphalt Compatibility when tested in accordance with ASTM D 3407: Pass.
   i. Curing: Product shall contain no water or volatile solvents and shall cure immediately upon cooling to sufficient viscosity to prevent tracking by traffic.
2. Acceptable Products:
   a. PLS by Crafco, Chandler, AZ (800) 528-8242 or (602) 276-0406. www.crafco.com

b. Flexifill 9075H or R by Koch Materials Company, Northumberland, PA (800) 521-9593 or (717) 473-8038. www.kochmaterials.com
c. Elastoflex 66 by Maxwell Products, Salt Lake City, Utah (800) 266-2090 or (801) 972-2097.
d. Equal as approved by Architect before bidding. See Section 01600.

B. Soil Sterilant:
1. Approved Products:
a. Arsenal.
b. Mixture of Roundup and Surflan.

PART 3 - EXECUTION

3.1 PREPARATION

A. One week prior to beginning crack repair operations, treat cracks with soil sterilant at maximum rate recommended by Manufacturer to kill existing weeds.

B. After weeds have died, remove by using wire wheel on crack cleaner / edger.

3.2 PERFORMANCE

A. Crack Repair:
1. Do not rout or fill cracks smaller than 1/8 inch wide.
2. Using carbide tipped router bit, rout existing cracks measuring between 1/8 and 3/8 inch wide to be 1/2 inch wide and 3/4 inch deep minimum. Do not rout cracks containing previously applied crack sealant without Architect's approval.
3. Clean routed cracks and unrouted cracks larger than 3/8 inch with compressed air at 60 psi and 100 cu ft per minute minimum. Do not perform cleaning operations when cracks are wet or muddy.
4. Apply crack sealant to full depth of crack. Smooth applied sealant with squeegee or device on hand wand leaving sealant flush with parking lot. Band-Aid on top of crack shall be 3 inches maximum. At cracks between asphalt paving and concrete, do not allow excess sealant on concrete.

3.3 CLEANING

A. Upon completion of crack sealing operations, clean up and remove debris.

END OF SECTION

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

B. See Division 2 Section "Earthwork" for drainage fill under slabs-on-grade.

C. See Section 03365 Concrete Hardener.

D. See Section 033665 Concrete Staining.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Shop Drawings:

1. Steel reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

2. **Formwork** Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.

3. Material test reports: For the following, from a qualified testing agency, indicating compliance with requirements:

   a. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

4. Material certificates: For each of the following, signed by the manufacturers:
   a. Cementitious materials.
   b. Admixtures.
   c. Form materials and form-release agents.
   d. Steel reinforcement and accessories.
   e. Curing compounds.
   f. Floor and slab treatments.
   g. Bonding agents.

h. Semirigid joint filler.
i. Joint-filler strips.
j. Repair materials.

D. Floor surface flatness and levelness measurements to determine compliance with specified tolerances.

E. Field quality-control field observation, test and inspection reports.

F. Minutes of preinstallation conference.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.

C. Preinstallation Conference: Conduct conference at Project site.

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
   a. Contractor’s superintendent.
   b. Independent testing agency responsible for concrete design mixtures.
   c. Ready-mix concrete manufacturer.
   d. Concrete subcontractor.
   e. Special field observation agency or individual engaged by Owner.
2. Review concrete placement in construction schedule context and implications for mix designs and placement procedures, special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, finishes to be placed on slab, and concrete protection.
3. Review requirements for sections 03365 and 03366. Do not do anything in this section that will effect the finish called for in sections 03365 and 03366.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Forms for cylindrical columns, pedestals, and supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. Form ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete no removal.
   1. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
   2. Furnish ties that, when removes, will leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.
   3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

B. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

C. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.

D. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice."

2.3 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I/II Supplement with the following:

   a. Fly Ash: ASTM C 618, Class F.

B. Normal-Weight Aggregates: ASTM C 33, graded, 1-inch nominal maximum coarse-aggregate size.

   1. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M and potable.

D. Air-Entraining Admixture: ASTM C 260.

E. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

   1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
   2. Retarding Admixture: ASTM C 494/C 494M, Type B.
   3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.

2.4 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

2.5 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

2.6 CONCRETE MIXTURES

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

B. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 15 percent.

C. Footings and Foundations: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: as indicated on drawings, as tested at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit 5 inches (125 mm), plus or minus 1 inch (25 mm).
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1 inch (25 mm) nominal maximum aggregate size.

D. Interior slabs-on-grade: Proportion structural normal weight concrete mixture as follows:

1. Minimum Compressive Strength: 3000 psi at 28 days as tested per ASTM C39.

2. Minimum Cementitous Materials Content: 520 lb/cu. Yd. (309 kg/cu. m).
3. Slump Limit: 4 inches (100 mm), 7 inches for concrete with verified slump of 2 to 4 inches before adding mid-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
4. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.

2.7 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.8 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK: See General Structural Notes for further requirements.

A. Design, erect, shore, brace, and maintain formwork according to ACI 301 to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads. Comply with the requirements of ACI 301 and ACI 347.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 301.

C. [**Chamfer**] [**Do not chamfer**] exterior corners and edges of permanently exposed concrete.

D. Earth forms: As per Structural Drawings for exterior canopy-like features only. Not permitted otherwise.

E. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

F. Coat contact surfaces on forms with form-release agent, according to manufacture's written instructions, before placing reinforcement and embedded items.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges." Comply with templates furnished by other trades.

3.3 STEEL REINFORCEMENT: See General Structural Notes for further requirements.

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

   1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.4 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
   1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface within 12 hours of concrete placement.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

3.5 CONCRETE PLACEMENT: See General Structural Notes for further requirements.

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

C. Cold-Weather Placement: Comply with ACI 306.1. and as follows:
1. When concrete is likely to be subjected to freezing temperatures within 24 hours of placement or when temperature is expected to fall below 40 deg F, maintain delivered concrete mixture temperature within the temperature range required by Table 7.6.1.1 of ACI 301. Do not exceed this temperature by more that 10 degrees.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing accelerators unless otherwise specified and approved in mixture designs.

D. Hot-Weather Placement: When air temperature exceeds 80 degrees F, take special precautions to prevent slump loss, rapid setting, and plastic shrinkage. Comply with ACI 301. and as follows:
1. Maintain concrete temperature below 80 deg F at time of placement. Chilled mixing water or shopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor’s option.
2. Use set retarding admixture subject to the approval of the Architect.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft sport, or dry areas.
4. Convey, deposit, finish and commence during of concrete as rapidly, as practicable. When air temperature exceeds 80 deg F, deposit concrete into final position within 60 minutes of introduction of cement and prior to 100 revolutions of mixing drum. When air temperature exceeds 90 deg F, deposit concrete into final position within 45 minutes of introduction of cement.

3.6 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view**,** to receive a rubbed finish**,** or to be covered with a coating or covering material applied directly to concrete.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.7 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

3.8 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

   a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer[**unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project**].

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.9 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

3.10 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

1. Testing Services: Tests shall be performed according to ACI 301.

END OF SECTION 03300END OF SECTION 03300

SECTION 03365

DRY-SHAKE COLORED HARDENER

PART 1 - GENERAL

DO NOT APPLY HARDNER UNTILL FULL STAIN SYSTEM INCLDING SECTION 03366 IS SELECTED AND APPROVED THROUGH MOCK UPS BY THE ARCHITECT.

1.1 SUMMARY

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to Work of this Section.

B. Section Includes:
1. Dry-shake colored hardener applied to the “Retail Area” slab where indicated on the drawings to receive a stain concrete finish.
2. Curing of colored concrete.

C. Related Sections:
1. Division 3 Section "Cast-In-Place Concrete" for general applications of concrete
2. Division 7 Section "Joint Sealants" for colored sealants for joints.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's complete technical data sheets for the following:
1. Dry-shake colored hardener.
2. Curing compound.

B. Design Mixes: For each type of concrete.

C. Samples for Initial Selection: Manufacturer's color charts showing full range of colors available.

D. Qualification Data: For firms indicated in "Quality Assurance" Article, including list of completed projects.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer with 10-years experience in manufacture of specified products.

B. Installer Qualifications: An installer with 5 years experience with work of similar scope and quality.

C. Comply with the requirements of ACI 301.

D. Obtain each specified material from same source and maintain high degree of consistency in workmanship throughout Project. Product shall be manufactured by the same company that makes the concrete stain called for in section 03366.

E. Notification of manufacturer's authorized representative shall be given at least 1-week before start of Work.

F. Colored Concrete Mockup:
   1. At location on Project selected by Architect, place and finish 4 by 4 feet area.
   2. Construct mockup using processes and techniques intended for use on permanent work, including curing procedures. Include samples of control, construction, and expansion joints in sample panels. Mockup shall be produced by the individual workers who will perform the work for the Project.
   3. Accepted mockup provides visual standard for work of Section.
   4. Mockup shall remain through completion of the work for use as a quality standard for finished work.
   5. Remove mockup when directed.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in original factory unopened, undamaged packaging bearing identification of product, manufacturer, batch number, and expiration data, as applicable.

B. Store the product in a location protected from damage, construction activity, and precipitation in strict accordance with the manufacturer's recommendations.

1.5 PROJECT CONDITIONS

A. Schedule placement to minimize exposure to wind and hot sun before curing materials are applied.

B. Avoid placing concrete if rain, snow, or frost is forecast within 24-hours. Protect fresh concrete from moisture and freezing.

C. Comply with professional practices described in ACI 305R and ACI 306R.

1.6 PRE-JOB CONFERENCE

A. Immediately after contract is awarded a meeting will be held to discuss the application of concrete stain and hardner.

B. It is suggested that the Architect, General Contractor, Subcontractor, Ready-Mix Concrete Representative, and a Manufacturer's Representative be present.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

A. L.M. SCOFIELD COMPANY, contact: Larry Bower 480-460-0434.

2.2 MATERIALS

A. Dry-shake Colored Hardener: LITHOCHROME® Color Hardener; L.M. SCOFIELD COMPANY, factory proportioned, mixed, and packaged, ready-to-use surface hardener.

B. Curing Compound for Dry-Shake Colored Hardener Concrete: Curing compound shall comply with ASTM C309 and be of same manufacturer as colored admixture, for use with dry-shake colored hardener concrete.

2. As recommended by L.M. SCOFIELD COMPANY. Use to cure interior color hardened flatwork for period prior to staining with Lithochrome Chemstain Classic.

3. Curing and Sealing Compound: Cureseal-S™ Gloss; L.M. SCOFIELD COMPANY. Curing and sealing compound shall comply with ASTM C309 and be of same

manufacturer as colored admixture, for use with integrally colored concrete.

a. To be applied to the final Lithochrome Chemstain Classic stained flatwork of the “Retail Area” and the gray flatwork of the “Storage Area”.

2.3 COLORS

A. Colors: L.M. Scofield LITHOCHROME Color Hardener #0266 Ash White.

2.4 CONCRETE MIX DESIGN

A. Per section 03300 and below.

B. Do not add calcium chloride to mix as it causes mottling and surface discoloration.

C. Supplemental admixtures shall not be used unless approved by manufacturer.

D. Do not add water to the mix in the field.

E. Maximum air content shall not exceed 5 percent.

PART 3 - EXECUTION

3.1 CONCRETE PLACEMENT

A. Move concrete into place with square-tipped shovels or concrete rakes.

B. Vibrators, when used, shall be inserted and withdrawn vertically.

C. Concrete shall be struck to specified level with wood or magnesium straight edge or mechanical vibrating screed.

D. The concrete surface shall be further leveled and consolidated with highway magnesium straight edge and/or magnesium bull float.

E. Mechanically float concrete surfaces as soon as concrete surface has taken its initial set and will support weight of a power float machine equipped with float shoes or combination blades and operator.

3.2 INSTALLATION – DRY-SHAKE COLORED HARDENER

DO NOT APPLY HARDNER UNTILL FULL STAIN SYSTEM INCLDING SECTION 03366 IS SELECTED AND APPROVED THROUGH MOCK UPS BY THE ARCHITECT

A. Apply 2/3 of specified application rate to freshly floated concrete surface. Bleed water shall not be present during or following application of first and second shake.

B. Do not throw dry-shake; distribute evenly by mechanical spreader designed to apply floor hardeners. Consult L.M. Scofield for recommended manufacturers of mechanical spreaders.

C. As soon as dry-shake material has absorbed moisture, indicated by uniform darkening of surface, mechanically float concrete surface a second time, just enough to bring moisture from base slab through dry-shake color hardener.

D. Immediately following second floating, apply remaining 1/3 of specified application rate. Broadcast in opposite direction of first application for a more uniform coverage. As soon as dry-shake material has absorbed moisture, mechanically float concrete surface a third time.

E. Do not add water to the surface.

F. As surface further stiffens, remove float blades to expose the power finishing blades or raise combination blades slightly. Flat trowel surface to remove marks and pinholes.

G. Further troweling operations can be done, each time raising blades, until desired texture or finish is obtained.

H. **DO NOT BURNISH TROWEL COLORED SURFACE FLOOR HARDENERS**.

3.3 CURING

A. Floors shall be cured with liquid membrane curing / curing and sealing compound as recommended by manufacturer.

B. Apply immediately after floor surface has hardened sufficiently so that application of curing / curing and sealing compound will not mar surface. Apply uniformly over entire

surface at coverage rate recommended by manufacturer and meeting or exceeding the moisture retention requirements of ASTM C309.

C. There should be no free water on surface at time of application.

3.4 PROTECTION OF FINISHED WORK

A. Protect finish work.

B. Prohibit foot or vehicular traffic on floor surface.

C. Barricade area to protect flooring.

D. Protect floor surface from damage until final inspection and acceptance by Owner.

3.5 SCHEDULE

A. Refer to the "Architectural Concrete Slab Finish Plan" for slab areas to receive different color hardening, curing, staining and sealing finishes.

3.6 APPLICATOR

A. For a list of qualified contractors, contact L.M. SCOFIELD COMPANY, Larry Bower 480-460-0434. The following have been pre-approved.

E B Berger	Bill Young	801-553-0993
Stone Touch	Steve	801-281-2299
CDR	Dan Dixon	801-502-3334

END OF SECTION

SECTION 03366

CHEMICALLY STAINED CONCRETE FLOOR

PART 1 - GENERAL

1.1 SUMMARY

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to Work of this Section.

B. Section Includes:
1. Chemically stained concrete floor finish.
2. Sealer.
3. Non Slip additive.
4. Waxing.

C. Related Sections:
1. Division 3 Section "Cast-In-Place Concrete" for general applications of concrete.
2. Division 7 Section "Joint Sealants" for colored sealant for joints.

1.2 SUBMITTALS

A. Product Data: Manufacturer's technical data sheets and installation instructions for each product specified.

B. Samples for Initial Selection: Manufacturer's color charts showing full range of colors available.

C. Qualification Data: For firms indicated in "Quality Assurance" Article, including lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of stain and sealer products shall have minimum 10 years experience in the production of the specified products.

B. Installer Qualifications: Minimum 5 years experience in staining applications and successfully completed not less than 10 projects comparable in scale and complexity.

C. Source Limitations: Obtain each specified material from same source and maintain high degree of consistency in workmanship throughout Project.

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D. Mockups:

1. At location on Project selected by Architect, prepare mockups for review and approval. Multiple mockups maybe required to achieve the desired finish. The Sub Contractor is to Work with the Architect in arriving at this finish. The finish also includes the color hardener described in section 03365, waxing and possibly a slip additive called SharkGrip. Mockups will be required for:

   a. Color Hardener.
   b. Color Hardener with Concrete stain.
   c. Color Hardener with Concrete stain and with curing/sealing compound.
   d. Color Hardener with Concrete stain, curing/sealing compound and final waxing.
   e. Color Hardener with Concrete stain, SharkGrip and with curing/sealing compound.
   f. Color Hardener with Concrete stain, SharkGrip, with curing/sealing compound and final waxing.

   Initial submittals maybe in the form of 12” X 12” X 1” concrete pieces until the desired effect is achieved. The final job site mockups shall be 48”X48”. These mockups will be required for items above:

   a.
   b.
   c./d. Apply wax to half of the sealed sample.
   e./f. Apply wax to half of the sealed sample.

2. Construct mockup using processes and techniques intended for use on permanent work, including curing procedures. Include samples of controll joints in mockup panels.

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3. Mockup shall be stained and sealed by the individual workers who will actually be performing the work for the Project.
4. Obtain approval of the mockup from Architect before start of work.
5. Retain approved mockups through completion of the Work for use as a quality standard for finished work.

8. Remove mockups when directed.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver the specified products in original, unopened co ntainers with legible manufacturer's identification and information.

B. Store specified products in conditions recommended by the manufacturer.

1.5 PROJECT CONDITIONS

A. Environmental Conditions: Maintain an ambient temperature of between 50 ^{o} and 90° F during app lication and at least 48 hours after application.

B. Protection: Precautions shall be taken to avoid damage or contamination of any surfaces near the work zone. Protect completed stain work from moisture or contamination.

1.6 PRE-JOB CONFERENCE

A. Immediately afte r contract is awarded a meeting will be held to discuss the application of concrete stain and hardner .

B. It is suggested that the Architect, General Contractor, ready mix Contractor, Subcontractor and a Manufacturer Representative be present.

PART 2 - PRODUCTS

2.1 ACCEPT ABLE MANUFACTURERS

A. Manufacturer: L.M. SCOFIELD COMPANY, contact: Larry Bower 480 -460-0434.

2.2 MATERIALS

A. Chemical Stains: LITHOCHROME® Chemstain Classic; L.M. SCOFIELD COMPANY, reactive water -based solution of metallic salts which react with the

calcium hydroxide in the cured concrete substrate to produce permanent, variegated or translucent color effects.

1. Colors: Dark walnut #CS-14.

B. Sealers:

1. SCOFIELD® Cureseal-S™ Gloss; L.M. SCOFIELD COMPANY, a clear curing and sealing compound for protecting concrete hard scapes and floors.

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Contractor shall examine areas and conditions under which work will be performed and identify conditions detrimental to proper and timely completion of work. Do not proceed until unsatisfactory conditions have been corrected.

B. Compliance with Manufacturer's Instructions: Contractor shall obtain, understand and comply with the current versions of the manufacturer's technical data sheets and installation instructions as referenced in Section 1.2.A. Wherever technical data such as preparation or installation instructions differs from language in this specification or other written material, the information submitted in accordance with Section 1.2.A is considered definitive.

3.2 PREPARATION

A. New Concrete:

1. Newly placed concrete shall be sufficiently cured to allow concrete to become reactive, minimum 14 days.
2. If any of the following colors are used, the minimum cure time of the concrete shall be 30 to 60 days to meet water vapor transmission requirements.
   a. Copper Patina.
   b. Fern Green.
   c. Weathered Bronze.
3. Do not use liquid curing materials. Cure concrete flatwork with new, unwrinkled, non-staining, high quality curing paper. Do not overlap curing paper.
4. Surfaces shall be cured using the same method and different sections (pours) chemically stained when the concrete is the same age.

5. Immediately prior to chemically staining, thoroughly clean the concrete. Sweep surfaces, then pressure wash or scrub using a rotary floor machine. Use suitable, high quality commercial detergents to facilitate cleaning. Rinse surfaces after cleaning until rinse water is completely clean. Allow floor to dry completely prior to application of floor stain.

3.3 APPLICATION OF CHEMICAL STAIN

A. Concrete surfaces shall be dry and properly prepared as described above. Protect surrounding areas from over-spray, run-off and tracking. Divide surfaces into small

B. work sections using wall, joint lines, or other stationary breaks as natural stopping points.

C. Apply chemical stains full strength (undiluted) at the coverage rate recommended by the manufacturer and use application equipment described in the manufacturer's printed technical literature. The color of the liquid chemical stain has no resemblance to the final color produced on the concrete substrate.

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D. Chemical stains normally fizz when reacting with the concrete. If fizzing does not occur, the substrate has not been adequately prepared or the concrete pH level is too low. If this should happen, contact the local representative for further recommendations.

E. Transfer chemical stain to the substrate by brush or spray and immediate scrub into surface.

F. Reaction time depends on wind conditions, temperatures, and humidity levels.

G. When multiple coats of one or more colors are required, washing and drying between colors is desirable to evaluate the color prior to the next coat.

H. After the final coat of chemical stain has remained on the surface for a minimum of four hours, remove all residue by wet scrubbing with commercial grade detergent. Rinse surfaces after scrubbing until rinse water is completely clean. Run off may stain the adjacent areas or harm plants. Collect rinse water by wet vacuuming or absorbing with an inert material.

3.4 APPLICATION OF SEALER

A. Concrete substrate shall be completely dry.

B. Sealer shall be produced by the chemical stain manufacturer.

C. Test surface for proper PH level prior to applying sealer.

D. Apply sealer according to manufacturer's written ins tructions at a rate of 300 to 500 square feet per gallon per coat.

E. Maintain a wet edge at all times.

F. Allow sealer to completely dry before applying additional coats.

G. Apply second coat of sealer at 90 degrees to the direction of the first coat using the same application method and rates.

H. Seal horizontal joints in areas subject to pedestrian or vehicular traffic.

3.5 PROTECTION

A. Protect floor from traffic for at least 72 hours after final application of sealer.

3.6 MAINTENANCE

A. Maintain chemically stained and sealed f loors by sweeping. Clean spills when they occur and rinse dirt off with water. Wet -clean heavily soiled areas by mopping or by scrubbing with a rotary floor machine equipped with a scrubbing brush and a suitable, high quality commercial detergent. Maint ain interior floors that require polishing by using a compatible, premium -grade, emulsion-type, commercial floor polish, following manufacturer's instructions and safety requirements.

1. Contractor is to apply initial waxing. Provide Johnson Diversey's, "Carefree for a gloss finish". Sturtevant, Wisconsin, 800 -558-2332.

3.7 APPLICATORS

A. For a list of qualified contractors, contact L.M. SCOFIELD COMPANY , Larry Bower 480-460-0434. The following have been pre-approved.

E B Berger	Bill Young	801-553-0993
Stone Touch	Steve	801-281-2299
CDR	Dan Dixon	801-502-3334

END OF SECTION

SECTION 04810 - UNIT MASONRY ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes unit masonry assemblies consisting of the following:

1. Concrete masonry units (CMUs).
2. Decorative concrete masonry units.

B. See Division 5 Section "Metal Fabrications" for furnishing steel shelf angles for unit masonry.

C. See Division 7 Section "Sheet Metal Flashing and Trim" for furnishing manufactured reglets installed in masonry joints for metal flashing.

D. Allowances: The following are included under the allowances indicated as specified in Division 1 Section "Allowances":
1. Preconstruction and field quality-control testing under Testing and Inspecting Allowance.

1.2 DEFINITIONS

A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 PERFORMANCE REQUIREMENTS

A. Provide structural unit masonry that develops indicated net-area compressive strengths (f’m) at 28 days.

B. Determine net-area compressive strength (f’m) of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

C. Determine net-area compressive strength (f’m) of masonry by testing masonry prisms according to ASTM C 1314.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings for the following:
1. For reinforcing steel. Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement.
2. For masonry units. Show sizes, profiles, coursing, and locations of special shapes.

C. Samples for each type and color of exposed masonry units, colored mortars, accessories embedded in masonry.

D. Material Certificates: For each type of product indicated. Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards.

1. For masonry units include material test reports substantiating compliance with requirements including data and calculations establishing average net-area compressive strength of units.

E. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
1. Include test reports, per ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

F. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1093 for testing indicated, as documented according to ASTM E 548.

B. Source limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through tone source from a single manufacturer for each product required.

C. Source limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.

D. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevates platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.7 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
   1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

C. Stain Prevention:

D. Cold Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Products: Subject to compliance with requirements, provide one of the products specified.

2.2 COLORS, TEXTURES, AND PATTERNS

A. Exposed Masonry Units: see Building Elevation drawing sheet for call out of CMU to be used.

2.3 CONCRETE MASONRY UNITS (CMUs)

A. Shapes: Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.

B. Integral Water Repellent: Provide units made with liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength for exposed units..

   1. Products:

      a. Addiment Incorporated; Block Plus W-10.

b. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Dry-Block.
c. Master Builders, Inc.; Rheopel.

C. Concrete Masonry Units: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength as indicated on Drawings.
2. Weight Classification: Lightweight.
3. Pattern and Texture for Decorative Units:
   a. Standard pattern, split-face finish.

2.4 MASONRY LINTELS

A. General: Provide masonry lintels complying with requirements below.

B. Masonry Lintels: Made from bond beam concrete masonry units with reinforcing bars placed as indicated and filled with coarse grout.

2.5 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction.

B. Hydrated Lime: ASTM C 207 Type S.

C. Aggregate for Mortar: ASTM C 144.

1. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
2. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

D. Aggregate for Grout: ASTM C 404.

E. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

1. Available Products:

   a. Addiment Incorporated; Mortar Kick.
   b. Euclid Chemical Company (The); Accelguard 80.
   c. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Morset.
   d. Sonneborn, Div. of ChemRex; Trimix-NCA.

F. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.

1. Available Products:

a. Addiment Incorporated; Mortar Tite.
b. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.
c. Master Builders, Inc.; Color Cure Mortar Admix or Rheomix Rheopel.

G. Water: Potable.

2.6 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.

B. Masonry Joint Reinforcement: ASTM A 951

1. Walls, Interior and Exterior: Mill-galvanized, carbon steel.

2. Wire Size for Side Rods: W1.7 or 0.148-inchdiameter.
3. Wire Size for Cross Rods: W1.7 or 0.148-inch diameter.
4. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
5. Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

2.7 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with eight subparagraphs below, unless otherwise indicated.

1. Mill galvanized carbon steel wire: ASTM A 82; with ASTM A 641/A 641M, Class 1 coating.

2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153/A 153M, Class B-2 coating.
3. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, hot-dip galvanized after fabrication to comply with ASTM A 153/A 153M.
4. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.

C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches wide.

D. Wire: Fabricate from 3/16-inch- diameter, hot-dip galvanized steel wire. Mill galvanized wire ties may be used in interior walls, unless otherwise indicated.

E. Adjustable Anchors for Connecting to Structure: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- diameter, hot-dip galvanized steel wire.
2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from [**0.188-inch-**] [**0.25-inch-**] diameter, hot-dip galvanized steel wire.

3. Connector Section for Concrete: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from [**0.053-inch-**] [**0.097-inch-**] thick, steel sheet, galvanized after fabrication.

2.8 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; formulated from neoprene urethane or PVC.

B. Preformed Control-Joint Gaskets: Made from PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Weep/Vent Products: Use one of the following, unless otherwise indicated:

1. Rectangular Plastic Weep/Vent Tubing: Clear butyrate, 3/8 by 1-1/2 by 3-1/2 inches long.
2. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.

   a. Products:

      1) Advanced Building Products Inc.; Mortar Maze weep vent.
      2) Dayton Superior Corporation, Dur-O-Wal Division; Cell Vents.
      3) Heckmann Building Products Inc.; No. 85 Cell Vent.
      4) Hohmann & Barnard, Inc.; Quadro-Vent.
      5) Wire-Bond; Cell Vent.

3. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch less than depth of outer wythe; in color selected from manufacturer's standard.

   a. Products:

      1) Mortar Net USA, Ltd.; Mortar Net Weep Vents.

E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

1. Provide one of the following configurations:

   a. Strips, full-depth of cavity and 10 inches wide, with dovetail shaped notches 7 inches deep.
   b. Strips, not less than 1-1/2 inches thick and 10 inches wide, with dimpled surface designed to catch mortar droppings and prevent weep holes from being clogged with mortar.

c. Sheets or strips full depth of cavity and installed to full height of cavity.

2. Products:

a. Advanced Building Products Inc.; Mortar Break Mortar Break II.
b. Archovations, Inc.; CavClear Masonry Mat.
c. Dayton Superior Corporation, Dur-O-Wal Division; Polytite MortarStop.
d. Mortar Net USA, Ltd.; Mortar Net.

F. Reinforcing bar positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.142-inch steel wire, hot-dip galvanized after fabrication. Provide units with wither two loops of four loops as needed for number of base indicated.

1. Products:
a. Dayton Superior Corporation, Dur-O-Wall Division; D/A 810, D/A 812 or D/A 817.
b. Kechmann Building Products Inc.; No. 376 Rebar Positioner.
c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.

2.9 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains from new masonry without damaging masonry. Use product approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

1. Manufacturers:

a. Diedrich Technologies, Inc.
b. EaCo Chem, Inc.
c. ProSoCo, Inc.

2.10 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Limit cementitious materials in mortar for exterior and reinforced masonry to portland cement and lime.
3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification.

1. For masonry below grade or in contact with earth, use Type S.
2. For reinforced masonry, use Type S.

3. For mortar parge coats, use Type S.
4. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type S.

C. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

D. Epoxy Pointing Mortar: Mix epoxy pointing mortar to comply with mortar manufacturer's written instructions.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Use full-size units without cutting if possible. If cutting is required, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

B. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

C. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

D. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:

1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.

3.2 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

C. Stopping and resuming work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

E. Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.

F. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

3.3 MORTAR BEDDING AND JOINTING

A. Lay hollow concrete masonry units as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

C. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

D. Grouting Concrete Masonry Units:

1. Place grout in reinforced cells and where indicated, at specified slump in approximate 4-foot lifts for low-lift grouting; ‘puddle’ or vibrate lightly soon after placement to consolidate grout and eliminate air pockets where moisture is pulled from grout, and top off grout to desired level.
2. For special-inspected high-lift grouting, construct inspection/relief ports at bottom course in each vertical cell to be grouted, and clean out loose mortar debris; grout and vibrate as each cell is filled to top of loft; allow enough time to pass for grout to lose water to dry CMU then re-consolidate by light vibration, and top off grout.
3. Avoid disturbing reinforcement position while grouting.

3.4 MASONRY-CELL INSULATION

A. Pour granular insulation into cavities to fill void spaces. Maintain inspection ports to show presence of insulation at extremities of each pour area. Close the ports after filling has been confirmed. Limit the fall of insulation to 1 story in height, but not more than 20 feet.

B. Install molded-polystyrene insulation units into masonry unit cells before laying units.

3.5 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

B. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

E. Cut and bend reinforcing unity as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions,

3.6 LINTELS

A. Install steel lintels where indicated.

B. Provide masonry lintels where shown and where openings of more than 24 inches for block sized units are shown without structural steel or other supporting lintels.

3.7 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.

B. Install flashing as follows, unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing as recommended by flashing manufacturer.
2. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
3. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal drip edge.
4. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal flashing termination.

C. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:

1. Use specified weep/vent products to form weep holes.
2. Space weep holes 24 inches o.c., unless otherwise indicated.

3. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.

D. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in Part 2 "Miscellaneous Masonry Accessories" Article.

E. Install vents in head joints in exterior wythes at spacing indicated. Use specified weep/vent products to form vents.

1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.8 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches
3. Avoid disturbing reinforcement position while grouting.

3.9 CLEANING

A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
2. Protect adjacent surfaces from contact with cleaner.
3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
4. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.

5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.10 MASONRY WASTE DISPOSAL

A. Waste Disposal:

1. Do not dispose of masonry waste as fill .
2. Remove masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04810

SECTION 05120 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes structural steel, grouting of base plates, and angles and miscellaneous steel to support metal decking..

1.2 PERFORMANCE REQUIREMENTS

1. Not used.

1.3 REFERENCE STANDARDS AND CODES

A. See the General Structural Notes on the contract drawings.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication of structural-steel components.
1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts.

C. Welding certificates.

D. Mill test reports: Signed by manufacturers certifying that the following products comply with requirements:
1. Structural steel including chemical and physical properties.
2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
3. Shop primers.
4. Nonshrink grout.

E. Source quality-control test reports.

F. Shop and Erection Drawings:
1. Shop drawings: Submit coordinated and checked shop drawing for all structural steel for review prior to fabrication. Shop drawing shall include a) size and location of all structural steel members and collection material, b) complete information necessary for the fabrication of members including cuts, copes, holes, stiffeners, c) type, size and location of bolts and welds, d) surface preparation and finishes, e) details of assembly, f)

identification of WPS applicable to each shop weld, g) indicate where welds are to be finished and ground smooth as required by AESS.

2. Erection Drawings: Submit coordinated and checked erection drawing for all structural steel for review prior to fabrication. Erection drawing shall show a) location of all structural steel material, b) identification mark of members, c) orientation and relation of members to appropriate grid lines, d) setting elevations for column bases, e) standard and special details for bolted and welded field connections, f) identification of WPS applicable to each shop weld, g) indicate where welds are to be finished and ground smooth as required by AESS.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator who participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category Sbd.

B. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."

C. Comply with applicable provisions of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Preinstallation Conference: Conduct conference at Project site.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground in a properly drained location and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.

B. Requirements for storage and handling of electrodes shall be per AWS D1.1.

1.7 Coordination

A. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 60 percent.

B. W-Shapes: ASTM A 992 Grade 50 unless noted otherwise.

C. Channels, Angles: ASTM A 36.

D. Plate and Bar: ASTM A 36 unless noted otherwise

E. Cold-Formed Hollow Structural Sections: Square and Rectangle sections, ASTM A 500, Grade B structural tubing.

F. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.

B. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B.

C. Unheaded Anchor Rods: ASTM F 1554, Grade 55, weldable.

1. Configuration: Straight.
2. Finish: Plain.

D. Threaded Rods: ASTM A 193/A 193M ASTM A 36/A 36M.

1. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

E. Deformed Bar Anchors: Stud type, ASTM A 496 cold finished low-carbon steel, minimum tensile strength of 80,000 psi.

2.3 PRIMER

A. Primer: SSPC-Paint 25, Type II, iron oxide, zinc oxide, raw linseed oil, and alkyd.

B. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer.

2.4 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC's Load and Resistance Factor Design Specification for Structural Steel Buildings."

2.6 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. General Bolted Construction Requirements:
1. Use standard holes unless otherwise indicated on the Drawings. Holes shall be cut, drilled, or punched at right angles to the surface of the metal. Making or enlarging holes by burning is prohibited.
2. Bolts shall be of a length that will extend entirely through, but not more that ¼ inch beyond, the nut.
3. Washers shall be used on all bolts. Use beveled washers where bolts bear on sloping surface.

C. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.

2.7 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials.
5. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

1. SSPC-SP 2, "Hand Tool Cleaning."
2. SSPC-SP 3, "Power Tool Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.8 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123 unless noted otherwise. Galvanize the following items.
1. Galvanize lintels attached to structural steel frame and located in exterior walls.
2. Items noted on Drawings to be galvanized.

3. Fasteners that connect galvanized components per ASTM A153, except that ASTM A490 bolts shall not be hot-dip galvanized.

B. Fill vent holes and grind smooth after galvanizing.

2.9 SOURCE QUALITY CONTROL

A. Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports. Comply with testing and inspection requirements of Part 3, Article "Field Quality Control."

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1 for stud welding.

PART 3 - EXECUTION

3.1 ERECTION

A. Examination: Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and “Load and Resistance Factor Design Specification for Structural Steel Buildings."

C. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.

1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of base plate.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate before packing with grout.
4. Promptly pack grout solidly between bearing surfaces and base or bearing plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

D. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

3.2 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened

B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.

1. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" and “Load and Resistance Factor Design Specification for Structural Steel Buildings" for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.

B. Bolted Connections: Shop-bolted connections will be[tested and] inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Field welds will be visually inspected according to AWS D1.1.

1. In addition to visual inspection, field welds will be tested according to AWS D1.1 and the following inspection procedures, at testing agency's option:

a. Liquid Penetrant Inspection: ASTM E 165.
b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
c. Ultrasonic Inspection: ASTM E 164.
d. Radiographic Inspection: ASTM E 94.

D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

END OF SECTION 05120END OF SECTION 05120

SECTION 05210 - STEEL JOISTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. K-series steel joists.
2. Joist girders.
3. Joist accessories.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated.

B. Design special joists to withstand design loads with live load deflections no greater than the following:
1. Roof joists: Vertical deflection of l/360 of the span.

1.3 SUBMITTALS

A. Product Data: For each type of joist, accessory, and product indicated.

B. Shop Drawings: Show layout, designation, number, type, location, and spacings of joists. Include joining and anchorage details, bracing, bridging, joist accessories; splice and connection locations and details; and attachments to other construction.
1. Indicate locations and details of bearing plates to be embedded in other construction.
2. Comprehensive engineering analysis of special joists signed and scaled by the qualified professional engineer responsible for its preparation, licensed in the State of Utah.

C. Welding certificates.

D. Manufacturer certificates.

E. Mill Certificates: For bolts.

F. Field quality-control test and inspection reports.

G. Research/Evaluation reports.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer certified by the Steel Joist Institute (SJI) to manufacture joists complying with SJI standard specifications and load tables.

B. SJI Specifications: Comply with SJI's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders" (hereafter, SJI's "Specifications") that are applicable to types of joists indicated.

C. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle joists as recommended in SJI's "Specifications."

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel: Comply with SJI's "Specifications" for web and steel-angle chord members.

1. Recycled Content: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 60 percent.

B. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A, carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.

1. Finish: **Plain, uncoated**.

C. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.

1. Finish: **Plain** .

2.2 PRIMERS

A. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.

2.3 K-SERIES STEEL JOISTS

A. Manufacture steel joists of type indicated according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.

1. Joist Type: K-series steel joists.

B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members.

2.4 JOIST GIRDERS

A. Manufacture joist girders according to "Standard Specifications for Joist Girders" in SJI's "Specifications," with steel-angle top- and bottom-chord members and with end and top-chord arrangements as indicated.

2.5 JOIST ACCESSORIES

A. Bridging: Provide bridging anchors and number of rows of **horizontal or diagonal** bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.

B. Bridging: Schematically indicated. Detail and fabricate according to SJI's "Specifications." Furnish additional erection bridging if required for stability.

C. Supply ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch of finished wall surface, unless otherwise indicated.

D. Supply miscellaneous accessories, including splice plates and bolts required by joist manufacturer to complete joist installation.

2.6 CLEANING AND SHOP PAINTING

A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories. Apply 1 coat of shop primer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Do not install joists until supporting construction is in place and secured.

B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.

1. Before installation, splice joists delivered to Project site in more than one piece.
2. Space, adjust, and align joists accurately in location before permanently fastening.
3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.

C. Field weld joists to supporting steel **bearing plates and framework**. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

D. Bolt joists to supporting steel framework using carbon-steel bolts.

E. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with Research Council on Structural Connections' "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.

F. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.2 FIELD QUALITY CONTROL

A. Testing Agency: **Owner will engage Engage** a qualified independent testing and inspecting agency to inspect **field welds and bolted connections** and to perform field tests and inspections and prepare test and inspection reports.

END OF SECTION 05210END OF SECTION 05210

SECTION 05310 - STEEL DECK

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Roof deck.

1.2 SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

C. Product certificates.

D. Welding certificates.

E. Field quality-control test and inspection reports.

F. Research/Evaluation Reports: For steel deck.

1.3 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

B. Fire-Test-Response Characteristics: Where indicated, provide steel deck units identical to those tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: Indicated by design designations of applicable testing and inspecting agency.
2. Steel deck units shall be identified with appropriate markings of applicable testing and inspecting agency.

C. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

D. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 60 percent.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

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. ASC Profiles, Inc.
2. Canam Steel Corp.;The Canam Manac Group.
3. Consolidated Systems, Inc.
4. DACS, Inc.
5. D-Mac Industries Inc.
6. Epic Metals Corporation.
7. Marlyn Steel Decks, Inc.
8. New Millennium Building Systems, LLC.
9. Nucor Corp.; Vulcraft Division.
10. Roof Deck, Inc.
11. United Steel Deck, Inc.
12. Valley Joist; Division of EBSCO Industries, Inc.
13. Verco Manufacturing Co.
14. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

2.2 ROOF DECK

A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 30, and with the following:

1. Prime-Painted Steel Sheet: ASTM A 1008/A 1008M, Structural Steel (SS), shop primed with manufacturer's standard baked-on, rust-inhibitive primer.

   a. Color: Manufacturer's standard GrayWhiteGray top surface with white underside.

2. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), G60 zinc coating.

3. Deck Profile: As indicated on structural drawings.
4. Profile Depth: As indicated on structural drawings
5. Design Uncoated-Steel Thickness: As indicated on structural drawings.

6.

2.3 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 12 minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 30, manufacturer's written instructions, requirements in this Section, and as indicated.

B. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

C. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

D. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

E. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

F. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

G. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.2 FIELD QUALITY CONTROL

A. Testing Agency: **Owner will engage** a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field welds will be subject to inspection.

C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.

D. Remove and replace work that does not comply with specified requirements.

E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.3 REPAIRS

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.

END OF SECTION 05310END OF SECTION 05310

SECTION 05400 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Exterior load-bearing wall framing.
2. Exterior non-load-bearing wall framing.

1.2 SUBMITTALS

A. Product Data: For each type of product and accessory indicated.

B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners.

1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Welding certificates.

D. Qualification data.

E. Product test reports. From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:
1. Steel sheet.
2. Expansion anchors.
3. Power-actuated anchors.
4. Mechanical fasteners.
5. Vertical deflection clips.
6. Miscellaneous structural clips and accessories.

F. Research/evaluation reports.

1.3 QUALITY ASSURANCE

A. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements.

B. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code--Sheet Steel."

C. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

D. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."

1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Truss Design."
2. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."

E. Comply with AISI's "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: **As required by structural performance.**
2. Coating: **G60, A60, AZ50, or GF30.**

2.2 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: as indicated on drawings.
2. Flange Width: as indicated on drawings.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and same minimum base-metal thickness as steel studs.

C. Vertical Deflection Clips: Manufacturer's standard clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads.

E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.

2.3 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members, unless otherwise indicated.

B. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

C. Anchor Bolts: ASTM F 1554, Grade **36**, threaded carbon-steel **hex-headed bolts** and carbon-steel nuts; and flat, hardened-steel washers; zinc coated.

D. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

E. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

F. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

2.4 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint **ASTM A 780**.

B. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

C. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

PART 3 - EXECUTION

3.1 PREPARATION

A. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.

B. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.2 INSTALLATION, GENERAL

A. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

B. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

C. Install framing members in one-piece lengths.

D. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

E. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

F. Install insulation, specified inDivision 7 Section "Building Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

G. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

H. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.3 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:

1. Stud Spacing: as indicated on drawings.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single deflection tracks and anchor to building structure.
2. Install double deflection tracks and anchor outer track to building structure.

3. Connect vertical deflection clips to studs and anchor to primary building structure.

E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within **12 inches** of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

a. Install solid blocking at **96-inch centers**.

2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable curtain-wall-framing system.

3.4 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.5 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05400END OF SECTION 05400

SECTION 05500 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Miscellaneous steel framing and supports.
2. Shelf angles.
3. Loose bearing and leveling plates.
4. Steel weld plates and angles.
5. Miscellaneous steel trim.
6. Metal ladders.
7. Metal bollards.
8. Loose steel lintels.

B. See Division 5 Section "Gratings" for metal gratings.

1.2 SUBMITTALS

A. Shop Drawings: Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

PART 2 - PRODUCTS

2.1 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces without blemishes.

B. Ferrous Metals:
1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

2. Steel Tubing: ASTM A 500, cold-formed steel tubing.

C. Nonferrous Metals:

1. Aluminum Extrusions: ASTM B 221, alloy 6063-T6.

2.2 FASTENERS

A. General: Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.

B. Cast-in-Place Anchors in Concrete: Threaded or wedge type; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.

2.3 MISCELLANEOUS MATERIALS

A. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.

B. Galvanizing Repair Paint: SSPC-Paint 20, high-zinc-dust-content paint for regalvanizing welds in steel.

C. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107.

D. Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.

2.4 FABRICATION

A. General: Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces.

1. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.
2. Weld corners and seams continuously. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals. Obtain fusion without undercut or overlap. Remove welding flux immediately. Finish exposed welds smooth and blended.
3. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.
4. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
5. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, not less than 24 inches o.c.

B. Miscellaneous Framing and Supports: Provide steel framing and supports not specified in other Sections as needed to complete the Work. Fabricate units from steel shapes, plates, and bars of welded construction. Cut, drill, and tap units to receive hardware, hangers, and similar items.

C. Loose Steel Lintels: Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.

1. Lintels in Exterior Walls: Galvanize.

D. Shelf Angles: Fabricate shelf angles of sizes indicated and for attachment to framing. Fabricate with horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c.

1. Shelf Angles in Exterior Walls: Prime with zinc-rich primer.

E. Loose Bearing and Leveling Plates: Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts.

F. Miscellaneous Steel Trim: Fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Exterior Miscellaneous Steel Trim: Prime with zinc-rich primer.

G. Metal Ladders: Comply with ANSI A14.3, unless otherwise indicated.

H. Metal Bollards: Fabricate per details.

1. Cap bollards with 1/4-inch- thick steel plate.

2.5 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Finish metal fabrications after assembly.

B. Steel and Iron Finishes:
1. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with requirements indicated below for environmental exposure conditions of installed metal fabrications:

a. Exteriors (SSPC Zone 1B)[**and Items Indicated to Receive Zinc-Rich Primer**]: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
b. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

2. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, with edges and surfaces level, plumb, and true.

1. Fit exposed connections accurately together. Weld connections that are not to be left as exposed joints but cannot be shop welded. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication.

2. Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction.
3. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

B. Set bearing and leveling plates on cleaned surfaces using wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts and pack solidly with nonshrink, nonmetallic grout.

C. Bollards:
1. Anchor bollards in place with concrete footings. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.

D. Touch up surfaces and finishes after erection.

1. Painted Surfaces: Clean field welds, bolted connections, and abraded areas and touch up paint with the same material as used for shop painting.
2. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05500END OF SECTION 05500

SECTION 05530 - GRATINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Formed-metal plank gratings.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance of Gratings: Provide gratings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

   1. Floors: Uniform load of 125 lbf/sq. ft. or concentrated load of 2000 lbf, whichever produces the greater stress.

B. Seismic Performance: Provide gratings capable of withstanding the effects of earthquake motions.

1.3 SUBMITTALS

A. Product Data: For the following:

   1. Formed-metal plank gratings.
   2. Clips and anchorage devices for gratings.
   3. Paint products.

B. Shop Drawings: Detail fabrication and installation of gratings.

   1. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

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: McNichols or equal by others.

2.2 METALS

A. Ferrous Metals:

1. Galvanized Steel Sheet: ASTM A 653/A 653M, structural quality, Grade 33, with G90 coating.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5.

2.4 MISCELLANEOUS MATERIALS

A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.

B. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

2.5 FABRICATION

A. Cut, drill, and punch material cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.

B. Form from materials of size, thickness, and shapes indicated, but not less than that needed to support indicated loads.

C. Fit exposed connections accurately together to form hairline joints.

D. Fabricate toeplates for attaching in the field.

2.6 FORMED-METAL PLANK GRATINGS

A. C-shaped channels rolled from heavy sheet metal of thickness indicated, and punched in serrated diamond shape to produce raised slip-resistant surface and drainage holes.

B. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include McNichols Diamond Grip Strut or equal by others.

1. Channel Width: 2-1/2 inches.
2. Channel Depth: 1-1/8 inches.
3. Material: 0.0785-inch- thick, hot-dip galvanized steel sheet.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Perform cutting, drilling, and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

B. Formed-Metal Plank Gratings: Comply with manufacturer's written instructions for installing gratings. Use manufacturer's standard anchor clips and hold-down devices for bolted connections.

1. Attach removable units to supporting members by bolting at every point of contact.
2. Attach nonremovable units to supporting members by welding, unless otherwise indicated. Comply with manufacturer's written instructions for size and spacing of welds.

C. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.

D. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05530END OF SECTION 05530

SECTION 06100 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Rooftop equipment bases and support curbs.
   2. Wood blocking and nailers.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

   1. Factory mark each piece of lumber with grade stamp of grading agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA C2.

   1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat all rough carpentry, unless otherwise indicated.

   1. Wood nailers, curbs, equipment support bases, blocking, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
   2. Wood sills, blocking, and similar concealed members in contact with masonry or concrete.

2.3 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 19 percent maximum moisture content of any species.

2.4 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Power-Driven Fasteners: NES NER-272.

C. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate]nailers, blocking and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

D. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

END OF SECTION 06100END OF SECTION 06100

SECTION 06160 - SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Wall sheathing.
2. Building wrap.

1.2 SUBMITTALS

A. Research/Evaluation Reports: For the following:
1. Building wrap.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Stack plywood and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PANEL PRODUCTS, GENERAL

A. Oriented Strand Board: DOC PS 2.

2.2 WALL SHEATHING

A. Oriented-Strand-Board Wall Sheathing: Exposure 1 sheathing.

2.3 FASTENERS

A. General: Provide fasteners of size and type indicated.

1. For wall and roof sheathing panels, provide fasteners with corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

2.4 WEATHER-RESISTANT SHEATHING PAPER

A. Building Wrap: ASTM E 1677, Type I air retarder; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.
   1. Products: Subject to compliance with requirements, provide or equal by others:
      a. Dow Chemical Company; Tyvek CommercialWrap.

   2. Water-Vapor Permeance: Not less than 152 g through 1 sq. m of surface in 24 hours per ASTM E 96, Desiccant Method (Procedure A).

B. Building-Wrap Tape: Tape recommended by building-wrap manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Securely attach to substrate by fastening as indicated, complying with the following:

   1. NES NER-272 for power-driven fasteners.
   2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."

B. Coordinate sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that exclude exterior moisture.

C. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30K, "APA Design/Construction Guide: Residential & Commercial."

   1. Comply with "Code Plus" installation provisions in guide referenced in paragraph above.

B. Fastening Methods: Fasten panels as indicated below:

   1. Wall Sheathing:
      a. Screw to cold-formed metal framing.

END OF SECTION 06160END OF SECTION 06160

SECTION 06402 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Wood cabinets.
   2. Plastic-laminate cabinets.
   3. Plastic-laminate countertops.
   4. Shop finishing of woodwork.

B. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips unless concealed within other construction before woodwork installation.

1.2 SUBMITTALS

A. Product Data: For solid-surfacing material, cabinet hardware and accessories, handrail brackets and finishing materials and processes.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

C. Samples:

   1. Lumber and panel products for transparent finish, for each species and cut, finished on one side and one edge.
   2. Plastic-laminates, for each type, color, pattern, and surface finish.
   3. Thermoset decorative panels, for each type, color, pattern, and surface finish.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of woodwork.

B. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards."

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 WOODWORK FABRICATORS

2.2 MATERIALS

A. Wood Species and Cut for Transparent Finish: Baltic Birch plywood with a maple veneer finish surface added. Match Architect's sample.

B. Wood Products:
1. Medium-Density Fiberboard: ANSI A208.2, Grade MD.
2. Particleboard: ANSI A208.1, Grade M-2.
3. Softwood Plywood: DOC PS 1.
4. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1.
5. Baltic Birch Plywood.
6. Maple veneer fitches.

C. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.

D. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.

2.3 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural woodwork, except for items specified in Division 8 Section "Door Hardware (Scheduled by Describing Products)."

B. Frameless Concealed self closing Hinges (European Type): BHMA A156.9, B01602, 125 degrees of opening.

C. Wire Pulls: For Retail Area -back mounted, stainless steel, 10 inches long, 5/16 inch in diameter. For Breakroom -back mounted, solid metal, 4 inches long, 5/16 inch in diameter.

D. Catches: Magnetic catches, BHMA A156.9, B03141.

E. Drawer Slides: BHMA A156.9, B05091.

1. Standard Duty Grade 1: Side mounted; partial-extension type; zinc-plated steel with polymer rollers.

F. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
1. Satin Stainless Steel: BHMA 630.

2.4 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.

2.5 FABRICATION

A. General: Complete fabrication to maximum extent possible before shipment to Project site. Where necessary for fitting at site, provide allowance for scribing, trimming, and fitting.

1. Interior Woodwork Grade: Custom except Break Room to be Economy.
2. Shop cut openings to maximum extent possible. Sand edges of cutouts to remove splinters and burrs. Seal exposed edges of countertop substrate with a coat of varnish.

B. Wood Cabinets for Transparent Finish:

1. AWI Type of Cabinet Construction: Flush overlay.
2. Grain Direction: Vertically for drawer fronts, doors, and fixed panels.
3. Matching of Veneer Leaves: Random match.
4. Veneer Matching within Panel Face: Balance match.
5. Semiexposed Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
6. Drawer Sides and Backs: Thermoset decorative panels.
7. Drawer Bottoms: Thermoset decorative panels.

C. Plastic-Laminate Cabinets:

1. AWI Type of Cabinet Construction: Flush overlay.
2. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate as follows:

   a. Horizontal Surfaces Other Than Tops: Grade HGL.
   b. Postformed Surfaces: Grade HGP.
   c. Vertical Surfaces: Grade HGL..
   d. Edges: PVC edge banding, 0.12 inch thick, matching laminate in color, pattern, and finish.

3. Materials for Semiexposed Surfaces Other Than Drawer Bodies Thermoset decorative panels.
4. Drawer Sides and Backs: Thermoset decorative panels.
5. Drawer Bottoms: Thermoset decorative panels.
6. Colors, Patterns, and Finishes: As selected by Architect from laminate manufacturer's full range of solid colors.

D. Plastic-Laminate Countertops:

1. High-Pressure Decorative Laminate Grade: HGP.
2. Colors, Patterns, and Finishes: As selected by Architect from laminate manufacturer's full range of solid colors.
3. Edge Treatment: Same as laminate cladding on horizontal surfaces.
4. Core Material at Sinks: Particleboard made with exterior glue.

2.6 SHOP FINISHING

A. Finish architectural woodwork at fabrication shop. Defer only final touchup, cleaning, and polishing until after installation.

B. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling.

C. Transparent Finish:

1. Grade: Custom.
2. AWI Finish System: Acrylic lacquer.
3. Staining: Match Architect's sample for color. Submit samples for initial approval and further samples for final selection.
4. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D 523.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas. Examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

B. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.

C. Install woodwork level, plumb, true, and straight to a tolerance of 1/8 inch in 96 inches. Shim as required with concealed shims.

D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation.

1. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches o.c. with No. 10 wafer-head screws sized for 1-inch penetration into wood blocking..

G. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop. Calk space between backsplash and wall with sealant specified in Division 7 Section "Joint Sealants."

END OF SECTION 06402END OF SECTION 06402

SECTION 07190 - WATER REPELLENTS & ANTI GRAFFITI CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes penetrating water-repellent coatings for the following vertical and horizontal surfaces:

1. Concrete unit masonry (unpainted and unglazed).

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product test reports.

C. 8”x16” CMU split face block - face panel only - type as called for on the Building Elevations drawing sheet. Half of face with two coats or product applied – the other half uncoated.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

1.4 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer and Applicator agree(s) to repair or replace materials that fail to maintain water repellency within Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: PROSOCO Blok-Guard & Graffiti Control “1” or equal by others.

2.2 PREPARATION

A. Clean substrate of substances that might interfere with penetration or performance of water repellents. Test for moisture content, according to water-repellent manufacturer's written instructions, to ensure that surface is dry enough.

B. Test for pH level, according to water-repellent manufacturer's written instructions, to ensure chemical bond to silicate minerals.

C. Protect adjoining work, including sealant bond surfaces, from spillage or blow-over of water repellent. Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of water repellent being deposited on surfaces. Cover live plants and grass.

D. Coordination with Sealants: Do not apply water repellent until sealants for joints adjacent to surfaces receiving water-repellent treatment have been installed and cured.

1. Water-repellent work may precede sealant application only if sealant adhesion and compatibility have been tested and verified using substrate, water repellent, and sealant materials identical to those used in the work.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

2.3 APPLICATION

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect the substrate before application of water repellent and to instruct Applicator on the product and application method to be used.

B. Apply a heavy-saturation spray coating of water repellent on surfaces indicated for treatment using low-pressure spray equipment. Comply with manufacturer's written instructions for using airless spraying procedure, unless otherwise indicated.

C. Apply a second saturation spray coating, repeating first application. Comply with manufacturer's written instructions for limitations on drying time between coats and after rainstorm wetting of surfaces between coats. Consult manufacturer's technical representative if written instructions are not applicable to Project conditions.

D. Immediately brush out runs and drips to prevent build up.

2.4 CLEANING

A. Immediately clean water repellent from adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses. Repair damage caused by water-repellent application. Comply with manufacturer's written cleaning instructions.

END OF SECTION 07190

SECTION 07210 - BUILDING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Perimeter insulation under slabs-on-grade.
2. Cavity-wall insulation.
3. Vapor retarders.
4. Sound attenuation insulation.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product test reports.

C. Research/Evaluation Reports: For foam-plastic insulation.

1.3 QUALITY ASSURANCE

A. Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84 for surface-burning characteristics, by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.

2.2 FOAM-PLASTIC BOARD INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C 578, Type VI, 1.80 lb/cu. ft., with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively:

1. Manufacturers:

a. DiversiFoam Products.
b. Dow Chemical Company.
c. Owens Corning.
d. Pactiv Building Products Division.

2.3 GLASS-FIBER BLANKET INSULATION

A. Manufacturers:

1. CertainTeed Corporation.
2. Guardian Fiberglass, Inc.
3. Johns Manville.
4. Knauf Fiber Glass.
5. Owens Corning.

B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

2.4 SLAG-WOOL-FIBER/ROCK-WOOL-FIBER BLANKET INSULATION

A. Manufacturers:

1. Fibrex Insulations Inc.
2. Owens Corning.
3. Thermafiber.

B. Unfaced, Slag-Wool-Fiber/Rock-Wool-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

2.5 VAPOR RETARDERS

A. Polyethylene Vapor Retarders: ASTM D 4397, 6 mils thick, with maximum permeance rating of 0.13 perm.

B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

C. Vapor-Retarder Fasteners: Pancake-head, self-tapping steel drill screws; with fender washers.

D. Single-Component Nonsag Urethane Sealant: ASTM C 920, Type I, Grade NS, Class 25, Use NT related to exposure, and Use O related to vapor-barrier-related substrates.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.

C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

E. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.2 INSTALLATION OF PERIMETER AND UNDER-SLAB INSULATION

A. On vertical surfaces, set insulation units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.

1. If not otherwise indicated, extend insulation a minimum of 24 inches below exterior grade line.

B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

3.3 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Seal joints between foam-plastic insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

C. Install slag-wool-fiber/rock-wool-fiber blanket insulation to cavities formed by framing members of restroom walls according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

3.4 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

A. Install 6-inch- thick, unfaced slag-wool-fiber/rock-wool-fiber blanket insulation in restroom ceiling.

3.5 INSTALLATION OF VAPOR RETARDERS

A. General: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as indicated. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

B. Seal vertical joints in vapor retarders over framing by lapping not less than two wall studs. Fasten vapor retarders to wood framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16 inches o.c.

C. Before installing vapor retarder, apply urethane sealant to flanges of metal framing including runner tracks, metal studs, and framing around door and window openings. Seal overlapping joints in vapor retarders with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Seal butt joints with vapor-retarder tape. Locate all joints over framing members or other solid substrates.

D. Firmly attach vapor retarders to metal framing and solid substrates with vapor-retarder fasteners as recommended by vapor-retarder manufacturer.

E. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarder.

F. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarder.

END OF SECTION 07210END OF SECTION 07210

SECTION 07411 - METAL ROOF PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exposed-fastener, lap-seam metal roof panels.
2. Concealed-fastener, lap-seam metal roof panels.
3. Standing-seam metal roof panels.
4. Batten-seam metal roof panels.
5. Metal soffit panels.

B. Related Sections:

1. Division 7 Section "Sheet Metal Roofing" for custom-fabricated and on-site, roll-formed sheet metal roofing.

1.2 PERFORMANCE REQUIREMENTS

A. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E 2140.

B. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.

1. Uplift Rating: [**UL 30**] [**UL 60**] [**UL 90**].

C. FMG Listing: Provide metal roof panels and component materials that comply with requirements in FMG 4471 as part of a panel roofing system and that are listed in FMG's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FMG markings.

1. Fire/Windstorm Classification: [**Class 1A-60**] [**Class 1A-75**] [**Class 1A-90**] [**Class 1A-105**] [**Class 1A-120**] <**Insert number**>.
2. Hail Resistance: [**MH**] [**SH**].

D. Structural Performance: Provide metal roof panel assemblies capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 1592:

1. Wind Loads: Determine loads based on the following minimum design wind pressures:

a. Uniform pressure of [**20 lbf/sq. ft. (957 Pa)**] [**30 lbf/sq. ft. (1436 Pa)**] <**Insert design wind pressure**>, acting inward or outward.

2. Snow Loads: [**25 lbf/sq. ft. (1197 Pa)**] [**30 lbf/sq. ft. (1436 Pa)**] [**35 lbf/sq. ft. (1676 Pa)**] <**Insert load**>.

3. Deflection Limits: Metal roof panel assemblies shall withstand wind and snow loads with vertical deflections no greater than [**1/180**] [**1/240**] of the span.

E. Energy Performance: Provide roof panels with solar reflectance index not less than [**78**] [**29**] when calculated according to ASTM E 1980 based on testing identical products by a qualified testing agency.

F. Energy Performance: Provide roof panels that are listed on the U.S. Department of Energy's ENERGY STAR Roof Products Qualified Product List for [**low-slope**] [**steep-slope**] roof products.

G. Energy Performance: Provide roof panels with initial solar reflectance not less than [**0.70**] <**insert value**> and emissivity not less than [**0.75**] <**insert value**> when tested according to CRRC-1.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. LEED Submittals:

1. Product Test Reports for Credit SS 7.2: For roof panels, indicating that panels comply with solar reflectance index requirement.
2. Product Data for Credit MR 4.1[**and Credit MR 4.2**]: Indicating percentages by weight of postconsumer and preconsumer recycled content for products having recycled content.

a. Include statement indicating costs for each product having recycled content.

C. Shop Drawings: Show fabrication and installation layouts of metal roof panels; details of edge conditions, side-seam and endlap joints, panel profiles, corners, anchorages, trim, flashings, closures, and accessories; and special details. Distinguish between factory- and field-assembled work.

D. Samples: For each type of exposed finish required.

E. Delegated-Design Submittal: For metal roof panel assembly indicated to comply with performance requirements and design criteria, including analysis data and calculations signed and sealed by the qualified professional engineer responsible for their preparation.

F. Coordination Drawings: Roof plans, drawn to scale, based on input from installers of the items involved.

G. Manufacturer Certificates: Signed by manufacturer certifying that roof panels comply with energy performance requirements specified in "Performance Requirements" Article.

1. Submit evidence of meeting performance requirements.

H. Product test reports.

I. Field quality-control reports.

J. Maintenance data.

K. Warranties: Samples of special warranties.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Fire-Resistance Ratings: Where indicated, provide metal roof panels identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Combustion Characteristics: ASTM E 136.

C. Preinstallation Conference: Conduct conference at [**Project site**] <**Insert location**>.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace metal roof panel assemblies that fail in materials or workmanship within specified warranty period.

1. Warranty Period: [**Two**] <**Insert number**> years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal roof panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Finish Warranty Period: [**10**] [**20**] <**Insert number**> years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANEL MATERIALS

A. Metallic-Coated Steel Sheet: Restricted flatness steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

1. Recycled Content: Provide steel sheet with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than [**25**] <**Insert number**> percent.
2. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation; structural quality.
3. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Class AZ50 coating designation, Grade 40 (Class AZM150 coating designation, Grade 275); structural quality.
4. Surface: [**Smooth, flat**] [**Embossed**] finish.
5. Exposed Coil-Coated Finish:

a. 2-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat.
b. 3-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat.
c. Siliconized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) for topcoat.

6. Concealed Finish: Manufacturer's standard white or light-colored acrylic or polyester backer finish.

B. Aluminum Sheet: Coil-coated sheet, ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.

1. Surface: [**Smooth, flat**] [**Embossed**] finish.
2. Exposed Coil-Coated Finish:

a. 2-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat.
b. 3-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat.
c. Siliconized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) for topcoat.

3. Concealed Finish: White or light-colored acrylic or polyester backer finish.

C. Panel Sealants:

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing; 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
2. Joint Sealant: ASTM C 920; as recommended in writing by metal roof panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.2 FIELD-INSTALLED THERMAL INSULATION

A. Refer to Division 7 Section "Building Insulation."

B. Polyethylene Vapor Retarders: ASTM D 4397, 6 mils (0.15 mm) thick, with maximum permeance rating of 0.13 perm (7.5 ng/Pa x s x sq. m).

C. Unfaced, Polyisocyanurate Board Insulation: ASTM C 591, Type II, compressive strength of 35 psi (240 kPa), with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, based on tests performed.

D. Faced, Polyisocyanurate Board Insulation: ASTM C 1289, [**Type I, Class 1 aluminum foil**] [**Type II, Class 1 or 2 felt or glass-fiber mat, Grade 3**] [**Type V, oriented-strand-board**

facing], with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, based on tests performed on unfaced core.

E. Extruded-Polystyrene Board Insulation: ASTM C 578, Type IV, 1.60-lb/cu. ft. (26-kg/cu. m) minimum density unless otherwise indicated; with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively.

F. Molded-Polystyrene Board Insulation: ASTM C 578, [**Type I, 0.9 lb/cu. ft. (15 kg/cu. m)**] [**Type II, 1.35 lb/cu. ft. (22 kg/cu. m)**], with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively.

G. Mineral-Fiber-Blanket Insulation: ASTM C 665, type indicated below; consisting of fibers manufactured from [**glass, slag wool, or rock wool**] [**glass**] [**slag or rock wool**].

1. Type I (blankets without membrane covering), passing ASTM E 136 for combustion characteristics.
2. Type II (blankets with nonreflective membrane covering), Category 1 (membrane is a vapor retarder), Class A (membrane-faced surface with a flame-spread index of 25 or less).
3. Type III (blankets with reflective membrane covering), Category 1 (membrane is a vapor retarder), Class A (membrane-faced surface with a flame-spread index of 25 or less).

H. Metal Building Insulation: [**ASTM C 991, Type I, or NAIMA 202**] [**ASTM C 991, Type II**], glass-fiber-blanket insulation; 0.5-lb/cu. ft. (8-kg/cu. m) density; 2-inch- (50-mm-) wide, continuous, vapor-tight edge tabs; and with a flame-spread index of 25 or less.

1. Vapor-Retarder Facing: ASTM C 1136, with permeance not greater than 0.02 perm (1.15 ng/Pa x s x sq. m) when tested according to ASTM E 96, Desiccant Method:

a. Composition: [**Polypropylene faced, scrim reinforced, and kraft-paper backing**] [**Foil faced, scrim reinforced, and kraft-paper backing with vapor-retarder coating**] [**Polypropylene faced, scrim reinforced, and foil backing**] [**Vinyl faced, scrim reinforced, and foil backing**] [**Vinyl faced, scrim reinforced, and polyester backing**] <**Insert facing**>.

2. Insulation Retainer Strips: 0.019-inch- (0.48-mm-) thick, formed, galvanized-steel or PVC retainer clips colored to match insulation facing.
3. Thermal Spacer Blocks: Fabricated from extruded polystyrene, 1 inch (25 mm) thick.

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: 30 to 40 mils (0.76 to 1.0 mm) thick minimum, consisting of slip-resisting, polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: Stable after testing at 240 deg F (116 deg C); ASTM D 1970.
2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F (29 deg C); ASTM D 1970.

3. Products: Subject to compliance with requirements, [**provide the following**] [**provide one of the following**] [**available products that may be incorporated into the Work include, but are not limited to, the following**]:

   a. Carlisle Coatings & Waterproofing Inc., Div. of Carlisle Companies Inc.; CCW WIP 300HT.
   b. Grace Construction Products; a unit of Grace, W. R. & Co.; Ultra.
   c. Henry Company; Blueskin PE200 HT.
   d. Metal-Fab Manufacturing, LLC; MetShield.
   e. Owens Corning; WeatherLock Metal High Temperature Underlayment.
   f. <**Insert manufacturer's name; product name or designation**>.

B. Felts: ASTM D 226, [**Type II (No. 30)**] [**Type I (No. 15)**], asphalt-saturated organic felts.

C. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

2.4 SUBSTRATE BOARDS

A. Gypsum Board: Type X, of thickness indicated. ASTM C 1396/C 1396M.

B. Glass-Mat Gypsum Sheathing Board: ASTM C 1177/C 1177M; [**Regular, 1/2 inch (13 mm)**] [**Type X, 5/8 inch (16 mm)**].

C. Perlite Board: ASTM C 728, 1 inch (25 mm) thick.

D. Substrate-Board Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FMG 4470, designed for fastening substrate board to substrate.

2.5 MISCELLANEOUS METAL FRAMING

A. Miscellaneous Metal Framing, General: ASTM C 645, cold-formed metallic-coated steel sheet, [**ASTM A 653/A 653M, G40 (Z120) hot-dip galvanized**] [**ASTM A 653/A 653M, G60 (Z180) hot-dip galvanized**] or coating with equivalent corrosion resistance unless otherwise indicated.

B. Hat-Shaped, Rigid Furring Channels:

   1. Nominal Thickness: [**As indicated**] [**As required to meet performance requirements**] [**0.025 inch (0.64 mm)**] [**0.040 inch (1.02 mm)**] <**Insert thickness**>.
   2. Depth: [**As indicated**] [**7/8 inch (22 mm)**] [**1-1/2 inches (38 mm)**] <**Insert depth**>.

C. Cold-Rolled Furring Channels: Minimum 1/2-inch- (13-mm-) wide flange.

   1. Nominal Thickness: [**As indicated**] [**As required to meet performance requirements**] [**0.064 inch (1.63 mm)**] <**Insert thickness**>.
   2. Depth: [**As indicated**] [**3/4 inch (19 mm)**] <**Insert depth**>.
   3. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with nominal thickness of 0.040 inch (1.02 mm).

4. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.57-mm-) diameter wire, or double strand of 0.048-inch- (1.22-mm-) diameter wire.

D. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (32 mm), wall attachment flange of 7/8 inch (22 mm), and depth required to fit insulation thickness indicated.

1. Nominal Thickness: [**As indicated**] [**As required to meet performance requirements**] [**0.025 inch (0.64 mm)**] <**Insert thickness**>.

2.6 MISCELLANEOUS MATERIALS

A. Panel Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal roof panels by means of plastic caps or factory-applied coating. Provide EPDM, PVC, or neoprene sealing washers.

B. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.7 EXPOSED-FASTENER, LAP-SEAM METAL ROOF PANELS

A. General: Provide factory-formed metal roof panels designed to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps. Include accessories required for weathertight installation.

1. Manufacturers: Subject to compliance with requirements, [**provide products by one of the following**] [**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:
2. Basis-of-Design Product: Subject to compliance with requirements, provide [**product indicated on Drawings**] <**Insert manufacturer's name; product name or designation**> or comparable product by one of the following:

a. AEP-Span.
b. Alcoa Inc.
c. Architectural Metal Systems.
d. Berridge Manufacturing Company.
e. Butler Manufacturing; a BlueScope Steel company.
f. CENTRIA Architectural Systems.
g. Copper Sales, Inc.
h. Fabral.
i. Flexospan Steel Buildings, Inc.
j. Galvamet; Galvacer Building Systems.
k. MBCI; a division of NCI Building Systems, L. P.
l. McElroy Metal, Inc.
m. Metal Sales Manufacturing Corporation.
n. Metecno-Morin Corporation; Division of Metecno Inc.
o. Petersen Aluminum Corporation.
p. Steelox Systems, L.L.C.

q. United Steel Deck Inc.; Subsidiary of Bouras Industries Inc.
r. VICWEST; Div. of Jenisys Engineered Products.
s. <**Insert manufacturer's name**>.

3. Profile: [**Corrugated**] [**Tapered rib**] [**Vee rib**] [**Box rib**] [**Deep-box rib**] as indicated on Drawings.
4. Material: Zinc-coated (galvanized) steel sheet, [**0.022-inch (0.56-mm)**] [**0.028-inch (0.71-mm)**] [**0.034-inch (0.86-mm)**] [**0.040-inch (1.02-mm)**] [**0.052-inch (1.32-mm)**] [**0.064-inch (1.63-mm)**] nominal thickness.

   a. Exterior Finish: [**2-coat fluoropolymer**] [**3-coat fluoropolymer**] [**Siliconized polyester**] <**Insert finish**>.
   b. Color: [**As indicated by manufacturer's designations**] [**Match Architect's samples**] [**As selected by Architect from manufacturer's full range**] <**Insert color**>.

5. Material: Aluminum-zinc alloy-coated steel sheet, [**0.022-inch (0.56-mm)**] [**0.028-inch (0.71-mm)**] [**0.034-inch (0.86-mm)**] [**0.040-inch (1.02-mm)**] [**0.052-inch (1.32-mm)**] [**0.064-inch (1.63-mm)**] nominal thickness.

   a. Exterior Finish: [**2-coat fluoropolymer**] [**3-coat fluoropolymer**] [**Siliconized polyester**] <**Insert finish**>.
   b. Color: [**As indicated by manufacturer's designations**] [**Match Architect's samples**] [**As selected by Architect from manufacturer's full range**] <**Insert color**>.

6. Material: Aluminum sheet, [**0.032 inch (0.81 mm)**] [**0.040 inch (1.02 mm)**] [**0.050 inch (1.27 mm)**] thick.

   a. Exterior Finish: [**2-coat fluoropolymer**] [**3-coat fluoropolymer**] [**Siliconized polyester**] <**Insert finish**>.
   b. Color: [**As indicated by manufacturer's designations**] [**Match Architect's samples**] [**As selected by Architect from manufacturer's full range**] <**Insert color**>.

7. Major-Rib Spacing: <**Insert dimension**> o.c.
8. Panel Coverage: <**Insert dimension**>.
9. Panel Height: <**Insert dimension**>.

2.8 CONCEALED-FASTENER, LAP-SEAM METAL ROOF PANELS

A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners[**and factory-applied sealant**] in side laps. Include accessories required for weathertight installation.

1. Manufacturers: Subject to compliance with requirements, [**provide products by one of the following**] [**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:

2. Basis-of-Design Product: Subject to compliance with requirements, provide [**product indicated on Drawings**] <**Insert manufacturer's name; product name or designation**> or comparable product by one of the following:

   a. AEP-Span.
   b. Alcoa Inc.
   c. Berridge Manufacturing Company.
   d. Cheney Flashing Company.
   e. Copper Sales, Inc.
   f. Dimensional Metals, Inc.
   g. Englert, Inc.
   h. McElroy Metal, Inc.
   i. Merchant & Evans.
   j. Metal Fab Manufacturing.
   k. Metal Sales Manufacturing Corporation.
   l. <**Insert manufacturer's name**>.

3. Profile: [**Tapered rib**] [**Standing seam**] [**Batten seam**] as indicated on Drawings.
4. Material: Zinc-coated (galvanized) steel sheet, [**0.022-inch (0.56-mm)**] [**0.028-inch (0.71-mm)**] [**0.034-inch (0.86-mm)**] nominal thickness.
5. Material: Aluminum-zinc alloy-coated steel sheet, [**0.022-inch (0.56-mm)**] [**0.028-inch (0.71-mm)**] [**0.034-inch (0.86-mm)**] nominal thickness.
6. Material: Aluminum sheet, [**0.032 inch (0.81 mm)**] [**0.040 inch (1.02 mm)**] thick.
7. Panel Coverage: <**Insert dimension**>.
8. Panel Height: <**Insert dimension**>.
9. Batten Width: <**Insert dimension**>.

2.9 STANDING-SEAM METAL ROOF PANELS

A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.

1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.
2. Aluminum Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1637.
3. Manufacturers: Subject to compliance with requirements, [**provide products by one of the following**] [**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:
4. Basis-of-Design Product: Subject to compliance with requirements, provide [**product indicated on Drawings**] <**Insert manufacturer's name; product name or designation**> or comparable product by one of the following:

   a. AEP-Span.
   b. Architectural Building Components.
   c. Architectural Metal Systems.
   d. Architectural Roofing and Siding, Inc.
   e. ATAS International, Inc.

f. Berridge Manufacturing Company.
g. Butler Manufacturing; a BlueScope Steel company.
h. CENTRIA Architectural Systems.
i. Copper Sales, Inc.
j. Dimensional Metals, Inc.
k. Englert, Inc.
l. Fabral.
m. Flexospan Steel Buildings, Inc.
n. Galvamet; Galvacer Building Systems.
o. IMETCO.
p. Integris Metals.
q. MBCI; a division of NCI Building Systems, L. P.
r. McElroy Metal, Inc.
s. Merchant & Evans.
t. Metal-Fab Manufacturing, LLC.
u. Metal Sales Manufacturing Corporation.
v. Metecno-Morin; Division of Metecno Inc.
w. Modern Metal Systems, Inc.
x. Petersen Aluminum Corporation.
y. Steelox Systems, L.L.C.
z. Ultra Seam Incorporated.
aa. United Steel Deck Inc.; Subsidiary of Bouras Industries Inc.
bb. VICWEST; Div. of Jenisys Engineered Products.
cc. <**Insert manufacturer's name**>.

5. Profile: [**Vertical-rib, snap**] [**Vertical-rib, seamed**] [**Trapezoidal-rib, snap**] [**Trapezoidal-rib, seamed**]-joint, as indicated on Drawings.
6. Material: Zinc-coated (galvanized) steel sheet, [**0.022-inch (0.56-mm)**] [**0.028-inch (0.71-mm)**] [**0.034-inch (0.86-mm)**] [**0.040-inch (1.02-mm)**] [**0.052-inch (1.32-mm)**] nominal thickness.

   a. Exterior Finish: [**2-coat fluoropolymer**] [**3-coat fluoropolymer**] [**Siliconized polyester**] <**Insert finish**>.
   b. Color: [**As indicated by manufacturer's designations**] [**Match Architect's samples**] [**As selected by Architect from manufacturer's full range**] <**Insert color**>.

7. Material: Aluminum-zinc alloy-coated steel sheet, [**0.022-inch (0.56-mm)**] [**0.028-inch (0.71-mm)**] [**0.034-inch (0.86-mm)**] [**0.040-inch (1.02-mm)**] [**0.052-inch (1.32-mm)**].nominal thickness.

   a. Exterior Finish: [**2-coat fluoropolymer**] [**3-coat fluoropolymer**] [**Siliconized polyester**] <**Insert finish**>.
   b. Color: [**As indicated by manufacturer's designations**] [**Match Architect's samples**] [**As selected by Architect from manufacturer's full range**] <**Insert color**>.

8. Material: Aluminum sheet, [**0.032 inch (0.81 mm)**] [**0.040 inch (1.02 mm)**] thick.

   a. Exterior Finish: [**2-coat fluoropolymer**] [**3-coat fluoropolymer**] [**Siliconized polyester**] <**Insert finish**>.

b. Color: [**As indicated by manufacturer's designations**] [**Match Architect's samples**] [**As selected by Architect from manufacturer's full range**] <**Insert color**>.

9. Clips: [**Fixed**] [**Floating to accommodate thermal movement**].

a. Material: [**Metallic coated steel**] [**Stainless steel**].

10. Joint Type: [**Single folded**] [**Double folded**] [**As standard with manufacturer**].
11. Panel Coverage: <**Insert dimension**>.
12. Panel Height: <**Insert dimension**>.

2.10 BATTEN-SEAM METAL ROOF PANELS

A. General: Provide factory-formed metal roof panel assembly designed to be installed by covering vertical side edges of adjacent panels with battens and mechanically attaching panels to supports using concealed clips. Include battens and accessories required for weathertight installation.

1. Manufacturers: Subject to compliance with requirements, [**provide products by one of the following**] [**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:
2. Basis-of-Design Product: Subject to compliance with requirements, provide [**product indicated on Drawings**] <**Insert manufacturer's name; product name or designation**> or comparable product by one of the following:

a. AEP-Span.
b. Architectural Building Components.
c. Architectural Roofing and Siding, Inc.
d. ATAS International, Inc.
e. CENTRIA Architectural Systems.
f. Copper Sales, Inc.
g. Dimensional Metals, Inc.
h. Englert, Inc.
i. Fabral.
j. Fashion, Inc.
k. IMETCO.
l. Integris Metals.
m. MBCI; a division of NCI Building Systems, L. P.
n. McElroy Metal, Inc.
o. Merchant & Evans.
p. Metal-Fab Manufacturing, LLC.
q. Metal Sales Manufacturing Corporation.
r. Petersen Aluminum Corporation.
s. Ultra Seam Incorporated.
t. <**Insert manufacturer's name**>.

3. Profile: [**Narrow, snap-on batten seam**] [**Wide, snap-on batten seam**] [**Seamed batten**] as indicated on Drawings.

4. Panel Material: Zinc-coated (galvanized) steel sheet, [**0.022-inch (0.56-mm)**] [**0.028-inch (0.71-mm)**] [**0.034-inch (0.86-mm)**] nominal thickness.

   a. Exterior Finish: [**2-coat fluoropolymer**] [**3-coat fluoropolymer**] [**Siliconized polyester**] <**Insert finish**>.
   b. Color: [**As indicated by manufacturer's designations**] [**Match Architect's samples**] [**As selected by Architect from manufacturer's full range**] <**Insert color**>.

5. Panel Material: Aluminum-zinc alloy-coated steel sheet, [**0.022-inch (0.56-mm)**] [**0.028-inch (0.71-mm)**] [**0.034-inch (0.86-mm)**] nominal thickness.

   a. Exterior Finish: [**2-coat fluoropolymer**] [**3-coat fluoropolymer**] [**Siliconized polyester**] <**Insert finish**>.
   b. Color: [**As indicated by manufacturer's designations**] [**Match Architect's samples**] [**As selected by Architect from manufacturer's full range**] <**Insert color**>.

6. Panel Material: Aluminum sheet, [**0.024 inch (0.61 mm)**] [**0.032 inch (0.81 mm)**] [**0.040 inch (1.02 mm)**] [**0.050 inch (1.27 mm)**] thick.

   a. Exterior Finish: [**2-coat fluoropolymer**] [**3-coat fluoropolymer**] [**Siliconized polyester**] <**Insert finish**>.
   b. Color: [**As indicated by manufacturer's designations**] [**Match Architect's samples**] [**As selected by Architect from manufacturer's full range**] <**Insert color**>.

7. Batten Material: [**Same material, finish, and color as roof panels**] <**Insert material and finish requirements**>.
8. Clips: [**One**] [**Two**] piece.

   a. Material: [**Metallic-coated-steel**] [**Stainless-steel**]sheet.

9. Sealant: Factory applied [**in top**] [**on each side**] of battens.
10. Panel Coverage: <**Insert dimension**>.
11. Batten Height: <**Insert dimension**>.

2.11 METAL SOFFIT PANELS

A. General: Provide factory-formed [**perforated**] metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners[**and factory-applied sealant**] in side laps. Include accessories required for weathertight installation.

B. Metal Soffit Panels: Match profile and material of metal roof panels.

   1. Finish: [**Match finish and color of metal roof panels**] [**Match finish and color of metal wall panels**] [**As indicated on Drawings**].
   2. Sealant: Factory applied within interlocking joint.

3. Manufacturers: Subject to compliance with requirements, [**provide products by one of the following**] [**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:
4. Basis-of-Design Product: Subject to compliance with requirements, provide [**product indicated on Drawings**] <**Insert manufacturer's name; product name or designation**> or comparable product by one of the following:

    a. AEP-Span.
    b. Architectural Building Components.
    c. ATAS International, Inc.
    d. Berridge Manufacturing Company.
    e. CENTRIA Architectural Systems.
    f. Cheney Flashing Company.
    g. Copper Sales, Inc.
    h. Dimensional Metals, Inc.
    i. Englert, Inc.
    j. Fabral.
    k. IMETCO.
    l. MBCI; a division of NCI Building Systems, L. P.
    m. McElroy Metal, Inc.
    n. Merchant & Evans.
    o. Metal-Fab Manufacturing, LLC.
    p. Metal Sales Manufacturing Corporation.
    q. Petersen Aluminum Corporation.
    r. Ultra Seam Incorporated.
    s. <**Insert manufacturer's name**>.

5. Profile: [**Flush**] [**Reveal joint**] [**V groove**] as indicated on Drawings.
6. Material: Same material, finish, and color as metal roof panels.
7. Material: Zinc-coated (galvanized) steel sheet, [**0.022-inch (0.56-mm)**] [**0.028-inch (0.71-mm)**] [**0.034-inch (0.86-mm)**] [**0.040-inch (1.02-mm)**] [**0.052-inch (1.32-mm)**] nominal thickness.

    a. Exterior Finish: [**2-coat fluoropolymer**] [**3-coat fluoropolymer**] [**Siliconized polyester**] <**Insert finish**>.
    b. Color: [**Match finish and color of metal roof panels**] [**Match finish and color of metal wall panels**] [**As indicated by manufacturer's designations**] [**Match Architect's samples**] [**As selected by Architect from manufacturer's full range**] <**Insert color**>.

8. Material: Aluminum-zinc alloy-coated steel sheet, [**0.022-inch (0.56-mm)**] [**0.028-inch (0.71-mm)**] [**0.034-inch (0.86-mm)**] [**0.040-inch (1.02-mm)**] [**0.052-inch (1.32-mm)**] nominal thickness.

    a. Exterior Finish: [**2-coat fluoropolymer**] [**3-coat fluoropolymer**] [**Siliconized polyester**] <**Insert finish**>.
    b. Color: [**Match finish and color of metal roof panels**] [**Match finish and color of metal wall panels**] [**As indicated by manufacturer's designations**] [**Match Architect's samples**] [**As selected by Architect from manufacturer's full range**] <**Insert color**>.

9. Material: Aluminum sheet, [**0.024 inch (0.61 mm)**] [**0.032 inch (0.81 mm)**] [**0.040 inch (1.02 mm)**] thick.

   a. Exterior Finish: [**2-coat fluoropolymer**] [**3-coat fluoropolymer**] [**Siliconized polyester**] <**Insert finish**>.
   b. Color: [**Match finish and color of metal roof panels**] [**Match finish and color of metal wall panels**] [**As indicated by manufacturer's designations**] [**Match Architect's samples**] [**As selected by Architect from manufacturer's full range**] <**Insert color**>.

10. Panel Coverage: [**8 inches (203 mm)**] [**12 inches (305 mm)**] [**16 inches (406 mm)**] [**20 inches (508 mm)**] <**Insert dimension**>.
11. Panel Height: [**0.875 inch (22 mm)**] [**1.0 inch (25 mm)**] [**1.5 inches (38 mm)**] [**3.0 inches (76 mm)**] <**Insert dimension**>.
12. Sealant: Factory applied within interlocking joint.

2.12 ACCESSORIES

A. Roof Panel Accessories: Provide components approved by roof panel manufacturer and as required for a complete metal roof panel assembly including trim, copings, fasciae, corner units, ridge closures, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.

   1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal roof panels.
   2. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
   3. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.

B. Flashing and Trim: Formed from same material as roof panels, prepainted with coil coating, minimum [**0.018 inch (0.45 mm)**] <**Insert thickness**> thick. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal roof panels.

C. Gutters: Formed from same material roof panels. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- (2400-mm-) long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced a maximum of 36 inches (900 mm) o.c., fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Finish gutters to match [**metal roof panels**] [**roof fascia and rake trim**].

D. Downspouts: Formed from same material as roof panels. Fabricate in 10-foot- (3-m-) long sections, complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual". Finish downspouts to match gutters.

E. Roof Curbs: Fabricated from same material as roof panels, minimum [**0.048 inch (1.2 mm)**] <**Insert thickness**> thick; with bottom of skirt profiled to match roof panel profiles, and welded top box and integral full-length cricket. Fabricate curb subframing of minimum 0.0598-inch- (1.5-mm-) thick, angle-, C-, or Z-shaped steel sheet. Fabricate curb and subframing to withstand indicated loads, of size and height indicated. Finish roof curbs to match metal roof panels.

1. Insulate roof curb with 1-inch- (25-mm-) thick, rigid insulation.

2.13 FABRICATION

A. Fabricate and finish metal roof panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes and as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.

B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

C. Fabricate metal roof panel side laps with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will seal weathertight and minimize noise from movements within panel assembly.

D. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. Substrate Board: Install substrate boards over roof [**deck**] [**sheathing**] on entire roof surface. Attach with substrate-board fasteners.

1. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
2. Comply with [**UL**] [**FMG**] requirements for fire-rated construction.

B. Miscellaneous Framing: Install subpurlins, eave angles, furring, and other miscellaneous roof panel support members and anchorage according to metal roof panel manufacturer's written instructions.

3.2 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated on Drawings, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Overlap side

edges not less than 3-1/2 inches (90 mm).[**Extend underlayment into gutter trough.**] Roll laps with roller. Cover underlayment within 14 days.

B. Felt Underlayment: Apply at locations indicated on Drawings, in shingle fashion to shed water, and with lapped joints of not less than 2 inches (50 mm).

C. Apply slip sheet over underlayment before installing metal roof panels.

D. Install flashings to cover underlayment to comply with requirements specified in Division 7 Section "Sheet Metal Flashing and Trim."

3.3 THERMAL INSULATION INSTALLATION

A. Polyethylene Vapor Retarder: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Repair tears or punctures immediately before concealment by other work.

B. Board Insulation: Extend insulation in thickness indicated to cover entire roof. Comply with installation requirements in Division 7 Section "Building Insulation."

1. Erect insulation and hold in place with Z-shaped furring members spaced [**24 inches (610 mm)**] [**600 mm**] o.c. Securely attach narrow flanges of furring members to roof deck with screws spaced 24 inches (600 mm) o.c.

C. Blanket Insulation: Install insulation concurrently with metal roof panel installation, in thickness indicated to cover entire roof, according to manufacturer's written instructions and as follows:

1. Set vapor-retarder-faced units with vapor retarder [**to warm side**] [**in location indicated**] <**Insert location**> of construction unless otherwise indicated. Do not obstruct ventilation spaces.
2. Tape joints and ruptures in vapor retarder and seal each continuous area of insulation to surrounding construction to ensure airtight installation.
3. Install blankets straight and true in one-piece lengths with both sets of facing tabs sealed. Comply with the following installation method:

   a. Over-Framing Installation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing members. Hold in place by panels fastened to secondary framing.
   b. Over-Purlin-with-Spacer-Block Installation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing members. Install layer of filler insulation over first layer to fill space formed by roof panel standoffs. Hold in place by panels fastened to standoffs.

4. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.
5. Thermal Spacer Blocks: Where metal roof panels attach directly to purlins, install thermal spacer blocks.

3.4 METAL ROOF PANEL INSTALLATION

A. Lap-Seam Metal Roof Panels: Fasten metal roof panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.

1. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
2. Lap ribbed or fluted sheets one full rib corrugation.
3. Provide metal-backed neoprene or EPDM washers under heads of exposed fasteners bearing on weather side of metal roof panels.
4. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
5. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
6. Provide sealant tape at lapped joints of metal roof panels and between panels and protruding equipment, vents, and accessories.
7. Apply a continuous ribbon of sealant tape to weather-side surface of fastenings on end laps, and on side laps of nesting-type panels; on side laps of corrugated nesting-type, ribbed, or fluted panels; and elsewhere as needed to make panels weatherproof to driving rains.
8. At panel end splices, nest panels with minimum 6-inch (150-mm) end lap, sealed with butyl-rubber sealant and fastened together by interlocking clamping plates.

B. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended by manufacturer.

1. Install clips to supports with self-tapping fasteners.
2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
4. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.

C. Batten-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each batten-seam joint at location, spacing, and with fasteners recommended by manufacturer.

1. Install clips to supports with self-drilling fasteners.
2. Apply battens to metal roof panel seams, fully engaged to provide weathertight joints.

D. Metal Soffit Panels: Provide metal soffit panels full width of soffits. Install panels perpendicular to support framing.

1. Flash and seal panels with weather closures where metal soffit panels meet walls and at perimeter of all openings.

3.5 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal roof panel assembly including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
2. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
3. Provide elbows at base of downspouts to direct water away from building.

3.6 CLEANING

A. Remove temporary protective coverings and strippable films, if any, as metal roof panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal roof panel installation, clean finished surfaces as recommended by metal roof panel manufacturer. Maintain in a clean condition during construction.

END OF SECTION 07411

SECTION 07414 - METAL PLATE WALL PANELS

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 metal plate wall panels.

B. Related Sections:
   1. Division 7 Section "Sheet Metal Flashing and Trim" for field-formed flashings and other sheet metal work not part of metal wall panel assemblies.

1.3 DEFINITION

A. Metal Plate Wall Panel Assembly: Metal plate wall panels, attachment system components, miscellaneous metal framing, and accessories necessary for a complete weather tight wall system.

1.4 PERFORMANCE REQUIREMENTS

A. General Performance: Metal plate wall panel assemblies shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.

B. Delegated Design: Design metal plate wall panel assembly, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Air Infiltration: Air leakage through assembly of not more than 0.06 cfm/sq. ft. of wall area when tested according to ASTM E 283 at the following test-pressure difference:

   1. Test-Pressure Difference: 6.24 lbf/sq. ft..

D. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:

   1. Test-Pressure Difference: 15.00 lbf/sq. ft..

E. Water Penetration under Dynamic Pressure: No evidence of water leakage when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of inward-acting, wind-load design pressure of not less than 6.24 lbf/sq. ft. and not more than 12 lbf/sq. ft..

1. Water Leakage: As defined according to AAMA 501.1.
2. Water Leakage: Uncontrolled water infiltrating the system or appearing on system's normally exposed interior surfaces from sources other than condensation. Water controlled by flashing and gutters that is drained back to the exterior and cannot damage adjacent materials or finishes is not water leakage.

F. Structural Performance: Provide metal plate wall panel assemblies capable of withstanding the effects of the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 330:

1. Wind Loads: Determine loads based on the following minimum design wind pressures:

a. Uniform pressure of 30 lbf/sq. ft., acting inward or outward.
b. Uniform pressure as indicated on Drawings.

2. Deflection Limits: Metal plate wall panel assemblies shall withstand wind loads with horizontal deflections no greater than 1/240 of the span.

G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, material surfaces.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal plate wall panel and accessory.

B. Shop Drawings: Show fabrication and installation layouts of metal plate wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details. Distinguish among factory-, shop-, and field-assembled work. Shop drawings are to be prepared by the panel manufacturer.

1. Accessories: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches:

a. Flashing and trim.
b. Anchorage systems.

C. Samples for Initial Selection: For each type of metal plate wall panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Metal Plate Wall Panels: 12 inches long by actual panel width. Include fasteners, closures, and other panel accessories.
2. Trim and Closures: 12 inches long. Include fasteners and other exposed accessories.
3. Accessories: 12-inch- long Samples for each type of accessory.

E. Delegated-Design Submittal: For metal plate wall panel assembly indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

F. Coordination Drawings: Exterior elevations, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Metal plate wall panels and attachments.
2. Wall-mounted items including doors, windows, louvers, and lighting fixtures.
3. Penetrations of wall by pipes and utilities.

G. Qualification Data: For Manufacturer, Installer, professional engineer and testing agency.

H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

I. Field quality-control reports.

J. Maintenance Data: For metal plate wall panels to include in maintenance manuals.

K. Warranties: Sample of special warranties.

1.6 QUALITY ASSURANCE

A. InstallerQualifications:
An employer of workers trained and approved by the panel manufacturer. Pre-Qualified Company specializing in performing the work of this Section shall install the system in strict compliance with the panel manufacture's written "Installation Guide.

B. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

C. Source Limitations: Obtain each type of metal plate wall panel from single source from single manufacturer.

D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical wall and corners panels**,** as shown on Drawings; approximately four panels wide by one story high by full thickness, including insulation, supports, attachments, and accessories. Include four-way joint.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, metal plate wall panel Installer, metal plate wall panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects panels including installers of doors, windows, and louvers.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal plate wall panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal plate wall panels.
6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
7. Review temporary protection requirements for metal plate wall panel assembly during and after installation.
8. Review metal plate wall panel observation and repair procedures after installation.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal plate wall panels, and other manufactured items so as not to be damaged or deformed. Package panels for protection during transportation and handling.

B. Unload, store, and erect metal plate wall panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal plate wall panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store panels to ensure dryness, with positive slope for drainage of water. Do not store panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Remove strippable protective covering on metal plate wall panel for just prior to installation

1.8 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal plate wall panels to be performed according to manufacturer's written instructions and warranty requirements.

B. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before metal plate wall panel fabrication and indicate measurements on Shop Drawings.

1.9 COORDINATION

A. Coordinate metal plate wall panel assemblies with rain drainage work, flashing, trim, and construction of studs, soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal plate wall panel assemblies that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures, including rupturing, cracking, or puncturing.
b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal plate wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANEL MATERIALS

A. Aluminum Plate: ASTM B 209. Alloy and temper as recommended by manufacturer for application.

2.2 MISCELLANEOUS METAL FRAMING

A. Miscellaneous Metal Framing, General: ASTM C 645, cold-formed metallic-coated steel sheet, ASTM A 653/A 653M, G40 hot-dip galvanized or coating with equivalent corrosion resistance unless otherwise indicated.

B. Base or Sill Angles: 0.079-inch nominal thickness.

C. Fasteners for Miscellaneous Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten miscellaneous metal framing members to substrates.

2.3 MISCELLANEOUS MATERIALS

A. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by manufacturer for type of use and finish indicated.

B. Panel Fasteners: Self-tapping screws; bolts and nuts; self-locking rivets and bolts; end-welded studs; and other suitable fasteners designed to withstand design loads. Stainless or other equivalent corrosive resistant fastener with minimum ¾” length with heads and integral washers with a minimum 7/16” diameter.

C. METAL PLATE WALL PANELS

D. Metal Plate Wall Panels: Provide factory-formed, metal plate wall panels fabricated from single sheets of metal formed into profile for installation method indicated. Include attachment system components, panel stiffeners, and accessories required for a complete Rainscreen system.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, (or equal by others with prior approval of the Architect):
   a. Provide Dri-Design® Aluminum Wall Panel System of 3003-H14 Aluminum. Thickness of aluminum shall be 063 unless otherwise specified. Overall depth of panels to be 1 ¼”. Panels are to be of dry joint design with an integral interlocking gutter. Inside corners are to be welded. Joint sealants/gaskets are not allowed .
2. Material: Tension-leveled, smooth aluminum sheet, ASTM B 209
3. Panel Depth: 1 1/4 inches.
4. Exterior Finish: Kynar resin finish as manufactured by Valspar, PPG, or equivalent
5. Color: as listed in the Exterior Finish Schedule on the Building Elevation drawings, sheet number AE2-01.

E. Attachment System Components: Formed from extruded aluminum.

1. Provide internal drainage system that allows individual panels to be installed and removed without disturbing adjacent panels.
2. Include manufacturer's standard perimeter extrusions, tracks, and drainage channels.

2.4 ACCESSORIES

A. Metal Plate Wall Panel Accessories: Provide components required for a complete metal plate wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, and similar items. Match material and finish of panels unless otherwise indicated.

B. Flashing and Trim: Same material, finish, and color as adjacent metal plate wall panels, minimum 0.030 inch thick unless otherwise indicated.

2.5 FABRICATION

A. General: Fabricate and finish metal plate wall panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.

a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal plate wall panel manufacturer for application, but not less than thickness of metal being secured.

2.6 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

A. Mica Fluoropolymer: AAMA 2605. 2-coat fluoropolymer finish with suspended mica flakes containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal plate wall panel supports, and other conditions affecting performance of the Work.

1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal plate wall panel manufacturer.
2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal plate wall panel manufacturer.
3. Verify that the weather-resistant sheathing barrier has been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating metal plate wall panels to verify actual locations of penetrations relative to seam locations of panels before 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. Miscellaneous Framing: Install subgirts, base angles, sills, furring, and other miscellaneous metal plate wall panel support members and anchorage according to ASTM C 754 and panel manufacturer's written instructions.

3.3 METAL PLATE WALL PANEL INSTALLATION

A. General: Install metal plate wall panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Anchor panels and other components of the Work securely in place, with provisions for thermal and structural movement.

B. Fasteners:

1. Aluminum Plate Wall Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior and aluminum or galvanized-steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action as recommended by metal plate wall panel manufacturer.

D. Attachment System, General: Install attachment system required to support metal plate wall panels and to provide a complete weathertight wall system, including subgirts, perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels.

1. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery.

2. Rainscreen-Principle Installation: Provide manufacturer's standard pressure-equalized, rainscreen-principle system with integral drainage and gutter system, draining at base of wall
3. Do not apply sealants to joints unless otherwise indicated on Drawings.

3.4 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal plate wall panel assembly including trim, copings, corners, seam covers, flashings, and similar items.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.5 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal plate wall panel units within installed tolerance of 1/4 inch in 20 feet, nonaccumulative, on level, plumb, and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.6 CLEANING

A. Remove temporary protective coverings and strippable films, as metal plate wall panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal plate wall panel installation, clean finished surfaces as recommended by panel manufacturer. Maintain in a clean condition during construction.

B. After metal plate wall panel installation, clear weep holes and drainage channels of obstructions, dirt..

C. Replace metal plate wall panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07414

SECTION 07543 - THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Adhered TPO membrane roofing system.

1.2 PERFORMANCE REQUIREMENTS

A. Energy Performance: Provide roofing system that is listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.

C. Samples for Verification: For the following products:

1. Sheet roofing, of color specified.
2. Roof walkway pad in each color and texture required.

D. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

1. Submit evidence of compliance with performance requirements.

E. Research/evaluation reports.

F. Field quality-control reports.

G. Maintenance data.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product.

B. Source Limitations: Obtain components including roof insulation fasteners for membrane roofing system from same manufacturer as membrane roofing.

C. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period.

1. Warranty Period: [**10**] [**15**] <**Insert number**> years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TPO MEMBRANE ROOFING

A. Fabric-Reinforced Thermoplastic Polyolefin Sheet: ASTM D 6878, internally fabric or scrim reinforced, uniform, flexible[**fabric backed**] TPO sheet.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Carlisle SynTec Incorporated.
b. Firestone Building Products Company.
c. GAF Materials Corporation.
d. GenFlex Roofing Systems.
e. Johns Manville.

2. Thickness: [**45 mils**] [**60 mils**] <**Insert thickness**>, nominal.

2.2 AUXILIARY MEMBRANE ROOFING MATERIALS

A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use, and compatible with membrane roofing.

1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

B. Sheet Flashing: Manufacturer's standard unreinforced thermoplastic polyolefin sheet flashing, [**55 mils**] <**Insert thickness**> thick, minimum, of same color as sheet membrane.

C. Bonding Adhesive: Manufacturer's standard[**, water based**].

D. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.

E. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick, prepunched.

F. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.

G. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.3 ROOF INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C 578, [**Type IV, 1.6-lb/cu. ft.**] [**Type X, 1.3-lb/cu. ft.**] minimum density, square edged.

B. Molded-Polystyrene Board Insulation: ASTM C 578, [**Type II, 1.35-lb/cu. ft.**] [**Type VIII, 1.15-lb/cu. ft.**] [**Type IX, 1.8-lb/cu. ft.**] minimum density.

C. Composite Molded-Polystyrene Board Insulation: ASTM C 578, [**Type II, 1.35-lb/cu. ft.**] [**Type VIII, 1.15-lb/cu. ft.**] [**Type IX, 1.8-lb/cu. ft.**] minimum density, with factory-applied facings, as follows:

1. Facer: ASTM C 208, Type II, Grade 2, cellulosic-fiber insulation board, asphalt coated, 1/2 inch thick.
2. Facer: DOC PS 2, Exposure 1, OSB, 7/16 inch thick.

D. Polyisocyanurate Board Insulation: ASTM C 1289, [**Type II, Class 1, Grade 2**] [**Type II, Class I, Grade 3**], felt or glass-fiber mat facer on both major surfaces.

E. Composite Polyisocyanurate Board Insulation: ASTM C 1289, with factory-applied facing board on one major surface, as indicated below by type, and felt or glass-fiber mat facer on the other.

1. Type IV, cellulosic-fiber-insulating-board facer, Grade 2, 1/2 inch thick.
2. Type V, OSB facer, 7/16 inch thick.
3. Type VII, glass mat faced gypsum board facer, 1/4 inch thick.

F. Perlite Board Insulation: ASTM C 728, rigid, mineral-aggregate thermal insulation board composed of expanded perlite, cellulosic fibers, binders, and waterproofing agents with top surface seal coated.

G. Cellulosic-Fiber Board Insulation: ASTM C 208, Type II, Grade 2, fibrous-felted, rigid insulation boards of wood fiber or other cellulosic-fiber and water-resistant binders, asphalt impregnated, chemically treated for deterioration.

H. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches unless otherwise indicated.

I. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.4 INSULATION ACCESSORIES

A. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

B. Insulation Adhesive: Insulation manufacturer's recommended cold-applied adhesive formulated to attach roof insulation to substrate or to another insulation layer.

2.5 ASPHALT MATERIALS

2.6 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads, approximately 3/16 inch thick, and manufactured by membrane roofing system manufacturer.

PART 3 - EXECUTION

3.1 SUBSTRATE BOARD

3.2 INSULATION INSTALLATION

A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

E. Adhered Insulation: Install each layer of insulation and adhere to substrate as follows:

1. Prime surface of concrete deck with asphalt primer at rate of 3/4 gal./100 sq. ft. and allow primer to dry.
2. Set each layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F of equiviscous temperature.
3. Set each layer of insulation in adhesive, firmly pressing and maintaining insulation in place.

F. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

1. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.

G. Mechanically Fastened and Adhered Insulation: Install each layer of insulation and secure first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

1. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
2. Set each subsequent layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F of equiviscous temperature.
3. Set each subsequent layer of insulation in adhesive, firmly pressing and maintaining insulation in place.

3.3 ADHERED MEMBRANE ROOFING INSTALLATION

A. Adhere membrane roofing over area to receive roofing and install according to membrane roofing system manufacturer's written instructions.

B. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

C. Bonding Adhesive: Apply to substrate and underside of membrane roofing at rate required by manufacturer and allow to partially dry before installing membrane roofing. Do not apply to splice area of membrane roofing.

D. In addition to adhering, mechanically fasten membrane roofing securely at terminations, penetrations, and perimeter of roofing.

E. Apply membrane roofing with side laps shingled with slope of roof deck where possible.

F. Seams: Clean seam areas, overlap membrane roofing, and hot-air weld side and end laps of membrane roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet membrane.
2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
3. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.

3.4 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.5 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.6 FIELD QUALITY CONTROL

A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.

B. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.

END OF SECTION 07543

SECTION 07620 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manufactured reglets and counterflashing.
2. Formed wall sheet metal fabrications.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.

1. Include details for forming, joining, supporting, and securing sheet metal flashing and trim, including pattern of seams, termination points, fixed points, expansion joints, expansion-joint covers, edge conditions, special conditions, and connections to adjoining work.

C. Samples: For each exposed product and for each finish specified.

D. Maintenance data.

E. Warranty: Sample of special warranty.

1.3 QUALITY ASSURANCE

A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical parapet cap/ fascia, approximately 12 feet long, including seams, attachments and accessories. Mockup may be built in place on building and become part of finished building if accepted by the architect.

C. Preinstallation Conference: Conduct conference at Project site.

1.4 WARRANTY

A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.

1. As-Milled Finish: One-side bright mill finish.

2. Exposed Coil-Coated Finishes:

a. Two-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat.
b. Three-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat.
c. Siliconized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat.

3. Color: As called out on the Exterior Building Elevation Sheet of the Construction Drawings.

2.2 UNDERLAYMENT MATERIALS

A. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.

2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.
1. Fasteners for Aluminum Sheet: Aluminum.

C. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

D. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

2.4 REGLETS

A. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with interlocking counterflashing on exterior face, of same metal as reglet.

1. Material: Aluminum, 0.024 inch thick.
2. Finish: Mill.

2.5 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.

1. Obtain field measurements for accurate fit before shop fabrication.
2. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
3. Conceal fasteners and expansion provisions. Exposed fasteners are not allowed on faces exposed to view.

B. Expansion Provisions: form expansion joints of intermeshing hooked flanges, fold flatnot less than 1 inch deep, filled with butyl sealant concealed within joints.

C. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

D. Seams: form intermeshing hooked flanges, not less than 1 inch deep, fold flat, filled with butyl sealant concealed within joints.

2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Copings: Fabricate in minimum 96-inch- long, but not exceeding 10-foot- long, sections. Furnish with continuous cleats to support edge of external leg and drill elongated holes for

fasteners on interior leg. Form seams of intermeshing hooked flanges, fold flat, not less than 1 inch deep, filled with butyl sealant concealed within joints.

B. Miter corners, seal, and solder or weld watertight. Fabricate from the following materials:
   1. Aluminum: 0.050 inch thick.

C. Base Flashing: Fabricate from the following materials:
   1. Aluminum: 0.040 inch thick.

D. Counterflashing: Fabricate from the following materials:
   1. Aluminum: 0.032 inch thick.

PART 3 - EXECUTION

3.1 UNDERLAYMENT INSTALLATION

A. Felt Underlayment: Install felt underlayment with adhesive for temporary anchorage. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

3.2 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement so that completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight. Use fasteners, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

   1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure sealant.
   2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
   3. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
   4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
   5. Torch cutting of sheet metal flashing and trim is not permitted.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.

   1. Coat back side of uncoated aluminum sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
   2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet 0r where shown on the drawigs with no joints allowed within 24 inches of corner or intersection. No lapped joints permitted. Form all joints of intermeshing hooked flanges, not less than 1 inch deep, fold flat, filled with sealant concealed within joints.

D. Fastener Sizes: Use fasteners of sizes that will penetrate wood not less than 1-1/4 inches for 3/4 inch for wood screws.

E. Seal joints as shown and as required for watertight construction.

1. Do not solder aluminum sheet.

3.3 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements and SMACNA's "Architectural Sheet Metal Manual." Provide only concealed fasteners, set units true to line, and level as indicated. Install work with joints, that will be permanently watertight and weather resistant.

B. Copings: Anchor to resist uplift and outward forces according to recommendations in SMACNA's "Architectural Sheet Metal Manual" and as indicated.

1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 24-inch centers.
2. Anchor interior leg of coping with washers and screw fasteners through slotted holes at 24-inch centers.

C. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with sealant.

E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.4 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

END OF SECTION 07620

SECTION 07720 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Roof hatches.

1.2 SUBMITTALS

A. Product Data: For each type of roof accessory indicated.

B. Shop Drawings: Show fabrication and installation details for roof accessories.

C. Samples: For each type of exposed factory-applied color finish required and for each type of roof accessory indicated, prepared on Samples of size to adequately show color.

1.3 QUALITY ASSURANCE

A. Sheet Metal Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.

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, manufacturers listed in other Part 2 articles.

2.2 METAL MATERIALS

A. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coated.

2.3 ROOF HATCHES

A. Roof Hatches: Fabricate roof hatches with insulated double-wall lids and insulated double-wall curb frame with integral deck mounting flange and lid frame counterflashing. Fabricate with welded or mechanically fastened and sealed corner joints. Provide continuous weathertight perimeter gasketing and equip with corrosion-resistant or hot-dip galvanized hardware.

1. Manufacturers:

   a. Babcock-Davis; a Cierra Products Inc. Company.
   b. Bilco Company (The).
   c. Bristolite Skylights.
   d. Custom Curb, Inc.
   e. Dur-Red Products.
   f. Hi Pro International, Inc.
   g. J. L. Industries, Inc.
   h. Metallic Products Corporation.
   i. Milcor Inc.; a Gibraltar Company.
   j. Nystrom, Inc.
   k. O'Keeffe's Inc.
   l. Precision Ladders, LLC.
   m. Roof Products & Systems Corporation.
   n. ThyCurb; Div of Thybar Corporation.
   o. Wasco Products, Inc.
   p. Western Canwell.

2. Loads: Fabricate roof hatches to withstand 40-lbf/sq. ft. external and 20-lbf/sq. ft. internal loads.
3. Type and Size: Single-leaf lid, 30 by 54 inches.
4. Curb and Lid Material: Galvanized steel sheet, 0.079 inch thick.

5. Insulation: Polyisocyanurate board.
6. Interior Lid Liner: Manufacturer's standard metal liner of same material and finish as outer metal lid.
7. Exterior Curb Liner: Manufacturer's standard metal liner of same material and finish as metal curb.
8. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
9. Fabricate units to minimum height of 12 inches, unless otherwise indicated.
10. Hardware: Galvanized steel spring latch with turn handles, butt- or pintle-type hinge system, and padlock hasps inside and outside.

11. Ladder Safety Post: Manufacturer's standard ladder safety post. Post to lock in place on full extension. Provide release mechanism to return post to closed position.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install roof accessories according to manufacturer's written instructions. Anchor roof accessories securely in place and capable of resisting forces specified. Use fasteners, separators, sealants, and other miscellaneous items as required for completing roof accessory installation. Install roof accessories to resist exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Install roof accessories to fit substrates and to result in watertight performance.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

D. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.

E. Seal joints with elastomeric sealant as required by manufacturer of roof accessories.

END OF SECTION 07720

SECTION 07900 - JOINT SEALERS

PART 1 - GENERAL

1..1 RELATED DOCUMENTS:

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

1..2 SUMMARY:

A. This Section includes joint sealers for the following locations:

1. Exterior joints in vertical surfaces and non-traffic horizontal surfaces as indicated below.
   a. Control and expansion joints in unit masonry.
   b. Joints between different materials listed above.
   c. Perimeter joints between materials listed above and frames of doors and windows.

2. Exterior joints in horizontal traffic surfaces as indicated below urethane sealants typical):
   a. Control, expansion, and isolation joints in cast-in-place concrete slabs for floors and planters.

3. Interior joints in vertical surfaces and horizontal non-traffic surfaces as indicated below:
   a. Control and expansion joints on exposed interior surfaces of exterior walls.
   b. Perimeter joints of exterior openings where indicated.
   c. Tile control and expansion joints.
   d. Vertical control joints on exposed surfaces of interior unit masonry walls and partitions.
   e. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
   f. Perimeter joints of toilet fixtures.

4. Interior joints in horizontal traffic surfaces as indicated below:
   a. Control and expansion joints in cast-in-place concrete slabs.
   b. Control and expansion joints in tile flooring.

1..3 SYSTEM PERFORMANCES:

A. Provide joint sealers that have been produced and installed to establish and maintain watertight and airtight continuous seals.

1..4 PROJECT CONDITIONS:

A. Environmental Conditions: Do not proceed with installation of joint sealers under the following conditions:
   1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealer manufacturer or below 40 deg F (4.4 deg C).

B. Joint Width Conditions: Do not proceed with installation of joint sealers where joint widths are less than

allowed by joint sealer manufacturer for application indicated.

C. Joint Substrate Conditions: Do not proceed with installation of joint sealers until contaminants capable of interfering with their adhesion are removed from joint substrates.

PART 2 - PRODUCTS

1..1 MATERIALS, GENERAL:

A. Compatibility: Provide joint sealers, joint fillers and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Colors: Provide color of exposed joint as selected by Architect from manufacturer's standard colors.

1..2 ELASTOMERIC JOINT SEALANTS:

A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C 920 requirements, including those referenced for Type, Grade, Class, and Uses.

B. One-Part Nonacid-Curing Silicone Sealant: Type S, Grade NS, Class 25, and complying with the following requirements for Uses and additional joint movement capability:

1. Uses NT, M, G, A, and, as applicable to joint substrates indicated, O.
2. Additional capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the following percentage changes in joint width as measured at time of application and remain in compliance with other requirements of ASTM C 920 for Uses indicated:

a. 50 percent movement in both extension and compression for a total of 100 percent movement.

C. One-Part Mildew-Resistant Silicone Sealant: Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide; intended for sealing interior joints with nonporous substrates and subject to in-service exposure to conditions of high humidity and temperature extremes.

1..3 JOINT SEALANT BACKING:

A. General: Provide sealant backings of material and type which are nonstaining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Plastic Foam Joint Fillers: Preformed, compressible, resilient, non-waxing, non-extruding strips of flexible, non-gassing plastic foam of material indicated below; nonabsorbent to water and gas; and of size, shape and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

1. Either open-cell polyurethane foam or closed-cell polyethylene foam, unless otherwise indicated, subject to approval of sealant manufacturer, for cold-applied sealants only.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant

manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

PART 3 - EXECUTION

1..1 EXAMINATION:

A. Examine joints indicated to receive joint sealers, with Installer present, for compliance with requirements for joint configuration, installation tolerances and other conditions affecting joint sealer performance. Do not proceed with installation of joint sealers until unsatisfactory conditions have been corrected.

1..2 PREPARATION:

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealers to comply with recommendations of joint sealer manufacturers and the following requirements:
   1. Remove all foreign material from joint substrates which could interfere with adhesion of joint sealer, including dust; paints, except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer; old joint sealers; oil; grease; waterproofing; water repellants; water; surface dirt; and frost.
   2. Clean concrete, masonry, unglazed surfaces of ceramic tile and similar porous joint substrate surfaces, by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealers. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
   3. Remove laitance and form release agents from concrete.
   4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile; and other nonporous surfaces by chemical cleaners or other means which are not harmful to substrates or leave residues capable of interfering with adhesion of joint sealers.

B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealer manufacturer based on preconstruction joint sealer-substrate tests or prior experience. Apply primer to comply with joint sealer manufacturer's recommendations. Confine primers to areas of joint sealer bond, do not allow spillage or migration onto adjoining surfaces.

1..3 INSTALLATION OF JOINT SEALERS:

A. General: Comply with joint sealer manufacturers' printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

B. Elastomeric Sealant Installation Standard: Comply with recommendations of ASTM C 962 for use of joint sealants as applicable to materials, applications and conditions indicated.

C. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:
   1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths which allow optimum sealant movement capability.

      a. Do not leave gaps between ends of joint fillers.
      b. Do not stretch, twist, puncture, or tear joint fillers.

c. Remove absorbent joint fillers which have become wet prior to sealant application and replace with dry material.

2. Install bond breaker tape between sealants and joint fillers, compression seals, or back of joints where adhesion of sealant to surfaces at back of joints would result in sealant failure.

D. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths which allow optimum sealant movement capability.

END OF SECTION 07900

SECTION 08110 - STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Standard hollow metal doors and frames.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include elevations, door edge details, frame profiles, metal thicknesses, preparations for hardware, and other details.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification: For each type of exposed finish required.

E. Schedule: Prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Amweld Building Products, LLC.
2. Benchmark; a division of Therma-Tru Corporation.
3. Ceco Door Products; an Assa Abloy Group company.
4. Curries Company; an Assa Abloy Group company.
5. Deansteel Manufacturing Company, Inc.
6. Firedoor Corporation.
7. Fleming Door Products Ltd.; an Assa Abloy Group company.
8. Habersham Metal Products Company.
9. Kewanee Corporation (The).
10. Mesker Door Inc.
11. Pioneer Industries, Inc.
12. Security Metal Products Corp.
13. Steelcraft; an Ingersoll-Rand company.
14. Windsor Republic Doors.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, CS, Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, CS, Type B.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum A40 metallic coating.

D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z 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.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

F. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.

G. Mineral-Fiber Insulation: ASTM C 665, Type I.

H. Glazing: Division 8 Section "Glazing."

I. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat.

2.3 STANDARD HOLLOW METAL DOORS

A. General: Comply with ANSI/SDI A250.8.

1. Design: Flush panel.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.
   a. Thermal-Rated (Insulated) Doors: R-value of not less than 12.3 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.
3. Vertical Edges for Single-Acting Doors: Beveled edge, 1/8 inch in 2 inches..
4. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- thick, end closures or channels of same material as face sheets.
5. Tolerances: SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Comply with 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), Model 1 (Full Flush).

C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet. 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), Model 1 (Full Flush).

D. Hardware Reinforcement: ANSI/SDI A250.6.

2.4 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8.

B. Exterior Frames: Fabricated from metallic-coated steel sheet.

1. Fabricate frames with mitered or coped corners.
2. Frames for Level 3 Steel Doors: 0.053-inch- thick steel sheet.

C. Interior Frames: Fabricated from cold-rolled steel sheet.

1. Fabricate frames with mitered or coped corners.
2. Fabricate frames as face welded unless otherwise indicated.
3. Frames for Level 2 Steel Doors: 0.053-inch- thick steel sheet.

D. Hardware Reinforcement: ANSI/SDI A250.6.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.

B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.6 STOPS AND MOLDINGS

A. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated.

2.7 ACCESSORIES

A. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

2.8 FABRICATION

A. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.

B. Hollow Metal Doors:

1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors. Seal joints in top edges of doors against water penetration.

C. Hollow Metal Frames: Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
4. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
5. Jamb Anchors: Provide number and spacing of anchors as follows:

a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

1) Two anchors per jamb up to 60 inches high.
2) Three anchors per jamb from 60 to 90 inches high.
3) Four anchors per jamb from 90 to 120 inches high.
4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

1) Three anchors per jamb up to 60 inches high.
2) Four anchors per jamb from 60 to 90 inches high.
3) Five anchors per jamb from 90 to 96 inches high.
4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
5) Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.

6. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers.

a. Single-Door Frames: Three door silencers.

D. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware according to the Door Hardware Schedule and templates furnished as specified in Division 8 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 16 electrical Sections.

E. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

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 each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
4. Provide loose stops and moldings on inside of hollow metal work.
5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.9 STEEL FINISHES

A. Factory-Applied Paint Finish: ANSI/SDI A250.3.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Hollow Metal Frames: 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. Install door silencers in frames before grouting.
   b. Remove temporary braces necessary for installation only after frames have been properly set and secured.
   c. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
   d. 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 postinstalled expansion anchors.

   a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled 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. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
6. 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, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

B. 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 plus or minus 1/16 inch.
    b. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
    c. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

3.2 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.

END OF SECTION 08110

SECTION 08331 - OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Insulated service doors.

B. Related Section:

   1. Division 5 Section "Metal Fabrications" for miscellaneous steel supports.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance, Exterior Doors: Exterior overhead coiling doors shall withstand the wind loads, the effects of gravity loads, and loads and stresses within limits and under conditions indicated according to SEI/ASCE 7.

   1. Wind Loads: Uniform pressure (velocity pressure) of 20 lbf/sq. ft., acting inward and outward.

B. Seismic Performance: Overhead coiling doors shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

1.3 SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data. Include plans, elevations, sections, details, and attachments to other work.

   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   2. Wiring Diagrams: For power, signal, and control wiring.

C. Samples: For each exposed product and for each color and texture specified.

D. Seismic Qualification Certificates: For overhead coiling doors**,** accessories, and components, from manufacturer.

E. Maintenance Data.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 2 - PRODUCTS

2.1 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
   1. Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84. Enclose insulation completely within slat faces.
   2. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face.

B. Bottom Bar for Service Doors: Consisting of two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch thick; fabricated from metal to match curtain slats and finish.

C. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain.

2.2 HOOD

A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.
   1. Exterior-Mounted Doors: Fabricate hood to act as weather protection and with a perimeter sealant-joint-bead profile for applying joint sealant.

2.3 LOCKING DEVICES

A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.

   1. Lock Cylinders: Provide cylinders and keyed to building keying system.
   2. Keys: Provide Three for each cylinder.

B. Chain Lock Keeper: Suitable for padlock.

C. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.4 CURTAIN ACCESSORIES

A. Weatherseals: Equip each exterior door with weather-stripping gaskets fitted to entire perimeter of door for a weathertight installation, unless otherwise indicated.

B. Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door. Provide pole hooks for doors more than 84 inches high.

2.5 COUNTERBALANCING MECHANISM

A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Brackets: Manufacturer's standard mounting brackets of cold-rolled steel plate.

2.6 ELECTRIC DOOR OPERATORS

A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation.

1. Comply with NFPA 70.
2. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24 V, ac or dc.

B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.

C. Electric Motors: Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Division 11 Section "Common Motor Requirements for Equipment" unless otherwise indicated.

1. Electrical Characteristics:

a. Phase: Single phase.
b. Volts: 115 V.
c. Hertz: 60.

2. Motor Type and Controller: Reversible motor and controller (disconnect switch) for motor exposure indicated.

3. Motor Size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.
4. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.

D. Obstruction Detection Device: Equip motorized door with indicated external automatic safety sensor capable of protecting full width of door opening. For non-fire-rated doors, activation of device immediately stops and reverses downward door travel.
1. Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable. Provide self-monitoring capability designed to interface with door operator control circuit to detect damage to or disconnection of sensing device.

E. Remote-Control Station: Momentary-contact, three-button control station with push-button controls labeled "Open," "Close," and "Stop."

1. Interior units, full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
2. Exterior units, full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4 enclosure, key operated.

F. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf.

G. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

H. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

I. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with regulatory requirements for accessibility.

2.7 DOOR ASSEMBLY

A. Insulated Service Door: Overhead coiling door formed with curtain of interlocking metal slats.
1. Basis-of-Design Product: Subject to compliance with requirements, **provide Overhead Door Corp's, insulated, 625 series, face of wall mount, F265I slat, angle guides B-B steel jamb**, or comparable product by one of the following:

a. ACME Rolling Doors.
b. Alpine Overhead Doors, Inc.
c. AlumaTek, Inc.

d. C.H.I. Overhead Doors.
e. City-Gates.
f. Cookson Company.
g. Cornell Iron Works, Inc.
h. Dynamic Closures Corp.
i. Lawrence Roll-Up Doors, Inc.
j. Mahon Door Corporation.
k. McKeon Rolling Steel Door Company, Inc.
l. Metro Door.
m. QMI Security Solutions.
n. Raynor.
o. Southwestern Steel Rolling Door Co.
p. Wayne-Dalton Corp.
q. Windsor Door.

B. Operation Cycles: Not less than 20,000.

C. Curtain R-Value: 7.7.

D. Door Curtain Material: 24 ga. Galvanized steel.

E. Door Curtain Slats: Flat profile slats of 2-5/8-inch center-to-center height by 3/4” thick.
1. Insulated-Slat Interior Facing: Metal.

F. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise.

G. Hood: Match curtain material and finish.

1. Shape: Round.
2. Mounting: Face of wall as shown on Drawings.
3. Locking Device Assembly: Single-jamb side locking bars, operable from inside with thumb turn outside with cylinder.
4. .

H. Electric Door Operator:

1. Usage Classification: Standard duty, up to 60 cycles per hour.
2. Motor Exposure: Interior.
3. Emergency Manual Operation: Push-up or Chain type.
4. Obstruction-Detection Device: Automatic electric sensor edge on bottom bar.
5. Remote-Control Station: Interior, where shown on Drawings.

I. Door Finish:
1. Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from manufacturer's full range.
2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion. Lubricate bearings and sliding parts as recommended by manufacturer. Adjust seals to provide weathertight fit around entire perimeter.

3.2 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION 08331

SECTION 08380 - IMPACT TRAFFIC DOORS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Double action impact resistant traffic doors.
   2. Double action insulated impact resistant traffic doors.
   2. Single action impact resistant traffic doors.

1.2 SUBMITTALS

A. 1. Product Data: Indicate door materials, thickness, configuration, and hardware.
   2. Shop Drawings:
      a. Indicate dimensions, details of construction, and installation.
      b. Indicate relationship to adjoining related Work where cutting, fitting, reinforcement, and anchorage is required for complete installation.
   2. Samples:
      a. Manufacturer's standard color chart for color selection by Architect.
   3. Assurance/Control Submittals:
      a. Certificates: Manufacturer's certificate that Products meet or exceed specified requirements.
      b. Qualification Documentation: Submit documentation of experience indicating compliance with specified qualification requirements.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer: Company specializing in manufacturing Products specified with minimum 5 years documented experience.
   2. Installer: Company specializing in performing the Work of this Section with minimum 5 years documented experience.

1.4 DELIVERY, STORAGE, AND HANDLING

A Deliver product in manufacturer's original unopened packages with labels legible and intact.
B. Labels shall identify manufacturer, brand name, model size, finish, and location of installation.
C. Store doors and accessories in unopened packages in protected dry area to prevent damage from environmental and construction operations.
D. Handle doors with care to prevent damage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with project requirements, manufacturer's offering Products which may be incorporated in the Work include, but not limited to the following:

1. Chase/Durus Industries, Incorporated (800) 547-6856.

2.2 TRAFFIC DOORS

A. Model: or equal by others

1. Chase/Durus Model SST2000 Sheet Doors and Frames.
2. Chase/Durus Model 300I Proline Insulated Core Doors and Frames

B Model SST2000 Sheet Doors and Frames:

1. Door shall be constructed of 16 gauge stainless steel with #4 brush finish.

2. Standard Hinge System: consists of the following components:

   A. Upper hinge: spring loaded, low friction with UHMW plug.

   B. Lower hinge: low friction UHMW cam mated to a stainless steel cam having an adjustment for entering panel in opening.
   C. All moving hinge parts to be fully enclosed with the extruded aluminum spine.
   D. Panels shall be manufactured with a one piece back edge spine of continuous extruded aluminum with flanges that radius the door panel. Spine shall be powder coated black.

3. Window shall be 9" x 14" shatter resistant acrylic, set in black rubber molding. All windows shall be factory installed and sealed. Window shall be centered 60" from the floor.

4. Aluminum Lower Hinge Guards to be 9" high.

5. Black Polyethylene teardrop bumpers with 3” projection to be 42” high. Mount only where called for in the Door Type Schedule.

6. Frames: Welded Channel steel frames by General Contractor. Powder coat – Black. No floor bolting plate or anchors.

C Model 300I Proline Insulated Core Doors and Frames:

1. Doors shall be constructed of 1-1/2” thick wood/foam and clad with full height galvanized steel surface covering on both sides.

2. Black Polyethylene teardrop bumpers with 3” projection to be 42” high. Mount only where called for in the Door Type Schedule.

3. All edges shall be constructed with a Pro-Loc™ Edge which shall be slotted to accept a bulb gasket to form a complete seal with the door jamb and floor. Gasket shall be replaceable.

4. Doors shall utilize the Chase gravity self closing v-cam upper hinge. Hinge shall allow 90° swing in each direction.

5. Window shall be 1/8” thick10” x 16” polycarbonate in a black ABS molded frame, centered 60” from floor.

6. Aluminum Lower Hinge Guards to be 9" high

7. Lower cane bolts, minimum 5/8-inch round steel, 18 inches long from tip to elbow. Chain hole with grommet - 1-5/8". See plans for side of door for bolts. Provide dirt free retainer sleeves for each cane bolt, with a depth of at least 1”. Provide 2 sleeves per door panel; one for closed, and one for hold-open position.

8. Frames: Welded Channel steel frames by General Contractor. Powder coat – Black. No floor bolting plate or anchors.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.
   1. Verify that openings are prepared with headers level, jambs plumb, floor level, without projections, and are correctly dimensioned to receive double action doors.

B. Report in writing to project manager prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

C. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the owner.

3.2 INSTALLATION

A. Install door unit assembly to manufacturer's published instructions and final shop drawings.

B. Fit and align door assembly level and plumb.

C. Use anchorage devices to securely fasten door assembly to door frame construction without distortion or imposed stresses.

3.3 ADJUSTING

A. Adjust door assembly to provide smooth operation from closed to full open position.

3.4 CLEANING

A. Remove protective material from pre-finished surfaces.

B. Remove labels and visible markings.

C. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Wipe surfaces clean.

END OF SECTION

SECTION 08411 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior and Vestibule storefront framing.
2. Storefront framing for punched openings.

1.2 PERFORMANCE REQUIREMENTS

A. General Performance: Aluminum-framed systems 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. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
2. Dimensional tolerances of building frame and other adjacent construction.
3. Failure includes the following:

a. Deflection exceeding specified limits.
b. Thermal stresses transferring to building structure.
c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
d. Noise or vibration created by wind and by thermal and structural movements.
e. Loosening or weakening of fasteners, attachments, and other components.
f. Failure of operating units.

B. Delegated Design: Design aluminum-framed systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Wind Loads: As indicated on Drawings.

D. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.

E. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:

1. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
2. Test Durations: 10 seconds.

F. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 1.57 lbf/sq. ft..

G. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft..

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.

1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.

C. Samples: For each type of exposed finish required.

D. Delegated-Design Submittal: For aluminum-framed systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

E. Product test reports.

F. Field quality-control reports.

G. Maintenance data.

H. Warranties: Sample of special warranties.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.

C. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.

D. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

E. Source Limitations for Aluminum-Framed Systems: Obtain from single source from single manufacturer.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Kawneer; Trifab VG 451T or comparable product by one of the following:

1. Arcadia, Inc.
2. Arch Aluminum & Glass Co., Inc.
3. CMI Architectural.
4. Commercial Architectural Products, Inc.
5. EFCO Corporation.
6. Leed Himmel Industries, Inc.
7. Pittco Architectural Metals, Inc.
8. TRACO.
9. Tubelite.
10. United States Aluminum.
11. Vistawall Architectural Products; The Vistawall Group; a Bluescope Steel company.
12. YKK AP America Inc.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209.
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Structural Profiles: ASTM B 308/B 308M.
5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.3 FRAMING SYSTEMS

A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Thermally broken.
2. Glazing System: Retained mechanically with gaskets on four sides.
3. Glazing Plane: As indicated.

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.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.
3. Do not use exposed fasteners. Retain first paragraph below if applicable or revise to suit Project.

D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.

E. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

F. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.

2.4 GLAZING SYSTEMS

A. Glazing: As specified in Division 8 Section "Glazing."

B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

2.5 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: see Section 08460 – Automatic Entrance Doors.

2.6 ACCESSORY MATERIALS

A. 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. Form or extrude aluminum shapes before finishing.

B. 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 fitted joints with ends coped or mitered.
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 from interior.
7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

C. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

D. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
6. Seal joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed to produce weathertight installation.

E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.

F. Install glazing as specified in Division 8 Section "Glazing."

END OF SECTION 08411

SECTION 08460 - AUTOMATIC ENTRANCE DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior and Vestibule, sliding, power-operated automatic entrances.

1.2 PERFORMANCE REQUIREMENTS

A. Opening-Force Requirements:

1. Power-Operated Doors: Not more than 50 lbf required to manually set door in motion if power fails, and not more than 15 lbf required to open door to minimum required width.
2. Accessible Interior Doors: Not more than 5 lbf to fully open door.

B. Entrapment Force Requirements:

1. Power-Operated Sliding Doors: Not more than 30 lbf required to prevent stopped door from closing.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For automatic entrances. Include plans, elevations, sections, details, hardware mounting heights, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.
2. Activation and safety devices.
3. Include hardware schedule and indicate hardware types, functions, quantities, and locations.

C. Sample: For each exposed product and for each color and texture specified.

D. Product certificates.

E. Product test reports.

F. Field quality-control reports.

G. Maintenance data.

H. Warranties: Sample of special warranties.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation and maintenance of units required for this Project.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Power-Operated Door Standard: BHMA A156.10.

D. Emergency-Exit Door Requirements: Comply with requirements of authorities having jurisdiction for automatic entrances serving as a required means of egress.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of automatic entrances that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
2. Sheet and Plate: ASTM B 209.

B. Steel Reinforcement: With manufacturer's standard corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

C. Stainless-Steel Bars: ASTM A 276 or ASTM A 666, Type 304.

D. Stainless-Steel Tubing: ASTM A 554, Grade MT 304.

E. Glazing: As specified in Division 8 Section “Glazing”.

F. Sealants and Joint Fillers: As specified in Division 7 Section “Joint Sealants."

G. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements, except containing no asbestos; formulated for 30-mil thickness per coat.

H. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

2.2 SLIDING AUTOMATIC ENTRANCES

A. General: Provide manufacturer's standard automatic entrances including doors, carrier assemblies, roller tracks, door operators, activation and safety devices, and accessories required for a complete installation.

B. Sliding Automatic Entrance:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Horton – Profiler 2000 Linear Drive or comparable product by one of the following:

   a. Single-Sliding Units:

      1) Besam Automated Entrance Systems, Inc.; an ASSA ABLOY Group company.
      2) DORMA Automatics; Div. of DORMA Group North America.
      3) Gildor, Inc.
      4) KM Systems, Inc.
      5) Nabco Entrances Inc.
      6) Sierra Automatic Doors, Inc.
      7) Stanley Access Technologies; Div. of The Stanley Works.
      8) Tormax Technologies, Inc.

2. Configuration: Double and Single- sliding door(s).

   a. Traffic Pattern: One and Two way.
   b. Emergency Breakaway Capability: none - rather electronic release, fail safe, mechanically locked after hours.
   c. Mounting: Between the jambs.

3. Operator Features:

   a. Power opening and closing.
   b. Drive System: shaft drive.
   c. Adjustable opening and closing speeds.
   d. Adjustable hold-open time between 0 and 30 seconds.
   e. Obstruction recycle.
   f. On-off/hold-open switch to control electric power to operator, key operated.

4. Sliding Door Carrier Assemblies and Overhead Roller Tracks: Manufacturer's standard carrier assembly that allows vertical adjustment; consisting of nylon- or delrin-covered,

ball-bearing-center steel wheels operating on a continuous roller track, or ball-bearing-center steel wheels operating on a nylon- or delrin-covered, continuous roller track. Support doors from carrier assembly by cantilever and pivot assembly.

a. Rollers: Minimum of two ball-bearing roller wheels and two antirise rollers for each active leaf.

5. Sliding Door Threshold: Manufacturer's standard threshold members and bottom-guide track system, with stainless-steel, ball-bearing-center roller wheels.

a. Configuration: Saddle-type threshold across door opening.

6. Activation Device: Motion sensors mounted on door header to detect pedestrians in activating zone to activate door operator.
7. Safety Devices: Presence sensor mounted to underside of door header and one photoelectric beam mounted in sidelite jambs to detect pedestrians in presence zone and to prevent door from closing.
8. Finish: door(s) and header with Class I, clear anodic finish to match finish of adjacent storefront.

2.3 ENTRANCE COMPONENTS

A. Framing Members: Manufacturer's standard extruded aluminum, minimum 0.125 thick and reinforced as required to support imposed loads.

1. Nominal Size: 1-3/4 by 4-1/2 inches.
2. Extruded Glazing Stops and Applied Trim: Minimum 0.062-inch wall thickness.

B. Stile and Rail Doors: Manufacturer's standard 1-3/4-inch- thick, glazed doors with minimum 0.125-inch- thick, extruded-aluminum tubular stile and rail members. Mechanically fasten corners with reinforcing brackets that are welded, or incorporate concealed tie-rods that span full length of top and bottom rails.

1. Glazing Stops and Gaskets: Square, snap-on, interior glazed, extruded-aluminum stops and manufacturer's standard preformed gaskets.
2. Stile Design: Narrow stile, 2-inch nominal width.
3. Rail Design: 5-inch nominal height.
4. Muntin Bars: Horizontal tubular rail member for each door; match stile design and finish. See drawing for horizontal spacing..
5. Sidelite(s): provided by storefront manufacturer – see Section 08411 and drawings.

C. Sidelite(s): Manufacturer's standard 1-3/4-inch- deep sidelite(s) with minimum 0.125-inch-thick, extruded-aluminum tubular stile and rail members matching door design and finish.

1. Glazing Stops and Gaskets: Same materials and design as for stile and rail door.

D. Headers: 4” (or 6”) X 6” X 0.125”- thick, extruded aluminum tube extending around all four sides of the Vestibule for visual continuity and to conceal door operators and controls where they occur. Provide hinged or removable access panels for service and adjustment of door operators and controls. Secure panels to prevent unauthorized access.

1. Mounting: see drawings
2. Capacity: Capable of supporting doors up to 175 lb per leaf over spans up to 14 feet without intermediate supports.

E. Signage: none if not required by governing authority.

2.4 DOOR OPERATORS AND ACTIVATION AND SAFETY DEVICES

A. Door Operators: Provide door operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for long-term, maintenance-free operation under normal traffic load for type of occupancy indicated.

1. Door Operator Performance: Provide door operators that will open and close doors and maintain them in fully closed position when subjected to Project's design wind loads.
2. Electromechanical Operators: Concealed, self-contained, overhead unit powered by fractional-horsepower, permanent-magnet dc motor; with closing speed controlled mechanically by gear train and dynamically by braking action of electric motor; with solid-state microprocessor controller; UL 325; and with manual operation with power off.

B. Motion Sensors: Self-contained, K-band-frequency, microwave-scanner units with metal or plastic housing; adjustable to provide detection field sizes and functions required by BHMA A156.10; with relay hold time of not less than 2 to 10 seconds.

1. Provide capability for switching between bidirectional and unidirectional detection.
2. For one-way-traffic entrances, sensor on egress side shall not be active when doors are fully closed.

C. Presence Sensors: Self-contained, infrared-scanner units with metal or plastic housing; adjustable to provide detection field sizes and functions required by BHMA A156.10; with relay hold time of not less than 2 to 10 seconds. Sensors shall remain active at all times.

D. Combination Motion/Presence Sensors: Self-contained units; consisting of both motion and presence sensors in a single metal or plastic housing; adjustable to provide detection field sizes and functions required by BHMA A156.10.

1. Motion Sensor: K-band-frequency, microwave-scanner units; with relay hold time of not less than 2 to 10 seconds.

   a. Provide capability for switching between bidirectional and unidirectional detection.
   b. For one-way-traffic entrances, sensor on egress side shall not be active when doors are fully closed.

2. Presence Sensor: Infrared-scanner units; with relay hold time of not less than 2 to 10 seconds. Sensors shall remain active at all times.

E. Photoelectric Beams: Pulsed infrared, sender-receiver assembly for recessed mounting. Beams shall not be active when doors are fully closed.

F. Electrical Interlocks: Unless units are equipped with self-protecting devices or circuits, provide electrical interlocks to prevent activation of operator when door is locked, latched, or bolted.

2.5 HARDWARE

A. General: Provide units in sizes and types recommended by automatic entrance and hardware manufacturers for entrances and uses indicated. Finish exposed parts to match door finish unless otherwise indicated.

B. Manual Opening for Power-Operated Swinging Doors: Provide hardware that in a power failure allows door to open with a manual force not to exceed 30 lbf according to BHMA A156.10.

C. Deadlocks: Manufacturer's standard deadbolt operated by exterior/interior cylinder with minimum 1-inch- long throw bolt; BHMA A156.5, Grade 1.

1. Cylinders: BHMA A156.5, Grade 1, six-pin mortise type.

a. Keying: Integrate into building master key system.

2. Deadbolts: Laminated-steel hook, mortise type, BHMA A156.5, Grade 1.

D. Thresholds: BHMA A156.21, extruded-aluminum raised thresholds; with beveled edges with a slope of not more than 1:2 and a maximum height of 1/2 inch. Provide cutouts as required for door operating hardware.

E. Weather Stripping: Manufacturer's standard replaceable components.

1. Sliding Type: AAMA 701, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

2.6 FABRICATION

A. General: Factory fabricate automatic entrance components to designs, sizes, and thicknesses indicated and to comply with indicated standards.

B. Framing: Provide automatic entrances as prefabricated assemblies. Complete fabrication, assembly, finishing, hardware application, and other work before shipment to Project site. See drawings for custom work. Fiels verify all dimensions prior to frabrication.

C. Doors: Factory fabricated and assembled in profiles indicated. Reinforce as required to support imposed loads and for installing hardware.

D. Door Operators: Factory fabricated and installed in headers, including adjusting and testing.

E. Glazing: Fabricate framing with minimum glazing edge clearances for thickness and type of glazing indicated, according to GANA's "Glazing Manual."

F. Hardware: Factory install hardware to greatest extent possible; remove only as required for final finishing operation and for delivery to and installation at Project site. Cut, drill, and tap for factory-installed hardware before applying finishes.

1. Provide sliding-type weather stripping, mortised into door, at perimeter of doors.

G. Activation and Safety Devices:

1. General: Factory install devices in doors and headers as required by BHMA A156.10 for type of door and direction of travel.
2. Install photoelectric beams in vertical jambs of sidelites, with dimension above finished floor as follows:

a. Top Beam: 48 inches.
b. Bottom Beam: 24 inches.

2.7 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight.

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

B. Entrances: Install automatic entrances plumb and true in alignment with established lines and grades without warp or rack of framing members and doors. Anchor securely in place.

1. Install surface-mounted hardware using concealed fasteners to greatest extent possible.
2. Set headers, carrier assemblies, tracks, operating brackets, and guides level and true to location with anchorage for permanent support.
3. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within system to exterior.

C. Door Operators: Connect door operators to electrical power distribution system as specified in Division 16 Sections.

D. Access-Control Devices: Connect access-control devices to access-control system as specified in Division 16 Sections.

E. Activation and Safety Devices: Install and adjust devices to provide detection field and functions indicated.

F. Glazing: Install glazing as specified in Division 8 Section " Security Glazing."

G. Sealants: Comply with requirements specified in Division 7 Section "Joint Sealants" to provide weathertight installation.

1. Set thresholds, bottom-guide track system, framing members and flashings in full sealant bed.
2. Seal perimeter of framing members with sealant.

H. Wiring within Automatic Entrance Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's written limitations on bending radii. Provide and use lacing bars and distribution spools.

I. Adjusting: Adjust door operators, controls, and hardware for smooth and safe operation and for weathertight closure; comply with requirements in BHMA A156.10.

1. Readjust door operators and controls after repeated operation of completed installation equivalent to 3 days' use by normal traffic (100 to 300 cycles). Lubricate hardware, operating equipment, and other moving parts.

J. Demonstration: train Owner's maintenance personnel to adjust, operate, and maintain automatic entrances.

END OF SECTION 08460

SECTION 08710 – DOOR HARDWARE

PART I – GENERAL

1.01 SUMMARY

A. SECTION INCLUDES

1. The work in this section includes furnishing all items of finish hardware as hereinafter specified or obviously necessary for all swinging, sliding, folding and other doors. Except items, which are specifically excluded from this section of the specification or of unique hardware, specified in the same sections as the doors and frames on which they are installed.

B. RELATED DOCUMENTS

1. Related documents, drawings and general provisions of contract, including General and Supplementary Conditions and Division 1 specification sections apply to this section.

C. RELATED SECTIONS

1. 08110 – STEEL DOORS AND FRAMES
2. 08380 - IMPACT TRAFFIC DOORS
3. 08411 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS
4. 08460 - AUTOMATIC ENTRANCE DOORS
5. Division 16 – Access Control

1.02 REFERENCES

A. STANDARDS

1. ANSI A156.1 – Butts and Hinges
2. ANSI A156.2 – Bored Locks and Latches
3. ANSI A156.3 – Exit Devices
4. ANSI A156.4 – Door Controls – Door Closers
5. ANSI A156.6 – Architectural Door Trim
6. ANSI A156.18 – Material and Finishes
7. ANSI A156.21 – Thresholds
8. ANSI A156.22 – Door Gasketing and Edge Seal Systems
9. ANSI A156.29 – Exit Locks, Exit Locks with Exit Alarms, Exit Alarms, Alarms for Exit Devices
10. ANSI A156.30 – High Security Cylinders
11. NFPA 80 – Fire Doors and Windows
12. UL10C – Positive Pressure Fire Tests of Door Assemblies
13. AIA A201 1997 – General Conditions of the Contract

B. CODES

1. NFPA 101 – Life Safety Code
2. IBC 2003 – International Building Code
3. ANSI A117.1 – Accessible and Usable Buildings and Facilities
4. ADA – Americans with Disabilities Act

1.03 SUBMITTALS

A. GENERAL REQUIREMENTS

1. Submit copies of finish hardware schedule in accordance with Division 1, General Requirements.

B. SCHEDULES AND PRODUCT DATA

1. Schedules to be in vertical format, listing each door opening, and organized into “hardware sets” indicating complete designations of every item required for each door opening to function as intended. Hardware schedule shall be submitted within two (2) weeks from date the purchase order is received by the finish hardware supplier. Furnish four (4) copies of revised schedules after approval for field and file use. Note any special mounting instructions or requirements with the hardware schedule. Schedules to include the following information:

a. Location of each hardware set cross-referenced to indications on drawings, both on floor plans and in door and frame schedule.
b. Handing and degree of swing of each door.
c. Door and frame sizes and materials.
d. Keying information.
e. Type, style, function, size, and finish of each hardware item.
f. Elevation drawings and operational descriptions for all electronic openings.
g. Name and manufacturer of each hardware item.
h. Fastenings and other pertinent information.
i. Explanation of all abbreviations, symbols and codes contained in schedule
j. Mounting locations for hardware when varies from standard.

2. Submit catalog cuts and/or product data sheets for all scheduled finish hardware.

3. Submit separate detailed keying schedule for approval indicating clearly how the owner's final instructions on keying of locks has been fulfilled.

C. SAMPLES

1. Upon request, samples of each type of hardware in finish indicated shall be submitted. Samples are to remain undamaged and in working condition through submittal and review process. Items will be returned to the supplier or incorporated into the work within limitations of keying coordination requirements.

D. TEMPLATES

1. Furnish a complete list and suitable templates, together with finish hardware schedule to contractor, for distribution to necessary trades supplying materials to be prepped for finish hardware.

E. OPERATIONS AND MAINTENANCE MANUALS

1. Upon completion of construction and building turnover, furnish two (2) complete maintenance manuals to the owner. Manuals to include the following items:

a. Approved hardware schedule, catalog cuts and keying schedule.
b. Hardware installation and adjustment instructions.
c. Manufacturer's written warranty information.
d. Wiring diagrams, elevation drawings and operational descriptions for all electronic openings.

1.04 QUALITY ASSURANCE

A. SUBSTITUTIONS

1. All substitution requests must be submitted before bidding and within the procedures and time frame as outlined in Division 1, General Requirements. Approval of products is at the discretion of the architect and his hardware consultant.

B. SUPPLIER QUALIFICATIONS

1. A recognized architectural door hardware supplier who has maintained an office and has been furnishing hardware in the project's vicinity for a period of at least two (2) years.

2. Hardware supplier shall have office and warehouse facilities to accommodate this project.

3. Hardware supplier shall have in his employment at lease one (1) Architectural Hardware Consultant (AHC) who is available at reasonable times during business hours for consultation about the project's hardware and requirements to the owner, architect and contractor.

4. Hardware supplier must be an authorized factory distributor of all products specified herein.

1.05 FIRE-RATED OPENINGS

1. Provide door hardware for fire-rated openings that comply with NFPA 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed by Underwriter's Laboratories (UL) or Warnock Hersey (WH) for use on types and sizes of doors indicated.

2. Project requires door assemblies and components that are compliant with positive pressure and S-label requirements. Specifications must be cross-referenced and coordinated with door manufacturers to ensure that total opening engineering is compatible with UL10C Standard for Positive Pressure Fire Tests of Door Assemblies.

   a. Hardware required for fire doors shall be listed with Underwriters Laboratories for ratings specified.

   b. Certification(s) of compliance shall be made available upon request by the Authority Having Jurisdiction.

1.06 DELIVERY, STORAGE AND HANDLING

A. MARKING AND PACKAGING

1. Properly package and mark items according to the approved hardware schedule, complete with necessary screws and accessories, instructions and installation templates for spotting mortising tools. Contractor shall check deliveries against accepted list and provide receipt for them, after which he is responsible for storage and care. Any shortage or damaged good shall be made without cost to the owner.

2. Packaging of door hardware is the responsibility of the supplier. As hardware supplier receives material from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set and door numbers to match the approved hardware schedule. Two or more identical sets may be packed in same container.

B. DELIVERY

1. The supplier shall deliver all hardware to the project site; direct factory shipments are not allowed unless agreed upon beforehand. Hardware supplier shall coordinate delivery times and schedules with the contractor. Inventory door hardware jointly with representatives of hardware supplier and hardware installer/contractor until each is satisfied that count is correct.

2. No keys, other than construction master keys and/or temporary keys are to be packed in boxes with the locks.

3. At time of hardware delivery, door openings supplier in conjunction with the contractor shall check in all hardware and set up a hardware storage room.

C. STORAGE

1. Provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of work will not be delayed by hardware losses both before and after installation.

1.07 WARRANTY

A. All items, except as noted below, shall be warranted in writing by the manufacturer against failure due to defective materials and workmanship for a minimum period of one (1) year commencing on the date of final completion and acceptance. In the event of product failure, promptly repair or replace item with no additional cost to the owner.

1. Cylindrical locksets – Heavy Duty: Seven (7) years
2. Exit Devices: Five (5) years
3. Door closers: Ten (10) years

PART II – PRODUCTS

2.01 MANUFACTURERS

A. Only manufacturers as listed below shall be accepted. Obtain each type of finish hardware (hinges, latch and locksets, exit devices, door closers, etc.) from a single manufacturer.

2.02 MATERIALS

A. SCREWS AND FASTENERS

1. All required screws shall be supplied as necessary for securing finish hardware in the appropriate manner. Thru-bolts shall be supplied for exit devices and door closers where required by code and the appropriate blocking or reinforcing is not present in the door to preclude their use.

B. HANGING DEVICES

1. HINGES

   a. Hinges shall conform to ANSI A156.1 and have the number of knuckles as specified, oil-impregnated bearings as specified with NRP (non-removable pin) feature, at all exterior reverse bevel doors. Unless otherwise scheduled, supply one (1) hinge for every 30” of door height. Hinges shall be a minimum of 4 1/2” high and 4” wide; heavy weight hinges (.180) shall be supplied at all doors where specified.

      1) Specified Manufacturer: McKinney
      2) Approved Substitutes: Hager, Stanley

C. CYLINDERS AND KEYING

1. CYLINDERS

   a. Provide cylinders and keys protected from unauthorized manufacture and distribution by manufacturer’s United States patents. The key design and tolerances shall permit the cutting of keys with standard code or duplicating machines. The requirement for a single-purpose or keyway-specific cutting or duplicating machine shall not be allowed. The key design and tolerances shall permit the use of keys and cylinders in existing key systems having similar keyways and sections.

      1) Specified Manufacturer: Sargent XC
      2) Approved Substitutes: Medeco Keymark, Yale Keymark

2. KEYING

   a. All locks and cylinders shall be construction master-keyed. All locks and cylinders to be master-keyed or grandmaster-keyed as directed by the owner. The factory shall key all locks and cylinders. Furnish the following key amounts:

      1) Two (2) change keys per lock
      2) Three (3) grand master keys
      3) Six (6) master keys per master level
      4) Fifteen (15) construction/temporary keys

   b. Master keys and all high-security or restricted keyway blanks shall be sealed in tamper-proof packaged boxes when shipped from the factory. The boxes shall be shrink wrapped and imprinted to ensure the integrity of the packaging.

3. KEY CABINET

   a. Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall expansion capacity of 150% of the number of locks required for the project.

      1) Specified Manufacturer: Telkee
      2) Approved Substitutes: Lund

D. LOCKING DEVICES

1. CYLINDRICAL LOCKSETS – HEAVY DUTY

a. All locksets shall be ANSI 156.2 Series 4000, Grade 1 Certified. Furnish with standard 2 3/4" backset. Lock housing shall be fabricated of steel zinc dichromate and stainless steel. Latchbolt shall be brass or stainless steel with a minimum 1/2" throw. Locks shall be non-handed and fully field reversible.

1) Specified Manufacturer: Sargent 10 Line
2) Approved Substitutes: Corbin Russwin CL3300 Series, Yale 5400LN Series

2. LOCKSET STRIKES

a. Strikes shall be non-handed and available with curved lip, full lip or ASA type strikes as required. Provide strikes with lip-length required to accommodate jamb and/or trim detail and projection.

E. EXIT DEVICES

1. CONVENTIONAL DEVICES – PUSH RAIL

a. All exit devices shall be ANSI A156.3, Grade 1 Certified and shall be listed by Underwriters Laboratories and bear the UL label for life safety in full compliance with NFPA 80 and NFPA 101. Mounting rails shall be formed from a solid single piece of stainless steel, brass or bronze no less than 0.072" thick. Push rails shall be constructed of 0.062" thick material. Lever trim shall be available in finishes and designs to match that of the specified locksets.

1) Specified Manufacturer: Sargent 80 Series
2) Approved Substitutes: Corbin Russwin ED5000 Series, Yale 7100 Series

F. DOOR CLOSERS

1. SURFACE MOUNTED CLOSERS – HEAVY DUTY

a. All door closers shall be ANSI 156.4, Grade 1 Certified. All closers shall have aluminum alloy bodies, forged steel arms, and separate valves for adjusting backcheck, closing and latching cycles and adjustable spring to provide up to 50% increase in spring power. Closers shall be furnished with parallel arms mounting on all doors opening into corridors or other public spaces and shall be mounted to permit 180 degrees door swing wherever wall conditions permit. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.

1) Specified Manufacturer: Sargent 351 Series
2) Approved Substitutes: Norton 7500 Series

G. DOOR TRIM AND PROTECTIVE PLATES

1. Kick plates shall be .050 gauges and two (2) inches less full width of door, or as specified. Push plates, pull plates, door pulls and miscellaneous door trim shall be as shown in the hardware schedule.

a. Specified Manufacturer: Rockwood
b. Approved Substitutes: McKinney, Quality

H. DOOR STOPS AND HOLDERS

1. WALL MOUNTED DOOR STOPS

a. Where a door is indicated on the plans to strike flush against a wall, wall bumpers shall be provided. Provide convex or concave design as indicated.

1) Specified Manufacturers: Rockwood
2) Approved Substitutes: McKinney, Quality

I. GASKETING AND THRESHOLDS

1. Provide continuous weatherseal on exterior doors and smoke, light, or sound seals on interior doors where indicated or scheduled. Provide intumescent seals as required to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies. Provide only those units where resilient or flexible seal strip is easily replaceable and readily available from stocks maintained by manufacturer.

2. Provide threshold units not less than 4" wide, formed to accommodate change in floor elevation where indicated, fabricated to accommodate door hardware and to fit door frames. All threshold units shall comply with the Americans with Disabilities Act (ADA).

   a. Specified Manufacturers: Pemko
   b. Approved Substitutes: McKinney, Reese, Zero

J. SILENCERS

1. Furnish rubber door silencers all hollow metal frames; two (2) per pair and three (3) per single door frame.

2.03 FINISHES

A. The designations used in schedules and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18 or traditional U.S. finishes shown by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.

C. Where specified hardware shall have an antimicrobial coating which permanently suppresses the growth of bacteria, algae, fungus, mold and mildew applied. The finish shall control the spread and growth of bacteria, mold and mildew and shall be FDA listed for use in medical and food preparation equipment.

PART III – EXECUTION

3.01 EXAMINATION

A. Contractor shall ensure that the building is secured and free from weather elements prior to installing interior door hardware. Examine hardware before installation to ensure it is free of defects.

3.02 INSTALLATION

A. Mount hardware units at heights indicated in the following applicable publications, except as specifically indicated or required to comply with the governing regulations.

1. "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute (DHI.)

2. NWWDA Industry Standard I.S.1.7, "Hardware Locations for Wood Flush Doors."

B. All hardware shall be applied and installed in accordance with best trade practice by an experienced hardware installer. Care shall be exercised not to mar or damage adjacent work.

C. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.

D. Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.03 FIELD QUALITY CONTROL

A. The Contractor shall comply with AIA A201 1997 section 3.3.1 which reads as follows: “The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the contract Documents give other specific instructions concerning these matters.”

B. Prior to the installation of hardware, manufacturer's representatives for locksets, closers, and exit devices shall arrange and hold a jobsite meeting to instruct the installing contractor's personnel on the proper installation of their respective products. A letter of compliance, indicating when this meeting is held and who is in attendance, shall be sent to the Architect and Owner.

C. The hardware supplier shall do a final inspection prior to building completion to ensure that all hardware was correctly installed and is in proper working order.

D. The manufacturer’s representative shall do a final inspection prior to building completion to ensure that all hardware was correctly installed and is in proper working order.

3.04 ADJUSTING, CLEANING, AND DEMONSTRATING

A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.

B. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore to proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

C. Instruct owner's personnel in the proper adjustment and maintenance of door hardware and hardware finishes and usage of any electronic devices.

3.05 PROTECTION

A. Contractor shall protect all hardware, as it is stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

3.06 HARDWARE SCHEDULE

A. The following schedule is furnished for whatever assistance it may afford the Contractor; do not consider it as entirely inclusive. Should any particular door or item be omitted in any scheduled hardware heading, provide door or item with hardware same as required for similar purposes. Hardware supplier is responsible for handing and sizing all products as listed in the hardware heading. Quantities listed are for each pair of doors, or for each single door.

B. Manufacturer’s Abbreviations:

1. MC – McKinney
2. PE - Pemko
3. RO – Rockwood
4. SA – Sargent

Group AL-01

Doors: 100

1	Cylinder	RIM / MORTISE AS REQUIRED	26D	SA
1	Hardware	BALANCE OF HARDWARE BY DOOR SUPPLIER		

Group AL-02

Doors: 101, 102

1	Hardware	ALL HARDWARE BY DOOR SUPPLIER

Group 01

Doors: 104

3	Hinges	T4A3386 4 1/2 X 4 1/2 NRP	26D	MC
1	Exit Device	11 16 8813 F ETL	32D	SA
1	Closer	351 CPS	EN	SA
1	Protection Plate	K1050 10" x 2" LDW	US32D	RO
1	Weatherstrip	2891 AS @ HEAD ONLY		PE
1	Weatherstrip	290 AS @ JAMBS ONLY		PE
1	Door Bottom	222AKPK		PE
1	Threshold	252X3AFG		PE

Group 02

Doors: 112

3	Hinges	T4A3386 4 1/2 X 4 1/2 NRP	26D	MC
1	Storeroom Lockset	11 28 10G04 LL	26D	SA
1	Closer	351 CPS	EN	SA
1	Protection Plate	K1050 10" x 2" LDW	US32D	RO
1	Weatherstrip	2891 AS @ HEAD ONLY		PE
1	Weatherstrip	290 AS @ JAMBS ONLY		PE
1	Door Bottom	222AKPK		PE
1	Threshold	252X3AFG		PE

Group 03

Doors: 105, 109

3	Hinges	TA2714 4 1/2 X 4 1/2	26D	MC
1	Entrance Lockset	11 28 10G05 LL	26D	SA
1	Wall Bumper	409	US32D	RO
3	Door Silencers	608 / 609 AS REQUIRED	GREY	RO

Group 04

Doors: 106, 107

3	Hinges	TA2714 4 1/2 X 4 1/2	26D	MC
1	Privacy Set	28 10U65 LL	26D	SA
1	Wall Bumper	409	US32D	RO
1	Weatherstrip	PK55D	BLACK	PE
1	Sweep	307AV		PE

END OF SECTION 08710

SECTION 08800 - GLASS AND GLAZING

PART 1 - GENERAL

1..1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1..2 SUMMARY:

A. Extent of glass and glazing work is indicated on drawings and schedules.

B. Types of work in this section include glass, glazing plastic and glazing for:

1. Windows
2. Doors.
3. Security glass.
4. Storefront.

1..3 SYSTEM DESCRIPTION:

A. Provide glass and glazing that has been produced, fabricated and installed to withstand normal thermal movement, wind loading and impact loading, without failure including loss or breakage of glass or glazing plastics, failure of sealants or gaskets to remain watertight and airtight, deterioration of glass, glazing plastics and glazing materials and other defects in the work.

1. Normal thermal movement is defined as that resulting from an ambient temperature range of 120 deg. F (67 deg. C) and from a consequent temperature range within glass and glass framing members of 180 deg. F (100 deg. C).
2. Deterioration of insulating glass is defined as failure of hermetic seal due to other causes than breakage which results in intrusion of dirt or moisture, internal condensation or fogging, deterioration of protected internal glass coating, if any, resulting from seal failure, and any other visual evidence of seal failure or performance.

1..4 SUBMITTALS:

A. Product Data: Submit manufacturer's technical data for each glazing material and fabricated glass product required, including installation and maintenance instructions.

1..5 QUALITY ASSURANCE:

A. Security Glass Identification: Each unit of burglar resistant glazing shall be permanently identified by the manufacturer. The identification shall be etched or ceramic fired on the glass and be visible when the unit is glazed.

B. Glazing Standards: Comply with recommendations of Flat Glass Marketing Association (FGMA) "Glazing Manual" and "Sealant Manual" except where more stringent requirements are indicated.

C. Refer to those publications for definitions of glass and glazing terms not otherwise defined in this section or other referenced standards.

C. Safety Glazing Standard: Where safety glass is indicated or required by authorities having jurisdiction, provide type of products indicated which comply with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for category II materials.

1. Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction.

D. Fire Resistance Rated Wire Glass: Provide wire glass products that are identical to those tested per ASTM E 163 (UL 9) and are labeled and listed by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.

E. Insulating Glass Certification Program: Provide insulating glass units permanently marked either on spacers or at least one component pane of units with appropriate certification label of inspecting and testing organization indicated below:

1. Insulating Glass Certification Council (IGCC).
2. Associated Laboratories, Inc. (ALI).

All Insulated Glazing Units shall be labeled and certified by the manufacturer stating the units U-factor and SHGC value. See the Glazing Type Schedule in the drawings for the specified values. These labels shall be removed by the General Contractor after installation and after the local authority has reviewed the units and approved their removal.

F. Single Source Responsibility for Glass: To ensure consistent quality of appearance and performance, provide materials produced by a single manufacturer or fabricator for each kind and condition of glass or glazing plastic indicated and composed of primary glass or glazing plastic obtained from a single source for each type and class required.

1..6 DELIVERY, STORAGE, AND HANDLING:

A. Protect glass, glazing plastic and glazing materials during delivery, storage and handling to comply with manufacturer's directions and as required to prevent edge damage to glass or glazing plastic, and damage to glass, glazing plastic and glazing materials from effects of moisture including condensation, of temperature changes, of direct exposure to sun, and from other causes.

1. Where insulating glass units will be exposed to substantial altitude changes, avoid hermetic seal ruptures by complying with insulating glass fabricator's recommendations for venting and sealing.

1..7 PROJECT CONDITIONS:

A. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing material manufacturer or when joint substrates are wet due to rain, frost, condensation or other causes.

1. Install liquid sealants at ambient and substrate temperatures above 40 deg. F (4.4 deg. C).

1..8 WARRANTY:

A. General: Warranties shall be in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.

B. Manufacturer's Special Project Warranty on Insulating Glass: Provide written warranty signed by manufacturer of insulating glass agreeing to furnish f.o.b. point of manufacture, freight allowed project site, within specified warranty period indicated below, replacements for those insulating glass units developing manufacturing defects. Manufacturing defects are defined as failure or hermetic seal of air space (beyond that due to glass breakage) as evidenced by intrusion of dirt or moisture, internal condensation or fogging, deterioration of protected internal glass coatings, if any, and other visual indications of seal failure or performance; provided the manufacturer's instructions for handling, installing, protecting and maintaining units have been complied with during the warranty period.

1. Warranty Period: Manufacturer's standard but not less than 10 years after date of substantial completion.

C. Manufacturer's Warranty Against Plastic Deterioration: Provide written warranty signed by manufacturer of glazing plastic agreeing to furnish (f.o.b. point of manufacture, freight allowed project site), within specified warranty period indicated below, replacements for glazing plastic sheets which yellow or change color noticeably, lose strength, lose impact or abrasion resistance, or deteriorate appreciably in other substantive ways related to intended applications. Warranty applies to glazing plastic sheets, which have been installed to comply with manufacturer's instructions, and have not been subjected to forces and environmental conditions including maintenance procedures, which are contrary to manufacturer's recommendations.

1. Warranty Period: Manufacturer's standard but not less than 3 years after date of substantial completion.

PART 2 - PRODUCTS

2..1 MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products, which may be incorporated in the work, include; but are not limited to, the following:

1. Manufacturers of Clear, Tinted and Mirrored Float Glass:

   a. AFG Industries, Inc.
   b. Ford Glass Division.
   c. Guardian Industries Corp.
   d. LOF Glass, Inc.
   e. PPG Industries, Inc.
   f. Saint-Gobain/Euroglass.
   g. Capitol Glass.

4. Manufacturers of Heat-Treated Glass:

   a. AFG Industries, Inc.
   b. Cardinal IG.
   c. Environmental Glass Products.
   d. Falconer Glass Industries.
   e. Ford Glass Division.
   f. Guardian Industries Corp.
   g. Hordis Brothers, Inc.
   h. LOF Glass, Inc.
   i. PPG Industries, Inc.
   j. Saint-Gobain/Euroglass.
   k. Spectrum Glass Prod. Div., H. H. Robertson Co.
   l. Viracon, Inc.
   m. Capitol Glass.

5. Manufacturers of Insulating Glass:

   a. Advanced Coating Technology.
   b. AFG Industries, Inc.
   c. Cardinal IG.
   d. Environmental Glass Products.
   e. Falconer Glass Industries.
   f. Ford Glass Division.
   g. Guardian Industries Corp.
   h. Hordis Brothers, Inc.
   i. Independent Insulating Glass.

j. PPG Industries, Inc.
k. Spectrum Glass Prod. Div., H. H. Robertson Co.
l. Viracon, Inc.
m. Capitol Glass

6. Manufacturers of Polycarbonate Plastic Glazing:

a. DSM Sheffield Plastics
b. GE Plastics
c. Viracon

2..2 GLASS AND GLAZING PLASTIC PRODUCTS, GENERAL:

A. Primary Glass Standard: Provide primary glass which complies with ASTM C 1036 requirements, including those indicated by reference to type, class, quality, and, if applicable, form, finish, mesh and pattern.

B. Heat-Treated Glass Standard: Provide heat-treated glass which complies with ASTM C 1048 requirements, including those indicated by reference to kind, condition, type, quality, class, and, if applicable, form, finish, and pattern.

C. Sizes: Fabricate glass and glazing plastics to sizes required for glazing openings indicated, with edge clearances and tolerances complying with recommendations of glass and glazing plastics manufacturer. Provide thicknesses indicated or, if not otherwise indicated, as recommended by glass or glazing plastics manufacturer for application indicated.

2..3 GLASS TYPES:

See Window Schedule, Glass Type Schedule and Frame Type Schedule in the drawings.

2..4 GLAZING PLASTIC:

A. Polycarbonate Glazing Plastic: Provide polycarbonate sheets with a minimum flexural strength of 13,500 psi per ASTM D 790, at 240 deg. F (116 deg. C) allowable continuous service temperature, and Izod impact strength of 16 ft-lb. per in. per ASTM D 256; in sizes and thicknesses indicated and complying with the following requirements.
1. Type: Solar grade uncoated sheet, UV stabilized, formulated with ultra-violet screen to resist yellowing. Abrasion-resistant sheet coated both sides, with abrasion resistance of 3% max. haze increase for 100 revolutions of 500g Taber abraser, ASTM D 1044.
2. Color: "Clear" provide colorless transparent sheet with light transmittance of 84% per ASTM D 1003 for ¼" thick sheet.

2..5 ELASTOMERIC GLAZING SEALANTS AND PREFORMED GLAZING TAPES:

A. General: Provide products of type indicated and complying with the following requirements:

1. Compatibility: Select glazing sealants and tapes of proven compatibility with other materials with which they will come into contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated

by testing and field experience.

2. Suitability: Comply with recommendations of sealant and glass manufacturers for selection of glazing sealants and tapes which have performance characteristics suitable for applications indicated and conditions at time of installation.
3. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, silicone sealant.
4. Colors: Provide color of exposed sealants indicated or, if not otherwise indicated, as selected by Architect from manufacturer's standard colors.
5. Preformed Butyl-Polyisobutylene Glazing Tape.

B. Available Products: Subject to compliance with requirements, products, which may be incorporated in the work, include, but are not limited to, the following:

1. Performed Butyl-Polyisobutylene Glazing Tape:

a. PTI 606; Protective Treatments, Inc.
b. PTI 303; Protective Treatments, Inc.
c. Tremco Polyshim Tape; Tremco.
d. Tremco 440 Tape; Tremco.
e. SST 800 Tape; Tremco.
f. Chem-Tape 40; Woodmont Products, Inc.

2..6 MISCELLANEOUS GLAZING MATERIALS:

A. Compatibility: Provide materials with proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.

C. Setting Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealants and glazing plastic, 80 to 90 Shore A durometer hardness.

D. Spacers: Neoprene, EPDM or silicone blocks, or continuous extrusions, as required for compatibility with glazing sealant, of size, shape and hardness recommended by glass and sealant manufacturers for application indicated.

E. Edge Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealant, of size and hardness required to limit lateral movement (side-walking) of glass.

F. Compressible Filler Rods: Closed-cell or waterproof-jacketed rod stock of synthetic rubber or plastic foam, flexible and resilient, with 5-10 psi compression strength for 25 percent deflection.

PART 3 - EXECUTION

3..1 EXAMINATION:

A. Require Glazier to inspect work of glass framing erector for compliance with manufacturing and installation tolerances, including those for size, squareness, offsets at corners; for presence and functioning of weep system; for existence of minimum required face or edge clearances; and for effective sealing of joinery. Obtain Glazier's written report listing conditions detrimental to

performance of glazing work. Do not allow glazing work to proceed until unsatisfactory conditions have been corrected.

3..2 PREPARATION:

A. Clean glazing channels and other framing members to receive glass or glazing plastics, immediately before glazing. Remove coatings which are not firmly bonded to substrates. Remove lacquer from metal surfaces where elastomeric sealants are indicated for use.

3..3 GLAZING, GENERAL:

A. Comply with combined printed recommendations of glass manufacturers, of manufacturers of sealants, gaskets and other glazing materials, except where more stringent requirements are indicated, including those of referenced glazing standards.

B. Glazing channel dimensions as indicated in details are intended to provide for necessary bite on glass or glazing plastics, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by job conditions at time of installation.

C. Protect glass from edge damage during handling and installation; use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar. Rotate glass with flares or bevels along one horizontal edge which would occur in vicinity of setting blocks so that these are located at top of opening. Remove from project and dispose of glass units with edge damage or other imperfections of kind that, when installed, weakens glass and impairs performance and appearance.

D. Protect plastic surfaces from abrasion and other damage during handling and installation by retaining manufacturer's protective covering, or by other protective methods recommended by glazing plastic manufacturer. Remove covering at border of each piece prior to glazing, remove remainder of covering immediately after installation where glazing plastic will be exposed to sunlight or other conditions where later removal will become difficult.

E. Apply primers to joint surfaces where required for adhesion of sealants, as determined by pre-construction sealant-substrate testing.

3..4 GLAZING:

A. Install setting blocks of proper size in sill rabbet, located one quarter of glass width from each corner, but with edge nearest corner not closer than 6" from corner, unless otherwise required. Set blocks in thin course of sealant which is acceptable for heel bead use.

B. Provide spacers inside and out, of correct size and spacing to preserve required face clearances, for glass sizes larger than 50 united inches (length plus height), except where gaskets or glazing tapes with continuous spacer rods are used for glazing. Provide 1/8" minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of tape.

C. Provide edge blocking to comply with requirements of referenced glazing standard, except where

otherwise required by glass unit manufacturer.

D. Miter cut gaskets at corners and install gaskets in manner recommended by gasket manufacturer to prevent pull away at corners; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3..5 PROTECTION AND CLEANING:

A. Protect exterior glass from breakage immediately upon installation by use of crossed streamers attached to framing and held away from glass. Do not apply markers to surfaces of glass. Remove nonpermanent labels and clean surfaces.

B. Protect glass and glazing plastics from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove immediately by method recommended by glass manufacturer.

C. Examine glass and glazing plastic surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less often than once a month, for build-up of dirt, scum, alkali deposits or staining. When examination reveals presence of these forms of residue, remove by method recommended by glass or glazing plastic manufacturer.

D. Remove and replace glass or glazing plastic which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.

E. Wash glass and glazing plastic on both faces not more than 4 days prior to date scheduled for inspections intended to establish date of substantial completion in each area of project. Wash glass and glazing plastic by method recommended by glass manufacturer.

END OF SECTION

SECTION 09250 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Interior gypsum board.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.

PART 2 - PRODUCTS

2.1 INTERIOR GYPSUM BOARD

A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.

1. 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:

a. American Gypsum Co.
b. BPB America Inc.
c. G-P Gypsum.
d. Lafarge North America Inc.
e. National Gypsum Company.
f. PABCO Gypsum.
g. Temple.
h. USG Corporation.

B. Regular Type:

1. Thickness: 5/8 inch.
2. Long Edges: Tapered or Tapered and featured (rounded or beveled) for prefilling.

2.2 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:

   a. Cornerbead.
   b. L-Bead: L-shaped; exposed long flange receives joint compound.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
1. Manufacturers: Subject to compliance with requirements, provide product by Fry Reglet Corp – picture hanging extrusion per drawings or similar by:
   a. Gordon, Inc.
   b. Pittcon Industries.

2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
3. Finish: Class II clear anodic.

2.3 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Wallboard: Paper.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.

3. Fill Coat: For second coat, use setting-type, sandable topping compound.
4. Finish Coat: For third coat, use setting-type, sandable topping compound.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

D. Sound Attenuation Blankets: As specified in Division 7 Section "Building Insulation."

E. Acoustical Sealant: As specified in Division 7 Section "Joint Sealants."

F. Thermal Insulation: As specified in Division 7 Section "Building Insulation."

G. Vapor Retarder: As specified in Division 7 Section "Building Insulation."

2.5 TEXTURE FINISHES

A. None - all surfaces to be smooth finish.

PART 3 - EXECUTION

3.1 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

3.2 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Regular Type: As indicated on Drawings.

3.3 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.
2. L-Bead: Use where indicated.

C. Aluminum Trim: Install in locations indicated on Drawings.

3.4 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below:

1. Level 5: All Gypsum Board to be painted. See finish schedule.

a. Primer and its application to surfaces are specified in other Division 9 Sections.

3.5 APPLYING TEXTURE FINISHES

A. None - all surfaces to be smooth finish.

3.6 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09250END OF SECTION 09250

SECTION 09310 - CERAMIC TILE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Ceramic tile.
2. Tile backing panels.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples:

1. Each type and composition of tile and for each color and finish required.

1.3 EXTRA MATERIALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

PART 2 - PRODUCTS

2.1 TILE PRODUCTS

A. ANSI Ceramic Tile Standard: Provide Standard grade tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

B. See Finish Schedule for tile for types of tile.
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product not limited to the following:

a. American Olean; Division of Dal-Tile International Inc.
b. Crossville, Inc.
c. Daltile; Division of Dal-Tile International Inc.
d. Interceramic.
e. Lone Star Ceramics Company.
f. Portobello America, Inc.
g. Seneca Tiles, Inc. Summitville Tiles, Inc.

h. United States Ceramic Tile Company.
i. Summitville Tiles, Inc.
j.

2.2 THRESHOLDS

A. Metal Thresholds as detail on the drawings.

2.3 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 or ASTM C 1325.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. C-Cure; C-Cure Board 990.
b. Custom Building Products; Wonderboard.
c. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
d. USG Corporation; DUROCK Cement Board.

2. Thickness: 5/8 inch.

2.4 SETTING MATERIALS

A. Dry-Set Portland Cement Mortar (Thin Set): ANSI A118.1.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Boiardi Products; a QEP company.
b. Bonsal American; an Oldcastle company.
c. Bostik, Inc.
d. C-Cure.
e. Custom Building Products.
f. Jamo Inc.
g. Laticrete International, Inc.
h. MAPEI Corporation.
i. Southern Grouts & Mortars, Inc.
j. Summitville Tiles, Inc.
k. TEC; a subsidiary of H. B. Fuller Company.

2. For wall applications, provide nonsagging mortar.

2.5 GROUT MATERIALS

A. Standard Cement Grout: ANSI A118.6.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Boiardi Products; a QEP company.
    b. Bonsal American; an Oldcastle company.
    c. Bostik, Inc.
    d. C-Cure.
    e. Custom Building Products.
    f. Jamo Inc.
    g. Laticrete International, Inc.
    h. MAPEI Corporation.
    i. Southern Grouts & Mortars, Inc.
    j. Summitville Tiles, Inc.
    k. TEC; a subsidiary of H. B. Fuller Company.

2.6 ELASTOMERIC SEALANTS

A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Division 7 Section "Joint Sealants."

B. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. DAP Inc.; 100 percent Silicone Kitchen and Bath Sealant.
    b. Dow Corning Corporation; Dow Corning 786.
    c. GE Silicones, a division of GE Specialty Materials; Sanitary 1700.
    d. Laticrete International, Inc.; Latasil Tile & Stone Sealant.
    e. Pecora Corporation; Pecora 898 Sanitary Silicone Sealant.
    f. Tremco Incorporated; Tremsil 600 White.

2.7 MISCELLANEOUS MATERIALS

A. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints and that does not change color or appearance of grout.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Bonsal American, an Oldcastle company; Grout Sealer.
    b. Custom Building Products; Grout Sealer.
    c. Southern Grouts & Mortars, Inc.; Silicone Grout Sealer.

d. TEC, a subsidiary of H. B. Fuller Company; TA-256 Penetrating Silicone TA-257 Silicone Grout Sealer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives or thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Blending: For tile exhibiting color variations, use factory blended tile or blend tiles at Project site before installing.

3.3 INSTALLATION

A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

E. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

1. Glazed Tile: 1/16 inch.

F. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

G. Grout Sealer: Apply grout sealer to grout joints according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

H. Install cementitious backer units and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use latex-portland cement mortar for bonding material unless otherwise directed in manufacturer's written instructions.

3.4 INTERIOR TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor:

1. Tile Installation F113: Thin-set mortar; TCA F113.

a. Tile Type: per finish schedule
b. Thin-Set Mortar: Dry-set portland cement mortar.
c. Grout: Standard sanded cement grout.

B. Interior Wall Installations, Metal Studs or Furring:

1. Tile Installation W244: Thin-set mortar on cementitious backer units; TCA W244.

a. Tile Type: per finish schedule.
b. Thin-Set Mortar: Dry-set portland cement mortar.
c. Grout: Standard sanded cement grout.

END OF SECTION 09310

SECTION 09912 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes surface preparation and the application of paint systems on the following interior substrates:
   1. Gypsum board.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For each finish and for each color and texture required.

C. Product List: Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

1.3 QUALITY ASSURANCE

A. MPI Standards:

   1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
   2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

1.4 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

   1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. of each material and color applied.

PART 2 - PRODUCTS

2.1 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Colors: As selected by Architect from manufacturer's full range.

2.2 PRIMERS/SEALERS

A. Interior Latex Primer/Sealer: MPI #50.

2.3 LATEX PAINTS

A. Interior Latex (Low Sheen): MPI #44 (Gloss Level 2).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
1. Gypsum Board: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION AND APPLICATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

C. Apply paints to produce surface films without cloudiness, flashing, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

D. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

E. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.3 INTERIOR PAINTING SCHEDULE

A. Gypsum Board Substrates: see the finish schedule on the drawings

1. Latex System: MPI INT 9.2A.

a. Prime Coat: Interior latex primer/sealer matching topcoat.
b. Intermediate Coat: Interior latex matching topcoat.
c. Topcoat: Interior latex (low sheen).

END OF SECTION 09912END OF SECTION 09912

SECTION 09960 - HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes surface preparation and application of high-performance coating systems for the exterior steel of the CANOPY, AWNING and TRELLIS.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of finish-coat product indicated.

C. Product List: For each product indicated. Cross-reference products to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules.

1.3 QUALITY ASSURANCE

A. Master Painters Institute (MPI) Standards:

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and coating systems indicated.

B. Mockups: Apply benchmark samples of each coating system indicated to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each type of coating and substrate.
   a. Columns, Beams and Deck: Architect will designate items or areas required.
2. Final approval of color selections will be based on benchmark samples.

   a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

PART 2 - PRODUCTS

2.1 HIGH-PERFORMANCE COATINGS, GENERAL

A. Material Compatibility:

1. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. Provide products of same manufacturer for each coat in a coating system.

B. Colors: As indicated in color schedule – see drawing sheet AE2-01.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
2. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
3. Coating application indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Remove plates, machined surfaces, and similar items already in place that are not to be coated. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and coating.

1. After completing coating operations, reinstall items that were removed; use workers skilled in the trades involved.

C. Clean substrates of substances that could impair bond of coatings, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers as required to produce coating systems indicated.

D. Steel Substrates: Remove rust and loose mill scale using methods recommended in writing by coating manufacturer.

E. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings.

3.3 APPLICATION

A. Apply high-performance coatings according to manufacturer's written instructions.

1. Use applicators and techniques suited for coating and substrate indicated.
2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Coat back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.

D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.5 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. Steel Substrates:

1. High-Build Epoxy Coating System:

   a. Prime Coat: Cold-curing epoxy primer.
   b. Intermediate Coat: High-build epoxy marine coating.
   c. Topcoat: Epoxy, cold-cured.
   d. Clear coat.

B. Galvanized-Metal Substrates:

1. Epoxy Coating System:

a. Prime Coat: Cold-curing epoxy primer.
b. Intermediate Coat: Epoxy, cold-cured..
c. Topcoat: Epoxy, cold-cured.
d. Clear coat.

END OF SECTION 09960END OF SECTION 09960

SECTION 10505 - METAL LOCKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Standard metal lockers.
2. Locker benches.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For metal lockers. Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For units with factory-applied color finishes.

D. Maintenance data.

E. Warranty: Sample of special warranty.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Where metal lockers and benches are indicated to comply with accessibility requirements, comply with the "Americans with Disabilities Act (ADA) ICC/ANSI A117.1.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver [**master and control keys**] [**combination control charts**] to Owner by registered mail or overnight package service.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B, suitable for exposed applications.

B. Extruded Aluminum: ASTM B 221, alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated.

C. Steel Tube: ASTM A 500, cold rolled.

D. Laminated clear hardwood.

E. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.

F. Anchors: Material, type, and size required for secure anchorage to each substrate.

1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls, and elsewhere as indicated, for corrosion resistance.
2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

2.2 STANDARD METAL LOCKERS

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include the following:
1. HSS Industries, Incorporated, Traverse City, MI (800) 330-9701
2. Lyon Metal Products, Incorporated.
3. Medart, Incorporated.
4. Penco Products, Incorporated, Oaks, PA (610) 666-0500
5. Republic Storage Systems Company, Canton, OH (800) 477-1255.

B. Locker Arrangement: Double tier.

C. Material: Cold-rolled steel sheet.

D. Body and Shelves: Assembled by riveting or bolting body components together. Fabricate from unperforated 0.024-inch nominal-thickness steel sheet.

E. Frames: Channel formed; fabricated from 0.060-inch nominal-thickness steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral door strike full height on vertical main frames.

F. Doors: One piece; fabricated from 0.060-inch nominal-thickness steel sheet; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges.
1. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than 15 inches wide; welded to inner face of doors.

2. Stiffeners: Manufacturer's standard full-height stiffener fabricated from 0.048-inch nominal-thickness steel sheet; welded to inner face of doors.

G. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.
1. Continuous Hinges: Manufacturer's standard, steel, full height.

H. Projecting Door Handle and Latch: Finger-lift latch control designed for use with either built-in combination locks or padlocks; positive automatic latching, chromium plated; pry and vandal resistant.

1. Latch Hooks: Equip doors less than 48 inches high with two latch hooks; fabricated from 0.105-inch nominal-thickness steel sheet; welded or riveted to full-height door strikes; with resilient silencer on each latch hook.
2. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact, and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.

I. Combination Padlocks: Key-controlled, three-number dialing combination locks; capable of five combination changes.
1.].

J. Equipment: Equip each metal locker with identification plate and the following unless otherwise indicated:
1. Double-Tier Units: One double-prong ceiling hook and two single-prong wall hooks.

K. Accessories:

a. Closed Front and End Bases: Fabricated from 0.036-inch nominal-thickness steel sheet.

2. Individual Sloping Tops: Fabricated from 0.024-inch nominal-thickness steel sheet.
3. Recess Trim: Fabricated from 0.048-inch nominal-thickness steel sheet.
4. Filler Panels: Fabricated from manufacturer's standard thickness, but not less than 0.036-inch nominal-thickness steel sheet.
5. Finished End Panels: Fabricated from 0.024-inch nominal-thickness steel sheet.

L. Finish: Baked enamel or powder coat.

1. Color(s): As selected by Architect from manufacturer's full range.

2.3 LOCKER BENCHES

A. Provide bench units with overall assembly height of 17-1/2 inches.

B. Bench Tops: Manufacturer's standard one-piece units, with rounded corners and edges.

1. Size: 12” wide X 30” long.

2. Laminated clear hardwood with one coat of clear sealer on all surfaces and one coat of clear lacquer on top and sides.

C. Fixed Pedestals: Manufacturer's standard supports, with predrilled fastener holes for attaching bench top and anchoring to floor, complete with fasteners and anchors, and as follows:

1. Tubular Steel: 1-1/2-inch- diameter steel tubing threaded on both ends, with standard pipe flange at top and bell-shaped cast-iron base; with baked-enamel or powder-coat finish; anchored with exposed fasteners.

a. Color: As selected by Architect from manufacturer's full range.

2.4 FABRICATION

A. Fabricate metal lockers square, rigid, and without warp and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.

1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.

B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments. Factory weld frame members of each metal locker together to form a rigid, one-piece assembly.

C. All-Welded Construction: Factory preassemble metal lockers by welding all joints, seams, and connections; with no bolts, nuts, screws, or rivets used in assembly of main locker groups. Factory weld main locker groups into one-piece structures. Grind exposed welds flush.

D. Accessible Lockers: Fabricate as follows:
1. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches above the floor.

E. Hooks: Manufacturer's standard ball-pointed type, aluminum or steel; zinc plated.

F. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers at least 3/8 inch high.

G. Continuous Base: Formed into channel profile for stiffness, and fabricated in lengths as long as practical to enclose base and base ends of metal lockers; finished to match lockers.

H. Recess Trim: Fabricated with minimum 2-1/2-inch face width and in lengths as long as practical; finished to match lockers.

I. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.

J. Finished End Panels: Designed for concealing unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of nonrecessed metal lockers; finished to match lockers.

2.5 STEEL SHEET FINISHES

A. Baked-Enamel Finish: Immediately after cleaning, pretreating, and phosphatizing, apply manufacturer's standard thermosetting baked-enamel finish. Comply with paint manufacturer's written instructions for application, baking, and minimum dry film thickness.

B. Powder-Coat Finish: Immediately after cleaning and pretreating, electrostatically apply manufacturer's standard, baked-polymer, thermosetting powder finish. Comply with resin manufacturer's written instructions for application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install level, plumb, and true; shim as required, using concealed shims.

1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion. Bolt to CMU wall to prevent tipping.

B. All-Welded Metal Lockers: Connect groups together with standard fasteners, with no exposed fasteners on face frames.

C. Equipment and Accessories: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.

1. Attach hooks with at least two fasteners.
2. Attach door locks on doors using security-type fasteners.
3. Identification Plates: Identify metal lockers with numbers.

   a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.

4. Attach recess trim to recessed metal lockers with concealed clips.
5. Attach finished end panels with fasteners only at perimeter to conceal exposed ends of nonrecessed metal lockers.

D. Fixed Locker Benches: Provide no fewer than two pedestals for each bench, uniformly spaced not more than 72 inches apart. Securely fasten tops of pedestals to undersides of bench tops, and anchor bases to floor.

E. Freestanding Locker Benches: Place benches in locations indicated on Drawings.

END OF SECTION 10505

SECTION 10522 - FIRE EXTINGUISHER CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes fire protection cabinets for fire extinguishers.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each exposed product and for each color and texture specified.

D. Maintenance data.

1.3 QUALITY ASSURANCE

A. Coordinate sizes and locations of fire protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

B. Transparent Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), 1.5 mm thick, with Finish 1 (smooth or polished).

2.2 FIRE PROTECTION CABINET

A. Cabinet Type: Suitable for fire extinguisher.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Fire End & Croker Corporation;.
b. J. L. Industries, Inc., a division of Activar Construction Products Group;.
c. Kidde Residential and Commercial Division, Subsidiary of Kidde plc;.
d. Larsen's Manufacturing Company;.
e. Modern Metal Products, Division of Technico Inc.;.

f. Moon-American;.
g. Potter Roemer LLC;.
h. Watrous Division, American Specialties, Inc.;.

B. Cabinet Construction: Nonrated.

C. Cabinet Material: Steel sheet.

D. Semirecessed Cabinet: Cabinet box partially recessed in walls of sufficient depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend). Provide where walls are of insufficient depth for recessed cabinets but are of sufficient depth to accommodate semirecessed cabinet installation.

1. Square-Edge Trim: 1-1/4- to 1-1/2-inch backbend depth.
2. Rolled-Edge Trim: 2-1/2-inch backbend depth.

E. Surface-Mounted Cabinet: Cabinet box fully exposed and mounted directly on wall with no trim. Provide where walls are of insufficient depth for semirecessed cabinet installation.

F. Cabinet Trim Material: Steel sheet.

G. Door Material: Steel sheet.

H. Door Style: Vertical duo panel with frame.

I. Door Glazing: Acrylic sheet.

1. Acrylic Sheet Color: Clear transparent acrylic sheet.

J. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

K. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect.

a. Identify fire extinguisher in fire protection cabinet with the words "FIRE EXTINGUISHER."

1) Location: Applied to cabinet door.
2) Application Process: Pressure-sensitive vinyl letters.
3) Lettering Color: Black.
4) Orientation: Vertical.

L. Finishes:

1. Manufacturer's standard baked-enamel paint for the following:

   a. Exterior of cabinet door, except for those surfaces indicated to receive another finish.
   b. Interior of cabinet.

2. Steel: Baked enamel or powder coat.

   a. Color and Gloss: As selected by Architect from manufacturer's full range.

2.3 FABRICATION

A. Fire Protection Cabinets: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Miter and weld joints and grind smooth.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine walls and partitions for suitable framing depth and blocking where semirecessed cabinets will be installed and prepare recesses as required by type and size of cabinet and trim style.

B. Install fire protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

C. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.

D. Identification: Apply vinyl lettering at locations indicated.

E. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

F. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 10522

SECTION 10523 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes portable, hand-carried fire extinguishers.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Operation and maintenance data.

C. Warranty: Sample of special warranty.

1.3 QUALITY ASSURANCE

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

C. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

1.4 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure of hydrostatic test according to NFPA 10.
b. Faulty operation of valves or release levers.

2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire protection cabinet indicated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Amerex Corporation.
    b. Ansul Incorporated; Tyco International Ltd.
    c. Badger Fire Protection; a Kidde company.
    d. Buckeye Fire Equipment Company.
    e. Fire End & Croker Corporation.
    f. J. L. Industries, Inc.; a division of Activar Construction Products Group.
    g. Kidde Residential and Commercial Division; Subsidiary of Kidde plc.
    h. Larsen's Manufacturing Company.
    i. Moon-American.
    j. Pem All Fire Extinguisher Corp.; a division of PEM Systems, Inc.
    k. Potter Roemer LLC.
    l. Pyro-Chem; Tyco Safety Products.

2. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.

B. Multipurpose Dry-Chemical Type: UL-rated, with monoammonium phosphate-based dry chemical in manufacturer's standard enameled container.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Install fire extinguishers in cabinet locations indicated and in compliance with requirements of authorities having jurisdiction.

END OF SECTION 10523

SECTION 10801 - TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Public-use washroom accessories.
2. Underlavatory guards.
3. Custodial accessories.

B. Owner-Furnished Material: Owner will supply and install all Public-Use Washroom Accessories except grab bars. General Contractor to coordinate and install blocking as required.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Schedule:

1. Identify locations using room designations indicated on Drawings.

PART 2 - PRODUCTS

2.1 PUBLIC-USE WASHROOM ACCESSORIES

A. Grab Bars:

1. Basis-of-Design Product: Bobrick, B-5806 series or equal by others.
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 18 Ga..

   a. Finish: Smooth, No. 4, satin finish.

4. Outside Diameter: 1-1/4 inches.
5. Configuration and Length: As indicated on Drawings.

2.2 UNDERLAVATORY GUARDS

A. Underlavatory Guard:

B. Basis-of-Design Product: TrueBro Lav Guard2 or equal by others.

1. Description: Insulating pipe covering for supply and drain piping assemblies, that prevent direct contact with and burns from piping, and allow service access without removing coverings.
2. Material and Finish: Antimicrobial, molded-plastic, white.

2.3 CUSTODIAL ACCESSORIES

A. Mop and Broom Holder with shelf:

1. Basis-of-Design Product: Bobrick B-224 or equal by others.
2. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.
3. Length: 36 inches.
4. Hooks: Three.
5. Mop/Broom Holders: Four, spring-loaded, rubber hat, cam type.
6. Material and Finish: Stainless steel, No. 4 finish (satin).

   a. Shelf: 18 Ga. stainless steel.
   b. Rod: Approximately 1/4-inch- diameter stainless steel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

END OF SECTION 10801

SECTION 11160 - LOADING DOCK EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Dock Scissor Lift.
2. Dock seals.

1.2 DEFINITIONS

A. Operating Range: Maximum amount of travel above and below the loading dock level.

B. Working Range: Recommended amount of travel above and below the loading dock level for which loading and unloading operations can take place.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For loading dock equipment. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

C. Samples: For each fabric and for each color and texture specified.

D. Welding certificates.

E. Product test reports.

F. Operation and maintenance data.

G. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3, "Structural Welding Code - Sheet Steel."

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of construction contiguous with loading dock equipment, including recessed pit dimensions slopes of driveways and heights of loading docks, by field measurements before fabrication.

1.6 WARRANTY

A. Special Warranty for Dock Levelers: Manufacturer's standard form in which manufacturer agrees to repair or replace dock-leveler components that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

   a. Structural failures including cracked or broken structural support members, load-bearing welds, and front and rear hinges.
   b. Faulty operation of operators, control system, or hardware.
   c. Deck plate failures including cracked plate or permanent deformation in excess of 1/4 inch between deck supports.
   d. Hydraulic system failures including failure of hydraulic seals and cylinders.

2. Warranty Period for Structural Assembly: 10 years from date of Substantial Completion.
3. Warranty Period for Hydraulic System: Five years from date of Substantial Completion.
4. Warranty shall be for unlimited usage of leveler for the specified rated capacity over the term of the warranty.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM 36/A 36M.

B. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from steel plate complying with ASTM A 572/A 572M, Grade 55.

C. Steel Tubing: ASTM A 500, cold formed.

D. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.2 HYDRAULIC DOCK SCISSOR LIFT

A. General: Recessed, Hydraulic Dock Scissor Lift designed for permanent installation in a concrete pit; of type, function, operation, capacity, size, and construction indicated; and complete with controls, safety devices, and accessories required.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Vestil Manufacturing Company, Model HWL–100-8-710 Hydraulic Dock Scissor Lift pit mounted or comparable product by others. General Contractor note coordinate pit size with actual lift used. **Note**: because of the unique location of scissor lift - the bridge distance to truck bed, bollard and seal geometry shall be closely coordinated by the General Contractor and dock equipment manufactures to ensure successful unloading of Owner's trucks.

B. Rated Capacity: Capable of supporting total gross load of 8000 LBS. without permanent deflection or distortion.

C. Platform: Not less than 1/4-inch- thick, nonskid galvanized steel checker plate.

1. Platform Size: 84" X 120".
2. Frame: Manufacturer's standard.
3. Toe Guards: Manufacturer's beveled standard. Include electric toe guard.

D. Function: Scissor Lift shall compensate for differences in height between truck bed and floor slab

1. Vertical Travel: Operating range:

a. Above floor slab: 60 inches, as indicated on Drawings.
b. Below floor slab: flush with slab, as indicated on Drawings. Remaing 10" folded assemble to be fully contained in a concrete pit sloped to drain.

E. Hydraulic Operating System: Electric control from a hard wired remote-control station located on drawings; fully hydraulic operation. Electric-powered (24 VAC) hydraulic raising and hydraulic lowering of lift. Equip lift with a packaged unit including a unitized, totally enclosed, nonventilated electric motor, (6 ½ HP) pump, manifold reservoir, and valve assembly of proper size, type, and operation for capacity of lift indicated. Provide a hydraulic velocity fuse connected to main hydraulic cylinder to limit loaded ramp's free fall to not more than 3 inches.

1. Locate pump unit per plans. Provide adequate length of hydraulic hose for indicated installation. Note sleeve location.
2. Locate Electrical control station per plans. Provide adequate length of electrical control cord for indicated installation.

F. Construction: Fabricate lift frame, platform supports, and lip supports from galvanized structural- or galvanized formed-steel shapes. Weld platform to supports. Shim supports with steel shims to compensate for slope of pit. Fabricate entire assembly to withstand deformation during both operating and stored phases of service.

G. Accessories:

1. Curb Angles: 3-by-3-by-1/4-inch galvanized-steel curb angles for edge of recessed lift pit, with 1/2-inch- diameter by 6-inch- long concrete anchors welded to angle at 6 inches o.c. Supplied and installed by General Contractor.
2. Controll lockout key switch.
3. Galvanized split steel bridge sized to span to truck bed. Approximately 18” clear span with an additional 6” to lap on to truck bed. See drawings. Field verify prior to shipping. Provide bridge with side run-off guards and lift chains.
4. Safety chains guards for both open ends of lift.
5. Warning beeper during travel.
6. Warning strobe during travel.
7. Wall mounted, hard wired electric control station.

H. Finish: Hot-dip galvanize and painted assembly.

1. Toe Guards: galvanized and paint with yellow and black diagonal stripping

2. Handrails: galvanized and paint yellow.

3. Frame: galvanized and painted black.

4. Chain guards: galvanized and paint yellow.

5. Platform: galvanized, non-skid, steel, checker plate.

6. Bridge: galvanized, non-skid, steel, checker plate.

2.3 FOAM-PAD DOCK SEALS

A. General: Dock seals consisting of fabric-covered foam pads designed to compress 4 to 5 inches under pressure of truck body to form an airtight seal at jambs and head of loading dock openings; of type, size, and construction indicated.

1. Basis-of-Design Product: Kelley VS or comparable product by one of the following: **Note**: because of the unique location of scissor lift and bridge distance to truck bed, Kelley VS was selected as the basis-of design to allow for the closest approach of truck to lift. Lift, bollard and seal geometry shall be closely coordinated by the General Contractor and dock equipment manufactures to ensure successful unloading of Owner’s trucks.

   a. Beacon Industries, Inc.
   b. Blue Giant Equipment Corporation.
   c. Chalfant Dock Equipment.
   d. DLM, Inc.
   e. Ellis Industries, Inc.
   f. Fairborn U.S.A., Inc.
   g. Flexon, Inc.
   h. Hugger Dock Equipment Company; Division of Columbus Foam Products, Inc.
   i. McGuire, W. B. Co., Inc.; Division of Overhead Door Corporation.
   j. Nordock Inc.
   k. NOVA Technology International, L.L.C.
   l. Pentalift Equipment Corporation.

m. Pioneer Loading Dock Equipment.
n. Rite-Hite Corporation.
o. Rotary Products Inc.
p. SPX Dock Products - Kelley.
q. SPX Dock Products - Serco.
r. Super Seal Mfg. Ltd.
s. Vestil Manufacturing Company.

B. Stationary Head Pad: 12 inches high and same depth as jamb pads; sized for opening width.

C. Jamb Pads: V-beveled.

1. Nominal Size: As indicated on Drawings wide and sized for opening height.

D. Construction: Consisting of single- or double-ply, coated, fabric-covered, urethane-foam core with supporting frame. Fabricate jamb and head pads of same depth and sized for opening width.
1. Steel Support Frame: Galvanized steel channel frame of manufacturer's standard weight, shape, and finish; with steel mounting hardware.
2. Cover Fabric: Kelley’sTS-55 Super Fabric or equal by others.

a. Color: As selected by Architect from manufacturer's full range.

3. Guide Strips: second layer of Kelley’sTS-55 Super Fabric or equal by others

2.4 STEEL FINISHES

A. Galvanizing: Hot-dip galvanize components as indicated to comply with the following:

1. ASTM A 123/A 123M for iron and steel loading dock equipment.
2. ASTM A 153/A 153M or ASTM F 2329 for iron and steel hardware for loading dock equipment.

B. Galvanized-Steel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat in manufacturer's standard color.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine roughing-in for electrical systems for loading dock equipment to verify actual locations of connections before equipment installation.

B. Examine walls and floors of pits for suitable conditions where recessed loading dock equipment is to be installed. Pits shall be plumb and square and properly sloped for drainage per drawings

C. Set curb angles in concrete edges of lift pit with tops flush with loading platform. Fit exposed connections together to form hairline joints.

D. Install loading dock equipment, including motors pumps control stations wiring safety devices light-communication systems and accessories as required for a complete installation.

1. Rough-in electrical connections according to requirements specified in Division 16 Sections.

E. Hydraulic dock scissors lift: Attach lift securely into pit, flush with adjacent loading dock surfaces and square to recessed pit.

F. Dock Seals: Attach dock-seal support frames securely to building structure in proper relation to openings, dock bollards, and scissor lift to ensure compression of dock seals when trucks are positioned against dock bollards.

G. Adjust loading dock equipment to function smoothly and safely, and lubricate as recommended by manufacturer.

H. Test scissor lift for vertical travel within operating range indicated.

3.2 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain loading dock equipment.

END OF SECTION 11160

SECTION 15010 - BASIC MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Basic requirements common to the work in general of Division 15 and other Divisions and Sections of the Specification where referenced.

B. Provide, unless specified otherwise, all labor, materials and equipment necessary for completely finished and operational mechanical systems described and specified under other Sections of this Division 15.

C. Provide all minor incidental items such as offsets, fittings, and accessories required as part of the work even though not specified or indicated.

D. Inspection: Inspect work preceding or interfacing with work of Division 15 and report any known or observed defects that affect the Work to the Construction Manager/General Contractor. Do not proceed with the work until defects are corrected.

E. Existing Utilities: Are indicated as accurately as possible on the Drawings. Close openings and repair damage in acceptable manner to utilities encountered. This Contractor shall be responsible for field surveying all aspects of existing conditions prior to bid date. Change orders will not be issued for a failure to review existing conditions which affect division 15000 work.

1.2 RELATED WORK

A. Requirements: Provide Basic Requirements in accordance with the Contract Documents.

1.3 UTILITIES, EXTENSIONS, CONNECTIONS AND FEES FOR WATER AND SEWER

A. Provide all building services extensions and connections to off-site and on-site utilities.

B. Sewer connection charges, typically based on fixture units, that in principle allow the right to obtain the sewer services from the utility will be arranged and paid for by the Division 15 Contractor.

C. Water system development fees, typically based on meter size, that in principle allow the right to obtain the water services from the utility will be arranged and paid for by the Site Utilities Contractor.

D. Sewer tap fees as they are known to the trade and are the charges for actual materials and labor for tapping, inspection and recording of the tap shall be arranged and paid for by the Site Utilities Contractor.

E. Water tap fees as they are known to the trade and are the charges for actual materials and labor for tapping, inspection and recording of the tap shall be arranged and paid for by the Site Utilities Contractor.

F. In the event that the serving utility company installs their own taps, service, meters, etc., all costs imposed by this action shall be paid for by the Division 15 Contractor. Extensions from termination points to connection with building services and systems will be the responsibility of the Division 15 Contractor.

G. Be responsible for all pads, vaults, manholes, manhole covers, meter enclosures, valves, services boxes, and the like, all in conformance with requirements of the serving utility company.

H. In the event that the water service to the building is a combination domestic and fire protection service, the responsibility of said "combination service" to the point of domestic connection shall be that of a licensed Fire Protection Contractor, including tap, valves, excavation, backfill, compaction and meters, if any. After point of domestic connection, responsibility for separate fire and domestic services is with appropriate trades including all labor and materials as herein before mentioned.

1. Contractor shall coordinate with other trades all interface piping and types of connections to be provided for interface.
2. Provide fire hydrant, auxiliary gate valve, tapping sleeve and valve or tee, service boxes, and anchor or swivel couplings, thrust blocks, deadmen, rods, and the like, all in conformance with the requirements of serving utility company.

1.4 REFERENCES

A. General:

1. For products or workmanship specified by association, trade, or Federal Standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
2. The date of the standard is that in effect at the date of the Contract Documents, except when a specific date is specified.
3. When required by individual Specifications section, obtain copy of standard. Maintain copy at job site during work until substantial completion.

B. Schedule of Referenced Organizations: The following is a list of the acronyms of organizations referenced in these Specifications:

ADC	Air Diffusion Council 1000 E. Woodfield Rd. Schaumburg, IL 60173 www.flexibleduct.org

AGA	American Gas Association 400 No. Capitol St. N.W. Washington, DC 20001 www.aga.org
AMCA	Air Movement and Control Association 30 West University Drive Arlington Heights, IL 60004 www.amca.org
ANSI	American National Standards Institute 1819 L Street N.W. Washington, DC 20036 www.ansi.org
ARI	Air Conditioning and Refrigeration Institute 4301 No. Fairfax Drive. Arlington, VA 22203 www.ari.org
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers 1791 Tullie Circle, N.E. Atlanta, GA 30329 www.ashrae.org
ASME	American Society of Mechanical Engineers Three Park Avenue New York, NY 10016 www.asme.org
ASPE	American Society of Plumbing Engineers 8614 W. Catalpa Ave. Chicago, IL 60656 www.aspe.org
ASSE	American Society of Sanitary Engineering 901 Canterbury Westlake, OH 44145 www.asse-plumbing.org
ASTM	American Society for Testing and Materials 100 Barr Harbor Dr. West Conshohoeken, PA 19428 www.astm.org

AWS	American Welding Society 550 N.W. LeJeune Rd. Miami, FL 33126 www.aws.org
AWWA	American Water Works Association 6666 West Quincy Avenue Denver, CO 80235 www.awwa.org
CDA	Copper Development Association 260 Madison Avenue New York, NY 10016 www.copper.org
CISPI	Cast Iron Soil Pipe Institute 5959 Shallow Ford Rd., Suite 419 Chattanooga, TN 37421 www.cispi.org
CS	Commercial Standard of NBS (U.S. Dept. of Commerce, National Institute of Standards and Technology) Government Printing Office Washington, D.C. 20402
CTI	Cooling Technology Institute 530 Wells Fargo Drive Houston, TX 77090 www.cti.org
ICC	International Code Council 5203 Leesburg Pike, Suite 600 Falls Church, VA 22041 www.intlcode.org
IAPMO	International Association of Plumbing and Mechanical Officials 20001 E. Walnut Drive South Walnut, CA 91789 www.iapmo.org
NEBB	National Environmental Balancing Bureau 8575 Grovemont Circle Gaithersburg, MD 20877 www.nebb.org
NEC	National Electric Code (of NFPA)

NEMA	National Electric Manufacturer's Association 1300 N. 17th Street Rosslyn, VA 22209 www.nema.org
NFPA	National Fire Protection Association One Batterymarch Park P.O. Box 9101 Quincey, MA 02269 www.nfpa.org
NSF	NSF International 789 No. Dixboro Rd. Ann Arbor, MI 48113 www.nsf.gov
OSHA	Occupational Safety Health Administration (U.S. Dept. of Labor) Government Printing Office Washington, D.C. 20402 www.osha.gov
PDI	Plumbing and Drainage Institute 45 Brystal Drive South Easton, MA 02375 www.pdionline.org
SMACNA	Sheet Metal and Air Conditioning Contractor's National Association 4201 Lafayette Center Drive Chantilly, VA 20151 www.smacna.org
UL	Underwriters Laboratories, Inc. 333 Pfingston Rd. Northbrook, IL 60062 www.ul.com

1.5 DEFINITIONS

A. Specification Language Explanation: These Specifications are of abbreviated, simplified or streamlined type and include incomplete sentences. Omissions of words of phrases such as "the Contractor shall", "in conformity therewith", "shall be", "as noted on the drawings", "a", "the", are intentional. Supply when "NOTE" occurs on Drawings. Supply words "shall be" or "shall" by inference when colon is used with sentences or phrases. Supply words "on the Drawings" by inference when "as indicated" is used with sentences or phrases. Singular words will be interpreted as plural and plural words will

be interpreted as singular where applicable and where full context of the Contract Documents so indicates.

B. Furnish: Except as otherwise defined in greater detail, term "furnish" is used to mean supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, etc., as applicable in each instance.

C. Install: Except as otherwise defined in greater detail, term "install" is used to describe operations at Project site including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations, as applicable in each instance.

D. Provide: Except as otherwise defined in greater detail, term "provide" means furnish and install, complete and ready for intended use, as applicable in each instance.

E. Indicated: The term "Indicated" is a cross-reference to graphics, notes or schedules on Drawings, to other paragraphs or schedules in the Specifications, and to similar means of recording requirements in contract documents. Where terms such as "shown", "noted", "scheduled", and "specified" are used in lieu of "indicated", it is for purpose of helping reader locate cross-reference, and no limitation of location is intended except as specifically noted.

F. General Contractor: The term "General Contractor" used in Division 15 and elsewhere in the Contract Documents means the party with whom the Owner has executed the Owner-Contractor Agreement.

G. Approved Equal: Except as otherwise defined in greater detail, term "approved equal" means that any materials, equipment, work procedures and techniques shall be either addressed on the drawing, specifications or addendum by manufacturer or by detailed material description. When brand names are referenced it implies that only the manufacturers listed are approved. All approved material, equipment, work procedures, and techniques will be noted in the specifications, drawings, or by addendum prior to bid date. Items not approved in this manner will not be considered.

1.6 QUALITY ASSURANCE

A. Quality Control:

1. Materials and apparatus required for the work to be new and of first-class quality; to be furnished, delivered, erected, connected and finished in every detail; and to be so selected and arranged so as to fit properly into the building spaces. Where no specific kind or quality of material is given, a first-class standard article shall be furnished.
2. Furnish the services of an experienced superintendent, who will be constantly in charge of the installation of the work, together with all skilled workmen, fitters, metal workers, certified welders, plumbers, millwrights, sprinkler fitters, drain layers, helpers, and labor required to unload, transfer, erect, connect, adjust, start, operate and test for each system.

3. Unless otherwise specifically indicated, equipment and materials to be installed in accordance with the recommendations of the manufacturer. This includes the performance of tests as recommended by the manufacturer.

B. Proof of Performance:

1. Division 15 Contractor shall provide proof of performance certification of all Mechanical Equipment and Systems to demonstrate that all Mechanical Equipment and Systems are operating to the intent of the design. This proof of performance shall include, but shall not be limited to, actual demonstration of all temperature/pressure control loops, operation of all heating/cooling equipment and other required tests upon request by the Engineer or Owner. A signed certificate from the piping, sheet metal, control, and balancing subcontractors stating that they have personally checked the operation of all equipment and control loops and that everything under their subcontract is operating as specified. These certificates shall be furnished to the 15990 Contractor for inclusion in the Operation and Maintenance Manual.

1.7 REGULATORY REQUIREMENTS

A. Execute work per Underwriters, Public Utility, Local and State Codes, Ordinances and applicable regulations. Obtain and pay for required permits, inspections, and certificates. Notify Architect of items not meeting said requirements.

B. Comply with editions of all applicable codes, ordinances and regulations in effect at the time of bid opening including but not necessarily limited to the following:

International Mechanical Code
International Plumbing Code
International Fuel Gas Code
State Department of Health Requirements
State Energy Code
National Fire Protection Association Standards
International Fire Code
International Building Code
National Electrical Code NFPA-70
State Boiler Code
Jurisdictional County Health Department
Jurisdictional City Wastewater Management Division or District
Jurisdictional City Water Department
Jurisdictional Water Conservation Standards

C. If discrepancies occur between the Contract Documents and any applicable codes, ordinances, acts, or standards, the most stringent requirements shall apply.

D. Where hourly fire ratings are indicated or required, provide components and assemblies meeting requirements of the IBC, and listed by Underwriters Laboratories, Inc.

1.8 SUBMITTALS

A. Contractors are required to submit Mechanical Cost Breakdown to Engineer when submitting shop drawings. Shop drawings will not be accepted without a complete Mechanical Cost Breakdown. See last page of this Section for requested breakdown. If your standard compilation of bids is different than our requested breakdown, please send it in your format. We need the data to keep our cost estimating files up to date. Just fill-in blanks with a pencil, typing is not required.

B. Submit Samples, Shop Drawings and Product Data as required by various Sections of Division 15 in accordance with The General Conditions of the Contract. The Contractor agrees that these Submittals processed by the Engineer are not Change Orders; that the purpose of these Submittals by the Contractor is to demonstrate to the Engineer that the Contractor understands the design concept, that he demonstrates his understanding by indicating which equipment and material he intends to furnish and install and by detailing the fabrication and installation methods he intends to use. Contractor further agrees that if deviations, discrepancies, or conflicts between these Submittals and the Contract Documents in the form of design drawings and specifications are discovered either prior to or after these Submittals are processed by the Engineer, the Design Drawings and Specifications shall control and shall be followed.

C. The submittals shall be submitted in a single package with all mechanical equipment for the project enclosed. The submittals shall be enclosed in a stiff back, 3-ring binder. All mechanical equipment shall be separated with tabbed index cards with an indexed legend provided in the front of the binder.

D. Test Reports: Submit certified test reports as required by various Sections of Division 15 showing compliance in accordance with General Conditions of the Contract. Signed copies shall be included in the Operation and Maintenance Manual.

E. Operating Instructions and Maintenance Data: Prepare and submit printed operating instructions and maintenance data in accordance with Operating and Maintenance Data paragraph in this Section.

F. Submittals will be reviewed and marked as follows:

1. No Exceptions Taken: No action required.
2. Make Corrections Noted: Correct the submittals per notes by engineer and submit new copies of submittal to contractor for project records. Do not resubmit to engineer.
3. Rejected: Equipment as submitted does not meet requirements of contract documents. Revise and/or clarify per comments and resubmit to engineer.
4. Submittal not Requested: Submittal not required per specification. Submittal returned with no review.

G. Note that the submittal review process doe not relieve Contractor from being ultimately responsible for ensuring that submitted items satisfy all requirements of the Contract Documents.

1.9 PRODUCT OPTIONS AND SUBSTITUTIONS

A. Substitutions and Prior Approvals: Substitutions and prior approvals will be acceptable only when the proposed substitute has been submitted to the Engineer and approved through an addendum or change order. Request for prior approval shall be submitted a minimum of 10 calendar days prior to bid.

B. Some materials and equipment are specified by manufacturer and catalog numbers. The manufacturer and catalog numbers are used to establish a degree of quality and style for such equipment and material.

C. NOTE: When alternate or substitute materials and equipment are used Division 15 Contractor shall be responsible for engineering/redesign costs, space requirements, configurations, performance, changes in bases, supports, structural members and openings in structure, electrical changes and other apparatus and trades that may be affected by their use. Notification of General Contractor and other affected subcontractors shall be the responsibility of the Division 15 Contractor.

1.10 PROJECT RECORD DOCUMENTS

A. General: Comply with Division 1.

B. Job Site Documents: Maintain at the job site, one record copy of the following:

1. Drawings
2. Specifications
3. Addenda
4. Reviewed Shop Drawings
5. Field Test Records

Do not use record documents for construction purposes. Maintain documents in clean, dry legible condition, apart from documents used for construction.

C. Record Information: Label each document "Record Document". Mark information with red ink. Keep each record current. Do not permanently conceal any work until required information is recorded.

D. Record following information on Drawings:

1. Horizontal and vertical location of underground utilities to be dimensioned from column lines.
2. Dimensioned location of internal utilities and appurtenances concealed in construction.
3. Field changes of dimension and detail.
4. Changes by change order or field order.
5. Details not on original contract drawings.
6. Manufacturer, trade name, catalog number and supplier of each product and item of equipment actually installed shall be indicated on equipment schedules.

E. Record the following information on Specifications:

1. Changes by change order or field order.
2. Other matters not originally specified.

F. Shop Drawings: Maintain shop drawings as record documents recording changes made after review as specified for drawings above.

G. Submittal: At completion of project, deliver record documents to Owner's representative and transmit a copy of signed receipt from Owner to the Engineer.

1.11 OPERATING AND MAINTENANCE DATA

A. Division 15 Contractor shall submit five (5) typed and bound copies of the maintenance manual, 8-1/2" x 11" in size, to the Mechanical Consulting Engineer for approval. These approved copies will be returned to the Contractor and shall then be transmitted to the Owner.

B. Organization of the manuals shall follow the recommendations in ASHRAE Guideline 4-1993.

C. The manual shall be enclosed in a stiff-back, three-ring binder and shall have:

1. Alphabetical list of all system components including the name, address, and 24-hour phone number of the company responsible for servicing each item during the first year's operation.
2. Operating instructions for complete system, including emergency procedures for fire or failure of major equipment and procedures for normal starting/operating/shutdown and long-term shutdown. Note that these instructions are for entire systems. Simply providing manufacturer’s shutdown procedures for individual components is unacceptable.
3. Maintenance instructions, including valves, valve tag and other identified equipment lists, proper lubricants and lubricating instructions for each piece of equipment and necessary cleaning/replacing/adjusting schedules.
4. All test reports and proof of performance certificates.
5. Manufacturer's data on each piece of equipment, including the following. Provide original printed material in each book, faxes and photocopies are NOT acceptable.

    a. Installation instructions.
    b. Drawings and specifications (final shop drawings).
    c. Parts lists.
    d. Complete "as-built" wiring and temperature control diagrams. (Shop drawings are not acceptable.)
    e. Lubrication and other preventative maintenance data.
    f. Equipment warranties.

D. In addition to the maintenance manual, and keyed to it, the equipment shall be identified and tagged as specified on drawings. Insert a copy of the Equipment List or Equipment Schedules in manual.

1. Identify all starters, disconnect switches, and manually operated controls, except integral equipment switches. Label with permanently applied, legible markers corresponding to operating instructions in the "Maintenance Manual".
2. Tag all manual operating valves per requirements in Section 15050.
3. Provide a typed tag list or schedule laminated or mounted under plexiglass in the equipment room stating number, location, and function of each tagged item. Insert a copy of tag list in each "Maintenance Manual".
4. Provide a reduced scale drawing of each floor indicating the location of each manual and automatic valve in every HVAC and plumbing piping system and include valve position number and normal valve position (normally open/normally closed) as per Specification Section 15050. Mount all drawings under plexiglass or laminate and mount on equipment room wall.

1.12 OPERATING AND MAINTENANCE MANUALS

A. The "Operating and Maintenance Manual" (O & M) is a bound compilation of descriptive drawings and data which identify equipment installed at the project site and detail the procedures and parts required to maintain and repair the equipment. Copies of approved submittals shall be included for all equipment items.

B. Five sets will be required for each project. These are to be submitted for approval to the Project Manager.

C. All data and instruction sheets shall be marked to indicate the plan symbol, model, number, and options installed for each item of equipment furnished and installed. These data sheets shall either be reviewed and approved submittals or shall be accompanied by such.

D. The serial numbers of each item of equipment installed are to be listed with the model numbers and plan symbols.

E. Pages are to be standard 8-1/2" x 11" sheets, or 11" x 17" folded to fit the 8-1/2" x 11" sizes.

F. Additionally, the following information is to be included:

1. A complete parts list(s) and source of supply for each piece of equipment, marked with model, size, and plan symbol.
2. A copy of the approved submittals for each piece of equipment.
3. The balance report.
4. Performance curves and capacity data, marked with model & size and plan symbol.
5. Wiring diagrams, marked with model and size and plan symbol.

G. Enclose the material in rigid 3-ring binders and submit to the Project Manager at the completion of the project. Binders shall be Buckram binders or prior approved equal with block lettering. Sheet size shall be 8-1/2" x 11" with expandable metal capacity as required for the project. The number of binders forming one O & M Manual shall be based on a maximum limit of 4 inches.

H. The following information shall appear on the front cover and backbone:

1. "Operation and Maintenance Manual"
2. Project Name (and volume number if more than one volume)
3. DFCM Project number
4. Building name, number, and street address
5. “DFCM”
6. * Architect's name
7. * Engineer's name
8. * General Contractor's name
9. * Mechanical Contractor's name

* Items "6" through "9" need not be printed on the backbone.

I. Include a Table of Contents and tabbed index dividers.

1.13 DELIVERY, STORAGE AND HANDLING

A. General: Deliver and store materials and equipment in manufacturer's unopened containers fully identified with manufacturer's name, trade name, type, class, grade, size and color.

B. Protection: Store materials and equipment off the ground and under cover, protected from damage. Maintain caution labels on hazardous materials.

C. Large Items: Make arrangements with other contractors on the job for introduction into the building of equipment too large to pass through finished openings.

D. Handling of Materials: Materials shall be handled, sorted and distributed using appropriate handling methods to protect all materials from damage. Dented, rusted, corroded or otherwise damaged materials shall be removed from the project site. Determination of materials deemed unusable or inappropriate for installation shall be made by the Architect/Engineer.

1.14 PROJECT CONDITIONS

A. Accessibility:

1. Division 15 Contractor shall be responsible for the sufficiency of the size of shafts and chases and the adequate clearance in double partitions and hung ceilings for proper installation of his work. He shall cooperate with Contractors of other Divisions of the Work whose work is in the same space and shall advise

the Construction Manager/General Contractor of his requirements. Such spaces and clearances shall, however, be kept to the minimum size required.

2. Division 15 Contractor shall locate all equipment which must be serviced, operated, or maintained in fully accessible positions. Equipment shall include (but not be limited to) valves, shock absorbers, traps, cleanouts, motors, controllers, switchgear, filters, VAV boxes, control valves, balancing valves, and drain points. If required for better accessibility, furnish access doors for this purpose. Minor deviations from Drawings may be allowed to provide for better accessibility. Any changes shall be approved by the Architect/Construction Manager/General Contractor prior to making the change.

3. Division 15 Contractor shall provide the Construction Manager/General Contractor with the exact locations of access doors for each concealed valve, damper, or other device requiring service. Locations of these doors shall be submitted in sufficient time to be installed in the normal course of work.

B. Fabrication:

1. Before any ductwork is fabricated and before running and/or fabricating any lines of piping or ductwork, the Contractor shall assure himself that they can be run as contemplated in cooperation with Contractors of other Divisions of the Work and the physical constraints of the Structural and Architectural Work.

C. Freeze Protection:

1. Do not run lines in outside walls, or locations where freezing may occur. Piping next to outside walls shall be in furred spaces with insulation between the piping and the outside wall. Insulation of piping shall not be considered freeze protection.

D. Scaffolding, Rigging and Hoisting:

1. Provide all scaffolding, rigging, hoisting and services necessary for erection and delivery into the premises of any equipment and apparatus furnished; remove same from premises when no longer required.

1.15 COORDINATION

A. General: Coordinate and order the progress of mechanical work to conform to the progress of the work of the other trades. Complete the entire installation as soon as the condition of the building will permit.

B. Coordination with Electrical Work: Section 15050.

C. Utility Interruptions: Coordinate mechanical utility interruptions with the Owner and the Utility Company. Plan work so that duration of the interruption is kept to a minimum.

D. Cutting and Patching: Section 15050.

E. Drawings and Specifications: The Mechanical Drawings indicate the general design and arrangement of lines, equipment, systems, etc. Information shown is diagrammatic in character and does not necessarily indicate every required offset, fitting, etc. Do not scale the Drawings for dimensions. Take dimensions, measurements, locations, levels, etc., from the Architectural Drawings and equipment to be furnished.

F. Each Division 15 subcontractor shall coordinate with other contractors to make certain that any of his equipment, piping or ductwork which is mounted on isolators or flexibly connected does not become "grounded" by another contractors work (e.g. walls, ceiling, etc.).

G. Discrepancies: Examine Drawings and Specifications for other parts of the work, and if any discrepancies occur between the plans for the work of this Division and the plans for the work of others, report such discrepancies to the Construction Manager/General Contractor and obtain written instructions for any changes necessary.

H. Order of Precedence: The precedence of mechanical construction documents are as follows:

1. Addenda and modifications to the Drawings and Specifications take precedence over the original Drawings and Specifications.
2. Should there be a conflict within the Specifications or within Drawings of the same scale, the more stringent or higher quality requirements shall apply.
3. In the Drawings, the precedence shall be Drawings of larger scale over those of smaller scale, figured dimensions over scaled dimensions and noted materials over graphic indications.
4. Should there be a conflict in dimensions or locations between Mechanical Drawings and Architectural Drawings, the Architectural Drawings shall have precedence.

1.16 START-UP PROCEDURES

A. Before start-up, each piece of equipment comprising a part of the system shall be checked for proper lubrication, drive rotation, belt tension, proper control sequence, and any other condition which may cause damage to equipment or endanger personnel.

B. Insure that all control systems are fully operational in automatic mode. Individually test each control loop to make certain it is operating as intended and is communicating properly with other devices.

C. If systems are not to continue in use following the start-up procedures, steps should be taken to insure against accidental operation or operation by unauthorized personnel. Provide padlocks on disconnect switches where applicable.

D. Factory personnel shall be notified as appropriate to start systems requiring their services.

E. Notify engineer at least 2 weeks prior to the scheduled start-up date of all major mechanical equipment and systems.

1.17 SCHEDULE OF TESTING

A. Provide testing in accordance with the General Conditions of the Contract.

B. A schedule of testing shall be drawn up by the Division 15 Contractor in such a manner that it will show areas tested, test pressure, length of test, date, time and signature of testing personnel.

C. All testing must be performed in the presence of the Architect's/Construction Manager's/General Contractor's representative; his signature for verification of the test must appear on the schedule.

D. All testing must be performed in accord with the procedures set forth in Division 15 and other Sections of the Specifications where referenced. At completion of testing, the completed schedule shall then be submitted in triplicate to the Architect and a copy shall be forwarded to the 15990 Contractor for inclusion in Operation and Maintenance Manual.

E. Make all specified tests on piping, ductwork and related systems as specified in this specification.

F. Make sure operational and performance tests are made on seasonal equipment.

G. Complete all tests required by Code Authorities, such as smoke detection, life safety, fire protection and health codes.

H. After test runs have been completed and systems have been demonstrated to be satisfactory and ready for permanent operation, all permanent pipeline strainers and filters shall be cleaned, air filters cleaned or replaced, settings on pressure relief valves properly adjusted, valve and pump packings properly adjusted, belt tensions adjusted, drive guards secured in place, lubrication checked and replenished if required.

1.18 CLEANING AND FINISHING

A. Provide cleaning in accordance with the General Conditions of the Contract and Division 1.

B. Cleaning shall include but not be limited to removing grease, dirt, dust, stains, labels, fingerprints and other foreign materials from sight-exposed piping, ductwork, equipment, fixtures and other such items installed under Division 15 of the work. If finishes have been damaged, refinish to original condition and leave everything in proper working order and of intended appearance.

C. Section 15511 Contractor shall be responsible to certify that all HVAC Piping Systems have been cleaned in accordance with Section 15548 - HVAC Water Treatment whether actually done by the Section 15511 Contractor or by the 15548 Contractor.

1.19 WARRANTIES

A. Warranty: Provide a written warranty to the Owner covering the entire mechanical work to be free from defective materials, equipment and workmanship for a period of one year after Date of Acceptance. During this period provide labor and materials as required to repair or replace defects. Provide certificates for such items of equipment which have warranties in excess of one year. Submit to the Construction Manager/General Contractor for delivery to the Architect. Include a copy of all warranties in the Operation and Maintenance Manual.

B. This warranty will be superseded by the terms of any specific equipment warranties or warranty modifications resulting from use of equipment for construction heat or ventilation.

C. All refrigeration compressors shall have a (4) four year extended warranty from the manufacturer of the equipment in addition to the standard one-year warranty.

1.20 PROJECT CLOSEOUT

A. Project Observation Reports:

At or near the completion of the construction phase of this project, the Engineer will generate one or more Project Observation Reports for the owner. These reports will list the items of construction observed by the Engineer which are not in compliance with the Contract Documents.

The Mechanical Contractor and/or subcontractors shall certify completion of each listed item in writing and forward copies to the Architect, Engineer and General Contractor. The Engineer will not recommend the payment of retainage until this compliance certification has been received.

Each item on the Project Observation Report shall have a signature/date in the margin of the report indicating completion of that item.

1.21 CERTIFICATES AND KEYS

A. Certificates: Upon completion of the work, deliver to the Construction Manager/General Contractor one copy of Certificate of Final Inspection.

B. Keys: Upon completion of work, submit keys for mechanical equipment, panels, etc. to the Construction Manager/General Contractor.

END OF SECTION 15010

CONFIDENTIAL

(For CEA Use Only)

MECHANICAL COST BREAKDOWN
(Rounding off to the nearest $500 is acceptable)

PROJECT NAME: NEW SALT LAKE CITY WINE STORE

BID DATE: (month/year) _____ CEA PROJECT NO.: 2007-063.00

SUBCONTRACTOR NAME: _____

HVAC Equipment:	$
HVAC Piping Material and Labor:	$
Sheet Metal Equipment:	$
Sheet Metal Material and Labor:	$
Insulation:	$
Plumbing Equipment and Fixtures:	$
Plumbing Piping Materials and Labor:	$
Automatic Temperature Control:	$
Testing, Adjusting and Balancing:	$
Fire Protection:	$
*Medical Gases:	$
*Medical Gas Certification:	$
*Clean Room Certification:	$
*Process Piping Materials and Labor:	$
*Site Utilities Piping:	$

A completed copy of this form <u>MUST</u> be forwarded to the Engineer before any shop drawings/submittal will be reviewed. See Section 15010, 1.8, A.

Fax or mail completed form to:

Colvin Engineering Associates, Inc.
244 West 300 North, Suite 200
Salt Lake City, Utah 84103
(801) 322-2400 - Phone
(801) 322-2416 – Fax

SECTION 15050 - BASIC MECHANICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED WORK

A. The General Conditions, Supplementary Conditions and Division 1, General Requirements apply to this Section, and Contractor shall review and adhere to all requirements of these documents.

B. Work furnished but not installed by this Contractor:

1. Access doors in accordance with paragraph 2.3 in this Section 15050.

1.2 SYSTEM DESCRIPTION

A. The work includes, but is not limited to the following:

Materials and methods common to the work in general of Division 15 and other Divisions and Sections of the Specifications where referenced.

1.3 QUALITY ASSURANCE

A. Welder Qualifications: Welding shall be performed by an ASME Certified welder with current certificate in accordance with ANSI B31.1 for shop and project site welding of piping work. Welder Qualifications:

1. Each welder shall have passed a qualification test within the past 6 months.
2. The test shall be in accordance with the ASME Boiler and Pressure Vessel Code, Section IX, "Welding Qualifications", ASME Section VIII, and ANSI 313.
3. The test report shall certify that the welder is qualified to weld the material to be used at the job site.
4. The Contractor shall submit three copies of each welder's qualification test report to the Project Manager for approval prior to commencing the work. No welder shall be used on the project until so certified.

1.4 REFERENCES

A. Reference Standards: Except as modified by governing codes and by the Contract Documents, comply with the applicable provisions and recommendations of the following:

1. For electrical equipment and products, comply with applicable National Electrical Manufacturers Association (NEMA) Standards, and refer to NEMA Standards for definitions of terminology herein.

2. Comply with National Electrical Code (NEC) NFPA-70 for electrical installation requirements.
3. Certified Pipe Welding Bureau (NCPWB) and American National Standards Institute (ANSI) Code Numbers B31.2, & B31.9 as applicable for welding requirements.
4. Comply with American National Standards Institute (ANSI A13) for identification of piping systems.
5. Comply with American National Standards Institute (ANSIB31.1) Code for Pressure Piping.
6. State of Utah, Division of Facilities Construction and Management Design Criteria.

1.5 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings and Product Data for the following items in accordance with the General Conditions of the Contract:

1. Proposed access door sizes and locations.

B. Operating Instructions and Maintenance Data: Submit printed Operating Instructions and Maintenance Data for the following items in accordance with Operating and Maintenance Data Paragraph in Section 15010.

1. Motors.
2. Starters.

C. Certificates: Before proceeding with the Work, submit to the Architect/Construction Manager/General Contractor, two copies of Certification that the welding work will be done according to ANSI B31.1 by welders who have been tested and whose qualification test sheets are available, attesting to their ability to weld in accordance with the Standard Procedure Specifications as established by the National Certified Pipe Welding Bureau.

PART 2 - PRODUCTS

2.1 MOTORS

A. General: Furnish motors necessary to operate mechanical equipment.

B. Motor Characteristics: Comply with the following requirements:

1. Variable Speed Drive Compatibility: All motors which are powered through a variable frequency drive shall conform to NEMA MG-1, Part 31 for inverter duty and shall be capable of continuous operation at 20% of nominal speed and shall meet the requirements of the Variable Frequency Drive specification in Section 15910 or Division 16 as applicable.
2. Altitude Deration: Motors to be furnished to maintain specified rated service factor at altitude of project.

3. NEMA Temperature Rating: Rated for 40 deg.C environment for continuous duty at full load, Class B motor temperature rise. Motors for use with variable frequency drives shall be Class F insulated.
4. Starting Capability: Provide each motor capable of making starts as frequently as indicated by the automatic control system.
5. Phases and Current Characteristics: Provide squirrel-cage induction polyphase motors for 3/4 horsepower and larger, and provide capacitor-start single-phase motors for 1/2 horsepower and smaller. One-sixth horsepower and smaller may, at equipment manufacturer's option, be split-phase type. Coordinate current characteristics with power specified in Division 16 and with individual equipment requirements specified in other Sections of Division 15. Provide two separate windings on polyphase two speed motors. Do not purchase motors until power characteristics available at locations of motors have been confirmed, and until rotation directions have been confirmed.
6. Power Factor: All motors rated greater than 1000 watts shall have a Power Factor of not less than 95% under rated load conditions. The 95% PF may be obtained by design of the motor or by providing a capacitor. Capacitors, if provided to obtain the 95% PF, must be switched with the motor. If the motor draws less than 1000 watts at full load, it is excluded from the 95% power factor requirement.
7. Service Factor: 1.15 for polyphase motors and 1.35 for single-phase motors. Motors shall be selected such that the brake horsepower requirement is not within the service factor at design load.
8. Efficiency: All motors shall be premium efficiency type in accordance with the current State Energy Code, except where a higher efficiency is noted on drawings.
9. Motor Construction: Provide Design "B" motors for general purpose continuous duty and Design "C" motors where required for high starting torque such as the low speed motor on fans with a two-motor drive arrangement. Small motors that are part of packaged equipment may be manufacturer's standard motors meeting Energy Code requirements for efficiency.

    a. Bearings: Ball or roller bearings with inner and outer shaft seals: regreasable; except permanently sealed where motor is normally inaccessible for regular maintenance. Where belt drives and other drives produce lateral or axial thrust in the motor, provide bearings designed to resist the thrust loading. Refer to individual sections of Division 15 for fractional horsepower light-duty motorized equipment where sleeve-type bearings are permitted.
    b. Enclosure Type: Except as otherwise indicated, provide open drip-proof motors for indoor use where satisfactorily housed during operation, and provide guarded drip-proof motors where exposed to contact by employees or building occupants. Provide weather-protected Type I for outdoor use, Type II where not housed. Refer to individual Sections of Division 15 for other enclosure requirements.
    c. Overload Protection: Provide built-in thermal overload protection for each leg of each phase and, where indicated, provide internal sensing device suitable for signaling and stopping the motor at the starter.

Thermal overload protectors shall be sized to accommodate the altitude of installation.

d. Name Plate: Provide metal nameplate on each motor, indicating full identification of manufacturer, ratings, characteristics, construction, NEMA efficiency, power factor, special features and similar information.

e. Motor Connections: Provide conduit connection boxes.

f. Motors shall not exceed 80dbA rating when running their full speed and power range.

2.2 STARTERS

A. Note that some starters are furnished and installed under Division 16. Review electrical plans before bidding.

B. General: Furnish starters and contactors necessary to operate mechanical equipment motors. **Starter manufacturer shall be the same brand for ALL motors furnished under Division 15.** Approved manufacturers shall be those listed in Division 16 or this specification.

C. Motor Starter Characteristics: Comply with NEMA standards and NEC. Furnish Type I general purpose enclosures with padlock ears, and with frames and supports for mounting on wall, floor or panel as required. Furnish the type and size of starter recommended by the motor manufacturer and equipment manufacturer for the applicable protection and start-up condition; refer to individual equipment sections for basic load requirements. All starters shall be by the same manufacturer. Only manufacturers approved by Division 16000 will be accepted. All starters shall comply with Division 16000 requirements.

D. Manual Control:

1. Furnish maintained-contact push buttons and pilot lights, properly arranged for single-speed or multi-speed operation as indicated.
2. Furnish manual switch and pilot light for motors 1/3 horsepower and smaller, except where interlock or automatic operation is indicated.

E. Automatic Control:

1. Furnish magnetic starters for motors 1/2 horsepower and larger and for smaller motors where interlock or automatic operation is indicated. Include the following:

a. Maximum number of auxiliary contacts available: three or more.

b. "Hand-Off-Automatic" switches in starter cover.

c. Interlocks, pneumatic switches and similar devices as required for coordination with the control requirement specified in Section 15955-Electronic Controls.

d. Built-in 120 volt control circuit transformer, fused from line side, where service exceeds 240 volts.

1) Control circuit conductors to be protected in accord with the National Electrical Code.

e. Trip-free thermal overload relays, each phase.
f. Externally operated manual reset except on refrigeration compressors which shall have automatic reset. Automatic reset shall be limited to three attempts. If motor fails to start after three attempts, manual reset shall be required.
g. Undervoltage release or protection.
h. Phase failure/phase reversal protection on all legs.

F. Weather Protection: Provide weather-proof mounting of magnetic starters for equipment outside of the building.

2.3 ACCESS DOORS

A. Furnish steel access doors, minimum size required for normal service use or as sized on drawings as manufactured by Inryco/Milcor, Walsh, Hannan, or Gladwin Co., where shown on mechanical or architectural drawings, and where required for access to valves, shock absorbers, dampers, mechanical equipment or appurtenances.

B. Standard Doors:

1. Frames: 16 ga. steel.
2. Panels: 14 ga. steel.
3. Finish: Chemically bonded prime coat of baked enamel.
4. Hinge: Concealed spring hinges openable to 175 degree; removable pins. Provide number of hinges as recommended by manufacturer for size of door.
5. Locking Devices: Flush steel, screwdriver operated, cam type locks. All access doors below 8'-0" in public areas shall be key-operated cylinder lock with two keys. Same key shall open all access doors.
6. Style of doors shall be appropriate for architectural finish at door location. Furnish masonry anchors where required.

C. Fire Rated Doors:

1. Frames: 16 ga. steel.
2. Panels: Sandwich type, 20 ga. steel sheets, manufacturer's standard insulated core.
3. Finish: Chemically bonded prime coat of baked enamel.
4. Hinge: Continuous type, steel with stainless steel pin.
5. Closer: Automatic closing mechanism.
6. Locking Devices: Self-latching, key-operated cylinder lock with two keys; interior, latch release mechanism.
7. Style of doors shall be appropriate for architectural finish at door location.
8. Fire rated doors shall have components and assemblies meeting requirements of the American Insurance Association, Factory Mutual Insurance Association and listed by Underwriters Laboratories, Inc.

D. Exact location of access doors shall be as directed by Mechanical Contractor and approved by the Architect.

E. Doors shall be installed by the General Contractor.

2.4 VALVES

A. General:

1. Provide valves as specified herein and as indicated on the Drawings complete with accessories and attachments as required and appropriate for the pressure/temperature of system.
2. Supply valves for proper pressure ratings determined by the system working pressures at point of use and of proper types for systems and functions indicated.
3. Provide like type valves of one manufacturer only unless specified otherwise.
4. Plainly and permanently mark valves with manufacturer's name or trademark, pressure rating, both Cold Working Pressure (CWP) and Steam Working Pressure (SWP), as applicable and flow direction when required to prevent improper installation.
5. Mark valves requiring approval by Underwriter's Laboratories (UL) or Factory Mutual Engineering Division (FM) with appropriate markings cast into the valve body.
6. Provide extended necks as appropriate for insulation.

B. Manufacturers:

1. The following manufacturers are acceptable providing the product to be considered is equivalent in every respect to the nomenclature provided by the specified make and model.

   a. Bronze Valves: Powell, Milwaukee, Crane, Hammond, Nibco.
   b. Iron Body Valves: Powell, Milwaukee, Traverse City, Kennedy, Iowa, American, Nibco.
   c. U.L., F.M. Approved or Listed Valves: Nibco, Demco, Pratt, Kennedy, Mission, Milwaukee, Hammond.
   d. Ball Valves: Hammond, Watts, Jamesbury, Worcester, Milwaukee, Apollo, Powell, Dynaquip, Nibco, Spirax Sarco.
   e. Butterfly Valves: Milwaukee, Hammond, Centerline, DeZurik, Fisher, Victaulic, Keystone, Posi-Seal, TEC, Flowseal, Nibco.
   f. Lubricated Plug Valves: Homestead, Nordstrom, Powell.
   g. Non-Lubricated Eccentric Plug Valves: DeZurik.
   h. Stop and Drain and Drain Valves: Milwaukee, Hammond, Prier, Nibco or United Brass.
   i. Gas Cock: Peter Healy or Crane.

C. Valve Schedule:

1. Standard Bronze Valves - 150 SWP/300 CWP, per ASTM B61/B62. No brass materials will be accepted.

   a. Check, Gate, and globe with union bonnet and rising stem.
   b. Sizes 1/8 through 2 inches.
   c. Schedule:

Plan Code:	G.V.	GL.V.	C.V.	L.C.V.
Valve Type:	Gate	Globe	Swing	Lift
Make:	Nibco	Nibco	Nibco	Crane
Straight Threaded:	T-134	T-235Y	T-433Y	365.5
Straight Soldered:	S-134	S-235Y	S-433Y	--
Angle Threaded:	--	T-335Y	--	--
Angle Soldered:	--	--	--	--

2. Standard Bronze Valves - 300 SWP/600 CWP, per ASTM B61/B62, no brass materials will be accepted.

   a. Gate, globe and check.
   b. Sizes 1/8 through 2 inches.
   c. Schedule:

Plan Code	G.V.	GL.V.	C.V.	L.C.V.
Valve Type:	Gate	Globe	Swing	Lift
Make:	Nibco	Nibco	Nibco	Crane
Straight Threaded:	T-134	T-235Y	T-433Y	365.5
Straight Soldered:	S-134	S-235Y	S-433Y	--
Angle Threaded:	--	T-335Y	--	--
Angle Soldered:	--	--	--	--

3. Standard Iron Body Valves - 125 SWP/200 CWP.

   a. Gate, globe and check.
   b. Sizes 2-1/2 through 12 inches.

c. Schedule:

Plan Code:	G.V.	OS&Y	GL.V.	C.V.	W.C.V.	N.S.C.V.
Valve Type:	Gate	Gate	Globe	Swing	Weighted	Non Slam
Make:	Nibco	Nibco	Nibco	Nibco	Nibco	Crane
Straight Threaded:	T-619	T-617-0	T-718B	T-918Y	T-918YBLW	--
Straight Flanged:	F-619	F-617-0	F-718B	F-918Y	F-918YBLW	23
Angle Threaded:	----	----	T-818B		----	----
Angle Threaded:	----	----	F-818B	----	----	----

4. Standard Iron Body Valves - 150 SWP/300 CWP.

a. Gate, globe and check.
b. Sizes 2 through 12 inches.
c. Schedule:

Plan Code:	G.V.	OS&Y	GL.V.	C.V.	N.S.C.V.
Valve Type:	Gate	Gate	Globe	Swing	Non Slam
Make:	Nibco	Nibco	Nibco	Nibco	Crane (Chapman)
Straight Threaded:	T-669	T-667-0	--	--	--
Straight Flanged:	F-669	F-667-0	F-768B	F-968B	223
Angle Threaded:	--	--	--	--	--
Angle Flanged:	--	--	F-868B	--	

5. Standard Iron Body Valves - 250 SWP/500 CWP.

a. Gate, globe and check.
b. Sizes 2 through 12 inches.
c. Schedule:

Plan Code:	G.V.	OS&Y	GL.V.	C.V.	N.S.C.V.
Valve Type:	Gate	Gate	Globe	Swing	Non Slam
Make:	Nibco	Nibco	Nibco	Nibco	Crane
Straight Threaded:	T-669	T-667-0	--	--	--
Straight Flanged:	F-669	F-667-0	F-768B	F-968B	223
Angle Threaded:	--	--	--	--	--
Angle Flanged:	--	--	F-868B	--	--

6. UL and FM Approved Valves.

a. Gate, check and butterfly.
b. Sizes all.

c. Schedule:

Plan Code:	OS&Y	C.V.	W.V.C.	BF.V	D.V.
Valve Type:	Gate	Swing	Wafer	BTFY	Drain
Make:	Nibco	Nibco	Nibco	Demco	Nibco
Straight Threaded:	T-104-0	T-413W	--	--	T-211Y
Straight Flanged:	F-607-0	F-908-W	--	--	--
Wafer:	--	--	W-900-W	NE-H	--

7. UL and FM Approved Valves - 175 Pound Water.

a. Post indicator with indicator post.
b. Sizes 4 through 12 inches.
c. Schedule:

Plan Code:	P.I.V.	P.I.V.B.F.
Valve Type:	Gate	BTFY
Make:	Nibco	Demco
Straight Flanged:	F-609	NE-H (Wafer)
Mechanical Joint:	M-609	--
Indicator Post Vertical:	NIP-1	Stem extension and gear operator with post indicator U.L. Listed only.
Indicator Post through Wall:	NIP-2	--

8. Underground Valves - 175 Pound Water, American Water Works Association (AWWA).

a. Gate valves with service boxes.
b. Sizes (see schedule).
c. Schedule:

Plan Code:	GV & SB	GV & SB
Size/Inches:	3/4 thru 2	2 thru 16
Valve Type:	Oriseal	Gate
Make:	Mueller	Mueller
Model:	H-15201	A-2380-22 or 2380-18
Service Box:	H-10396-86	H-10357
Base:	H-10396-7-8-9 or H-10400	No. 6 Oval
Key:	Stationary rod attached.	A-24610 Furnish one each box.

9. Ball Valve:

a. Blowout proof stem.
b. Ball port type with appropriate seals and seat, as specified.
c. Bronze bodies per ASTM B61/B62 or ASTM B-584. No brass material will be accepted.

d. Stainless steel bodies per ASTM A-351, Grade CF3M.
e. Schedule:

Plan Code:	B.V.	B.V.	H.V.	S.B.V.
Service:	Balancing	In line control and isolation	Refrigeration	Steam and Steam Condensate
Pressure:	150 SWP/300 CWP	150 SWP/300 CWP	500 CWP	150 SWP
Sizes/Inches:	1/4 thru 2-1/2	1/4 thru 3"	3/8" thru 2 1/8"	½” thru 2”
Make:	Nibco	Nibco	Nibco	Nibco
Straight Threaded:	T-580-70-66	T-585-70-66	--	T-595-Y-S6R-66
Straight Solder End:	S580-70	S585-70	S595-Y-66	--
Actuator:	Lever with memory stop	Lever	Lever	Lever
Port:	Standard	Full	Full	full

* Steam ball valve includes a three-piece body, seals rated for steam operating temperatures up to 400°F.

10. Butterfly Valves:

a. Schedule; standard 150 psi with 150 psi ANSI companion flanges for use where system pressures cannot exceed 200 psig shut off (static) pressure.

Plan Code:	BFV		
Style:	Semi-lug wafer body		
Pressure Rating ANSI Class:	150 minimum		
Body:	Cast Iron		
Disc:	Aluminum Bronze		
Stem:	316 Stainless	18-8 Stainless	17-4 PH Stainless
Seat:	EPDM (-40 deg.F to 250 deg.F)		
Actuator:	2" thru 5" Infinite position lever with memory stop. 6" thru 24" Self-locking worm gear with adjustable limit stops, and position indicator. Provide chain wheel and chain where indicated by contract documents.		
Make:	Keystone		
Size:	2"-12"	14"-20"	24-36
Model:	228	122	AR1

b. Schedule: High performance 300 psi with 300 psi ANSI companion flanges for use where system pressures are more than 200 psig but cannot exceed 700 psig shut-off (static) pressure.

Plan Code:	BFV	
Style:	Lug	
Pressure Rating ANSI Class:	300 minimum	
Body:	Carbon steel ASTM A-216	
Disc:	316 stainless steel ASTM A-216	
Stem:	Stainless steel ASTM A564 Type 630 (17-4PH)	
Seat:	Virgin TFE	
Actuator:	3" and 4": Rachet handle with lock. 6 and over: Worm gear with lock.	
Make:	Flowseal (Mark Controls Corp.)	
Size:	3" and 4"	6" and over
Model:	XX-3L-121TTH-L	XX-3L-121TTH-2

11. Stop Check Valve:

a. Schedule:

Plan Code:	S.C.V.
Pressure:	250 SWP/500 CWP
Size/Inches:	2-1/2 thru 10"
Make:	Crane
Straight Flanged:	28E
Angle Flanged:	30E

12. Eccentric Plug Valve:

a. Schedule:

Plan Code:	E.P.V.	E.P.V.
Pressure:	175 lb. CWP	175 lb. CWP
Size/Inches:	1/2 thru 3	4 thru 8
Make:	DeZurik	DeZurik
Model:	400	100
Actuator:	483-487	159 w/Memory Stop
Ends:	Threaded	Flanged

13. Gas Valves:

    a. Gas cock and lubricated plug.
    b. Schedule:

Plan Code:	G.C.K.	L.P.V.	L.P.V.	G.B.V.
Pressure:	100 PSI Air	200 lb. CWP	200 lb. CWP	250 PSI LP-Gas
Size/Inches:	1/2 thru 1	1/2 thru 3	4 thru 12	1/4" thru 3"
Make:	Peter Healy	Walworth	Walworth	Apollo
Model:	1500-F	1700	1707-F	80-100
Actuator:	None	E-2	Wrench as required	1/4 turn
Ends:	Threaded	Threaded	Flanged	Threaded

14. Specialty Valves:

    a. Petcock, stop and drain, drain, needle.
    b. Schedule:

Plan Code:	PTK	S&D.V.	D.V.	N.V.
Type:	Petcock	Gate	Ball	Needle
Pressure:	250 LB.	125 LB.	125 LB.	200 LB.
Size/Inches:	1/8	1/2 and ¾	3/4	1/8 thru 3/4
Make:	Powell	Nibco	Apollo	Jenkins
Model:	922	76 or 726	78-104	743G
Ends:	Threaded	Threaded or Soldered	Threaded and Hose End Adaptor	Threaded

2.5 PIPE HANGERS, SUPPORTS, AND ACCESSORIES PROTECTION

A. General:

1. Provide hangers, rods, clamps, brackets, attachments, inserts, bracing, nuts, coach screws, eye bolts, clips, plates, and washers as required for appropriate installation for building structure provided.
2. All hangers and accessories shall be manufactured by one manufacturer for compatibility of all components.
3. All hangers, attachments, and accessories shall be provided with a certified manufacturers safety factor of five (5).
4. All hangers, attachments and accessories shall comply with the following:

    a. Safety factor of 5 (actual load vs. ultimate load).

b. National Fire Protection Association (NFPA) (except as amended by provisions of this Specification for minimums) and as applicable.
c. Factory Mutual Engineering Division (FM) as applicable.
d. Manufacturers Standardization Society (MSS).

B. Material:

1. Hangers in contact with steel, iron, cast or ductile iron shall be hot dipped galvanized or cold galvanized with "ZRC" cold galvanized compound only to a thickness of not less than 3.0 mil (.003 inches). "ZRC" cold galvanizing compound is manufactured by ZRC Chemical Products Co., Quincy Mass.
2. Hangers in contact with copper piping shall be copper clad or provided with heavy density felt (20 oz.) pad permanently attached to the hanger and placed so as to prevent direct contact between pipe and hanger. Felt shall be mildew and moisture rot proof. Heavy polyvinyl chloride coating on hanger, 5 mil thickness minimum will be acceptable in lieu of felt.
3. Hangers in contact with "plastic" or "glass" piping shall be galvanized in accordance with Sub-paragraph B-1, above and padded in accordance with Sub-paragraph B-2, above.
4. Hangers for insulated piping shall be provided on all piping of this size with insulation shields or insulation saddles* as applicable and appropriate and in accordance with the following schedule:

Nominal Pipe or Tubing Size	Shield Length	Shield Gauge Thickness	Material
½" thru 3"	12"	18	Galvanized
4"	12"	16	Galvanized
5"	15"	16	Galvanized
6"	18"	16	Galvanized
8"	24"	--	B-line (B3160-3165)
over 8"	36"	--	B-line (B3160-3165)

* Insulation inserts between piping and shield shall be furnished by 15250 Contractor for appropriate pipe size and insulation thickness for all insulated piping requiring a vapor barrier.

5. Provide swivel ring hangers similar and equivalent to B-Line B-3170, 3170CT, and 3170C for pipe sizes 1/2" thru 8".
6. Clevis type hangers may, at the Contractors option, be provided when similar and equivalent to B-Line B-3100, and 3100C.
7. Beam and bar joist clamps shall be appropriate for attachment locations, top beam, bottom beam, etc., and provided with retainer rods, clips or straps as required.
8. Hanger spacing and minimum rod sizes in the following schedule are based on combined bending and shear stress of 1500 psi when the pipe is filled with water and 1/10-inch deflection allowance between supports, all valves, heavy fittings

and changes in direction of piping shall be additionally supported with hangers each side of valves and heavy fittings, and one additional support within one foot of the directional change. Where more stringent hanger spacing and rod sizes are required by jurisdictional authority, the more stringent requirements shall supercede the following schedule:

Nominal Pipe or Tubing Size	Maximum Support Spacing Center to Center (ft)	Minimum ATR or MTR rod dia (in)
½" thru 1"	6	3/8"
1-1/4" thru 2"	7	3/8"
2-1/2" thru 3"	10	1/2"
4"	14	5/8"
5"	16	5/8"
6"	17	3/4"
8"	19	7/8"
over 8"	20	1"

9. Riser clamps shall be provided on all vertical risers at each floor and shall conform to materials and protective coatings or pads as specified in Paragraph B of this Article 2.05. Clamps shall be similar and equivalent to B-Line B-3131 and B-3148.
10. Provide concrete inserts where required in flat slab construction similar and equivalent to B-Line B-22-1 Series 2000 lbs. per foot load capacity and spaced per hanger spacing schedule (sub-paragraph B-9 above) provide all accessories and nuts required.
11. Trapeze hangers shall be constructed of channel similar and equivalent to B-Line Series B-11 thru B-72 as appropriate complete with pipe clamps, nuts, rollers etc., as required. Channel to bear 5 times actual weight of all piping on trapeze system with minimum deflection. (.01 inch maximum). At a minimum, install pipe clamps on every other trapeze hanger, and where required to comply with seismic restraint design.
12. Wall brackets shall be fabricated "knee" brackets conforming to requirements of sub-paragraph B-12 above and made up with B-Line Series B-11 thru B-72 channel. Angle clips may be used in wood joist construction when similar and equivalent to B-Line B-3060 or 3061.
13. Hangers attached to wood construction shall be attached by use of eye bolts, coach screws or lag bolts when load bearing ratings maintain a safety factory of 5.
14. All other means of support i.e., special construction, pipe stands, earthquake bracing, sway bracing, etc., shall be provided as required and in conformance with jurisdictional authority and these Contract Documents, submit all special or required support and bracing systems for review by the Architect/Engineer prior to installing any item.

15. All piping systems exposed to motorized traffic shall be fully protected by installation of concrete-filled pipe bollards. Bollards shall be cleaned and painted as directed by the Architect.

C. Acceptable Manufacturers:

1. Manufacturers acceptable to this Specification are as follows, all other manufacturers must submit for acceptance.

a. B-Line
b. Fee & Mason
c. Grinnell
d. P.H.D.
e. Michigan
f. Tolco

2.6 IDENTIFICATION MATERIALS FOR PIPING AND EQUIPMENT

A. Materials for identification shall be as follows:

1. Metal Tags: Round brass discs, minimum 1-1/2" diameter with edges ground smooth. Each tag shall be punched and provided with brass chains for installation.
2. Engraved Nameplates: Fabricate from plastic sheet stock of sufficient thickness to allow engraved lettering in contrasting color. Attach nameplates to equipment with screws.
3. Pressure Sensitive Markers: Brady Type 350 flexible vinyl film identification markers and tape, with legend, size and color coding per ANSI A13.1. or approved equal.

Insulation or Pipe Diameter	Length of Color Field	Size of Letters
3/4" to 1-1/4"	8"	1/2"
1-1/2" to 2"	8"	3/4"
2-1/2" to 6"	12"	1-1/4"
8" to 10"	24"	2-1/2"
over 10"	32"	3-1/2"
Ductwork and Equipment	NA	2-1/2"

2.7 EQUIPMENT DRAINS AND OVERFLOWS

A. Steel Pipe: ASTM A53, Schedule 40 galvanized.

1. Fittings: Galvanized cast iron, or ANSI/ASTM B16.3 malleable iron.

2. Joints: Screwed, or grooved mechanical couplings.

B. Copper Tubing: ASTM B88, Type M, hard drawn.

1. Fittings: ANSI/ASME B16.23 cast brass, or ANSI/ASME B16.29 solder wrought copper.
2. Joints: ASTM B32, solder, Grade 95TA.

C. PVC Pipe: ASTM D1785, Schedule 40.

1. Fittings: ASTM D2466 or D2467, PVC.
2. Joints: ASTM D2855, solvent weld.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

A. General: Unless otherwise specifically indicated on Drawings or in Specifications, install equipment and materials in accordance with recommendations of manufacturer, including performance of tests as manufacturer recommends.

B. Protection:

1. Close ends of pipe and ductwork during construction to prevent entry of foreign material. Protect insulation against dirt, water, chemical or mechanical damage before, during and after installation. Cover floor drains and protect fixtures and equipment against damage during concrete pours and mechanical work.

C. Quiet Operation and Vibration:

1. All work shall operate in accordance with Section 15240 - Mechanical Sound and Vibration Control under all conditions of load.
2. Sound or vibration conditions not in accordance with Section 15240 and considered objectionable shall be corrected in a manner approved by the Architect under the Work of Division 15.

3.2 WELDING

A. Joints between sections of pipe, between pipe and fittings, shall be fusion welded. Use only certified welders. Strength of finished welded joints to be equal to strength of pipe. Width of finished weld to be at least 2-1/2 times the thickness of the part joined. Thickness of weld to be at least 25% greater than the thickness of pipe or fittings. Finished welded joints to present neat and workmanlike appearance.

B. Make no direct welded connections to valves, strainers, apparatus, and related equipment. Make connections to flanged valves, and flanged equipment with welded pipe connection flanges.

C. Radii of weld ells to be 1-1/2 times nominal diameter of fittings. Fittings used for all branch connections, whether full-size or reducing, to have interior surfaces smoothly contoured. Wall thickness of welded fittings equal to adjacent piping.

3.3 ELECTRIC WIRING

A. Furnish equipment requiring electrical connections to operate properly and to deliver full capacity at electrical service available.

B. All control wiring to be in accordance with manufacturer's recommendations; all wiring shall be color coded to facilitate checking.

C. Unless otherwise indicated, all mechanical equipment motors, starters, and controls shall be furnished, set in place, and wired in accordance with the Electrical Equipment/Wiring Responsibility Matrix on the drawings. Contractor should note that the intent of this electric wiring matrix is to have the Division 15 Contractor responsible for coordinating all control wiring as outlined, whether or not specifically called for by the mechanical or electrical drawings and specifications. Mechanical Contractor shall comply with the applicable requirements of Division 16 for electrical work of this Division 15 which is not otherwise specified. No extras will be allowed for Contractor's failure to provide for these required items. The Division 15 Contractor shall also refer to the Division 16 specifications and plans for all power and control wiring and shall advise the Architect/Engineer of any discrepancies prior to bidding.

ELECTRICAL EQUIPMENT/WIRING RESPONSIBILITY MATRIX

Item	Furnished By*	Set By*	Power Wiring*	Control Wiring*
Equipment Motors	MC	MC	EC	MC
Motor Starters & Overload Heaters	MC – Except when shown on MCC	EC	EC	MC
Fused & Unfused Disconnect Switches, Thermal Overload & Heaters	EC	EC	EC	--
Manual Switches & Speed Control Switches carrying full load currents.	MC	EC	EC	EC
Control Relays & Transformer (See Note 2)	MC	MC	EC	MC
Thermostats (Line Voltage)	MC	EC	EC	EC
Temperature Control Panels	MC	MC	EC	MC

Item	Furnished By*	Set By*	Power Wiring*	Control Wiring*
Building Fire Alarm System Fire & Smoke Detectors, including Relays in Starters for Fan Shutdown.	EC	EC	EC	EC
Electric Plumbing Fixtures, Sensor Faucets, Sensor Flush Valves, Electric Water Coolers, and required Transformers.	MC	MC	EC	MC
Motor & Solenoid Valves, Damper Motors, PE & EP Switches, Control Valves, Low Voltage Thermostats	MC	MC	MC	MC
Exhaust fans when switched with room lights.	MC	MC	EC	EC
Fire sprinkler system alarms, tamper switches, flow switches and fire alarm systems tie-ins to provide a complete fire protection system.	FPC	FPC	FPC	FPC
Temporary Heating Connections	MC	MC	EC	MC

* MC = Mechanical Contractor under Division 15 of the work.
* FM = Mechanical Contractor under Section 15365 - FM-200 Fire Suppression System.
* FPC = Fire Protection Contractor.
* EC = Electrical Contractor under Division 16 of the work.
* MGES = Medical Gas Equipment Supplier (Section 15484).

D. All temperature control conduit and wiring shall be furnished and installed under Section 15955. All motorized damper and motorized valve wiring shall be furnished and installed under Section 15955.

3.4 SLEEVES, PLATES AND CLOSURES

A. Division 15 Contractor shall provide and locate pipe sleeves, and inserts required before new floors and walls are built or shall be responsible for the cost of cutting and patching required where sleeves and inserts were not installed or where incorrectly located.

B. Provide sleeves for mechanical piping passing through concrete floor slabs and through concrete, masonry, tile, and gypsum wall construction. Provide metal collars to close and protect openings.

C. Where sleeves are placed in exterior walls below grade, pack spaces between the pipe or conduit and the sleeves with Hornflex Thiokol L-32 Sealant or Link Seal and make water-tight. Provide metal rodent collars securely fastened to structure. Link seal shall not be used on fire lines.

D. Where pipe motion due to expansion and contraction will occur, make sleeves of sufficient diameter to permit free movement of pipe. Where sleeves pass insulated pipes, the sleeves shall be large enough to pass the pipe only and the insulation shall be made to butt against the construction, except for pipes requiring insulation having a vapor barrier, in which case, the sleeves shall be large enough to pass the pipe and insulation. Check floor and wall construction finishes to determine proper length of sleeves for various locations, make actual lengths to suit the following:

1. Terminate sleeves flush with floors, walls, partitions, and ceilings.
2. Seal annular space around pipes watertight at floor penetrations.
2. In areas where pipes are concealed, as in chases, terminate sleeves flush with floor.
3. In all areas where pipes are exposed, extend sleeves 1/4" above finished floor, except in rooms having floor drains, where sleeves shall be extended 2" above floor and in Kitchens and Mechanical Equipment Rooms, where sleeves shall be extended 4" above floor.

E. Sleeves shall be constructed of 24 gauge galvanized sheet steel with lock seam joints for all sleeves set in concrete floor slabs terminating flush with the floor. All other sleeves shall be constructed of galvanized steel pipe unless otherwise indicated on the drawings. "Crete Sleeve" (plastic type) sleeves are acceptable for concrete construction as manufactured by Sperzel Division, Shamrock Industries.

F. Fasten sleeves securely in floors and walls so that they will not become displaced when concrete is placed or when other construction is built around them.

G. Provide tight fitting floor and ceiling plates on pipes passing thru walls, ceilings, and floors. Nickel or chrome plated in finished areas, galvanized cast iron in unfinished areas. Provide wall and ceiling flanges for ducts in finished areas.

H. Provide all cutting, patching of holes, openings, notches. Obtain written approval for notching, boring, chipping, burning, drilling, welding to structural members in accordance with the General Conditions of the Contract and paragraph 3.7 of this Section.

I. Where pipe sleeves penetrate fire rated walls and floors, this contractor shall use fire safing to seal openings.

3.5 FOUNDATIONS, PADS AND CURBS

A. Concrete foundations, pads and curbs for work under Division 15 shall be provided by the General Contractor.

B. All dimensions and exact locations for anchor bolts, foundations, pads and concrete curbs for mechanical equipment in Division 15 shall be determined and located by the Division 15 Contractor.

3.6 EXCAVATING AND BACKFILLING

A. Excavate for all mechanical equipment such as fuel tanks, ductwork, sump pumps, manholes and trenches for underground pipelines to required depths. Compact bottoms of excavations. Slope to obtain required grade. Remove rocks, trash and debris before installation of equipment and backfilling. Backfill by hand tamping earth under the haunch of the pipe to specified compaction. Backfill and compact in thin layers until top of pipe is covered. Complete backfill by methods required or directed for soil characteristics to comply with the Architectural section of these specifications.

B. Excavations near footings shall be such that, when nearing building footings, or bearing foundation walls, the excavation bottom shall not be nearer the footing than a normal 45 degree bearing line from edge of footing bottom to bottom of excavation. When it is necessary to perpendicularly cross under a continuous foundation wall, care shall be taken to insure that crossing is clear of the structural foundation and of minimal width.

C. Do not place backfill over pipe lines until lines are properly tested.

D. When trenching through specially tested areas, such as paving, asphalt, etc., Contractor shall be responsible for restoring the surface to its original condition, and in a manner approved by the Architect. Repair trenches where settlement occurs, and restore the surface for the period of one year after final acceptance of the project. All cutting of paving, asphalt, etc. shall be by saw cutting.

3.7 CUTTING AND PATCHING

A. Openings in New Construction:

1. Provisions for New Openings: The Division 15 Contractor shall verify all openings required in the new construction in connection with the work under Division 15 with the Architectural and Structural Drawings and shall then meet with and verify same with the General Contractor/Construction Manager who will assign the work to the appropriate contractor to provide all openings in the new construction of the correct size and location in walls, floors or through roofs required for the installation of the mechanical work.

B. Cutting in New Construction:

1. Failure on the part of the Division 15 Contractor to make the above arrangements for required openings shall cause the cost of cutting and patching for the necessary openings for the installation of his work to be borne by him, either by being assigned to the General Contractor/Construction Manager or in the form of performing the required cutting himself. In either case, all patching shall be done by the appropriate finishing contractor as determined by the General Contractor/Construction Manager. No cutting or drilling of holes shall be done without approval of the Architect/Engineer.

C. Patching in New Construction:

1. The appropriate finishing contractor as determined by the General Contractor/Construction Manager shall patch all openings in the new structure. All openings made in fire rated walls, floors, or ceilings, shall be patched and made tight to conform to the fire rating for the enclosure. All materials used in patching shall match the materials specified in the Architectural Specifications and all patched areas shall be restored to the specified finish surface to the satisfaction of the Architect.
2. The Division 15 Contractor shall pay the appropriate Finishing Contractor as determined by the General Contractor/Construction Manager for all patching resulting from cutting to accommodate mechanical work.

3.8 PIPE HANGERS/SUPPORTS

A. Use inserts, anchors, expansion bolts or other approved and acceptable means of attachment to concrete construction. Set inserts in advance of concrete installation, provide required reinforcement rod for all inserts carrying loading equivalent of one 4" pipe or more. All inserts shall be flush with face of slab or wall containing insert.

B. Provide flat square washers for rods thru metal decking with nut above washer, when acceptable and approved.

C. Cinch hangers to carry appropriate share of loading and slope piping without sags or "pocketing" as appropriate and required.

D. Rod offsets, or angle installation, plumber tape or wire will not be accepted. Hanger rods shall be true and plumb.

E. Piping shall not be hung from other piping or equipment items. Provide attachments to building structure only. Use trapeze, wall brackets, knee brackets, etc., where hanger rods cannot be attached within spacing plumb to structures.

F. Provide sway and earthquake bracing where required in accordance with Section 15241 - Mechanical Seismic Control.

3.9 INSTALLATION OF VALVES

A. General:

1. Provide valves as shown on Contract Documents and as required for pressure relief, balancing and/or control of flow.
2. Provide isolation valves for maintenance and service on each piece of equipment regardless of whether or not shown on Contract Drawings.
3. Provide isolation valves for all branch line take-offs that serve more than two items of fixtures or equipment.

4. Provide balancing valves for each leg of domestic hot water return piping of two branches or more, all heating/cooling water returns and/or supplies to equipment as shown on Contract Documents.
5. Provide access means for each valve or group of valves either by access panels or utilization of inherent access provided by building methods i.e., lift out ceiling construction or exposed valve installations in non critical areas such as janitors closets, storage rooms, etc.
6. Install all valves with valve bonnets or operating stems in vertical (upright) position when possible, valves may be installed with bonnets or stems not less than 35 degrees downward from vertical plane except valves on vertical piping may be 90 degrees from vertical plane. Swing type check valves shall be installed on horizontal piping no more than 45 degrees upward slope from horizontal plane, using lift checks on vertical piping. Lift check valves shall not be used on sewage or sump pump discharge piping.
7. Inspect and tighten all bonnet nuts, bolts, packing glands, lubricate all valves requiring lubrication, secure all hand wheels and identification plates, be responsible for all valves having manufacturers name, trade name, working pressure and size stamped or cast into the body of the valve. Perform all maintenance, repacking and inspection prior to installation of valve.

B. Proper Installation of Valves:

1. Provide valves in accordance with the following schedule unless specified otherwise in Contract Documents.

   a. Dead-end shut off: Gate, ball, butterfly, plug, stop and drain.
   b. Throttling: Ball, plug, globe, diaphragm, needle, butterfly (when using butterfly valves for throttling, additional valves must be provided for service shutoff.)
   c. Backflow prevention: Check.
   d. Water hammer prevention: Silent or pilot operated non slam check.
   e. Gas piping: Lubricated plug (or ground joint cock up to 1" only), or UL-Listed ball valve.

C. Removal and Repair Provisions:

1. Provide all valves which are not accessible for repair without removal from piping with union connection immediately adjacent to valve outlet.

3.10 PAINTING

A. Surfaces of exposed equipment and materials to be thoroughly cleaned and left ready for painting in accordance with Architectural Painting Specifications.

B. Duct interiors visible through registers, grilles and diffusers shall be painted flat black.

C. All other painting of mechanical equipment and piping, unless otherwise noted, shall be performed under other divisions of the work with the exception of identification of piping and equipment which will be the responsibility of the Division 15 Contractor.

3.11 IDENTIFICATION OF PIPING AND EQUIPMENT

A. General: Provide pipe identification, valve tags, stencils, or engraved nameplates to clearly identify the mechanical equipment, piping and controls of the various mechanical systems and direction of flow in piping.

B. Methods for identification shall be as follows:

1. Metal Tags: Stamp tags with letter prefixes to indicate service, followed by a number for location in system.
2. Engraved Nameplates: Attach nameplates with brass screws. Pressure-sensitive embossed labels are not acceptable. Nameplates shall bear the same identifying legend used on the Contract Documents.
3. Piping Legend and Color (Contractor shall obtain written approval of colors from Owner's representative prior to starting work.)

Legend	Background Color	Direction Arrow	Pressure
Natural Gas	Orange		

5. Pressure Sensitive Markers: Apply pressure sensitive markers in accordance with manufacturer's recommendations with complete wrap around may be used at Contractor’s option. Marker adhesion will be tested for permanence. Any markers showing dog ears, bubbles, or other failings shall be replaced.

C. Identification of Piping: Identify all piping accessible for maintenance as well as exposed to view utilizing pressure sensitive markers, according to the following procedures:

1. Use an arrow marker for each pipe-content legend. The arrow shall always point away from the pipe legend and in the direction of flow: color and height of arrow to be same as content legend lettering.
2. If flow can be in both directions, use a double-headed arrow indication.
3. Apply pipe legend and arrow indication at every point of pipe entry or exit where line goes thru wall or ceiling cut.
4. Apply pipe legend and arrow indication within 3" of each valve to show proper identification of pipe contents and direction of flow.
5. The legend shall be applied to the pipe so that lettering is in the most legible position. For overhead piping, apply legend on the lower half of the pipe where view is unobstructed, so that legend can be read at a glance from floor level.
6. For pipes under 3/4" O.D., fasten brass tags securely at specified legend locations.
7. Legend on steam piping, condensate return, compressed air, medical air, gas, and vacuum systems shall include working pressure or vacuum.

D. Valves: All valves, including but not limited to domestic hot and cold water, hot water recirculation, heating water, chilled water, condenser water, steam, steam condensate return, fire protection, gas, medical gas, vacuum and special service valves located inside the building, shall be tagged and identified as to type of service, location number, and normal valve position (normally open or normally closed).

E. Controls: All magnetic starters and relays, shall have nameplates or be stenciled to identify connecting or controlled equipment. All manual operating switches, fused disconnect switches and thermal over-load switches which have not been specified as furnished with indexed faceplates shall also have nameplates or be stenciled as to "connected" or "controlled" equipment. All automatic controls, control panels, zone valves, pressure electric, electric pressure switches, relays, and starters shall be clearly identified.

F. Storage Tanks, Water Treatment Equipment and Heaters: All tanks and heaters shall be stenciled as to service. The connecting pipes to each shall be identified and the service temperature entering and leaving the tank or heater shall be indicated.

G. Fans: All supply and exhaust fans and air handling units and connecting ductwork supplying one or more areas from an equipment room or isolated crawl or furred space shall have nameplate or be stenciled as to plan code number, service and areas of zones served.

H. Air Conditioning Equipment: Air conditioning equipment such as chillers, pumps, condensers, or roof-top equipment shall be identified by stencils, or system nameplates.

I. Access Doors: Provide engraved nameplates or painted stencils to identify concealed valves, controls, dampers or other similar concealed mechanical equipment. Obtain Architect approval before installation on all access doors in finished areas.

J. Lift Out Ceilings: Provide engraved nameplates or black lettering on transparent adhesive labels on ceiling tee stem to identify concealed valves, controls dampers or similar concealed mechanical equipment which is directly above nameplate in ceiling space. Obtain Architect approval before installation.

K. Expansion tanks shall be labeled to indicate system served and precharge pressure.

L. Access Flooring: Provide thin engraved nameplate on access panel to indicate location of underfloor fan coils and smoke/fire dampers.

3.12 DRIP PANS

A. Provide drip pans under all fluid conducting piping which runs over electric switchgear, busway, or electric motor starters, and under all point-of-use water heaters.

B. Pans: 18 gauge galvanized iron. Pans shall be two inch deep, with rolled top edges, and shall extend six inches each side of the pipe or group of pipes and six inches beyond the equipment below. Keep pans as close to the underside of the pipes as practicable. All

seams shall be soldered, and pans shall be crossbraced as required to prevent sagging and warping.

C. Pitch each pan to a drain connection, and pipe a 1-1/2 inch or larger copper tube drain to discharge over nearest available open drain.

3.13 FIRE SAFING

A. Mechanical Contractor shall provide fire safing for his work as follows: Where fire rated separations are penetrated by pipes, conduit or ductwork, the annular space around the pipe, conduit or ductwork shall be filled with a U.L. Rated fire safing material. Refer to Division 7 for materials and application specifications.

3.14 DRAIN LINES

A. Provide condensate drain lines from each cooling coil and evaporative media sump drain pan to drain or to termination indicated. Drain lines to be galvanized pipe or Type M hard copper.

3.15 HEATING SYSTEM USED FOR TEMPORARY HEAT DURING CONSTRUCTION

A. Permanent heating system shall not be used until building is totally and permanently enclosed (no temporary barriers for weather protection), and source of heat supply is permanently installed.

B. Once the heating system has been placed into operation, it shall not be shut down except for moderate weather, and all heated areas shall be maintained at a minimum temperature of 50 deg. F 24 hours a day.

C. When any air-handling equipment is used for temporary heat, the filters shall be installed and maintained. Before building acceptance by Owner, these units shall be thoroughly cleaned and new filters shall be installed. This is over and above the extra set of filters to be provided the Owner as called for in the specifications. Coils shall be cleaned if necessary, as determined by the Engineer.

D. Any and all systems being used for temporary heat shall become the Contractor's responsibility to maintain, and be put into first class working order before acceptance by the Owner.

E. Any manufacturer's guarantees that start with the use of equipment for temporary heat shall be extended by the contracting firm holding the prime contract for construction, so that the Owner will have his one-year guarantee from date of acceptance.

END OF SECTION 15050

SECTION 15240 - MECHANICAL SOUND AND VIBRATION CONTROL

PART 1 - GENERAL

1.1 RELATED WORK

A. Requirements: Provide Mechanical Sound and Vibration Control in accordance with the Contract Documents.

B. Related work specified in other Sections:

Section 15010 - Basic Mechanical Requirements
Section 15050 - Basic Mechanical Materials and Methods
Section 15880 - Air Distribution

1.2 SYSTEM DESCRIPTION

A. The work includes, but is not limited to the following:

1. Support isolation for motor/driven mechanical equipment.
2. Fabricated bases for distribution of equipment loading to isolation units.
3. Isolation of pipes and ductwork.
4. Sound-linings.
5. Sound proofing of construction.
6. External sound proofing.

1.3 QUALITY ASSURANCE

A. The Division 15 Contractor shall be responsible for assuring that all the following sound pressure level criteria are met. Sound pressure level tests shall be carried out by the Section 15990 Contractor in compliance with the Section 15990 specifications.

B. Acoustical Criteria:

1. Noise levels due to equipment and ductwork to permit attaining sound pressure levels in all 8 octave bands in occupied spaces conforming to RC curves:

All occupied spaces ---------- RC-35

except

Occupied spaces within 15 foot radius from main
supply and return duct shafts ---------- RC-40

Lobbies, Toilets, Commons Area ---------- RC-40

Kitchen ---------- RC-45-50

Garage ---------- RC-50-60

Mechanical Rooms ---------- RC-60-80

C. Mechanical Acoustical Performance:

1. Air Distribution system equipment terminal device noise:

Maximum permissible discharge sound-power levels in octave bands of airborne transmission through the terminal units or related pressure reducing devices, when operated in installed condition per Drawings and Specifications shall be as per Table 1, following:

TABLE 1 - Maximum PWL (dB re 10E-12 Watt)				
Octave Band	RC-30	RC-35	RC-40	RC-45
1	54	59	64	69
2	68	73	78	83
3	61	66	71	76
4	59	64	69	74
5	51	56	61	66
6	48	53	58	63
7	39	44	49	54

2. Pressure reducing variable air volume boxes radiated noise:

Maximum permissible radiated sound-power levels in octave bands when operated in an installed condition over occupied spaces, shall be as per Table 2 following:

TABLE 2 - Maximum PWL (dB re 10E-12 Watt)				
Octave Band	RC-30	RC-35	RC-40	RC-45
1	54	59	64	69
2	62	67	72	77
3	58	63	68	73
4	55	60	65	70
5	53	58	63	68
6	50	55	60	65
7	46	51	56	61

3. Motor Acoustical Performance:

   Motor drives for pumps when installed per Drawings and Specifications shall operate with noise levels not exceeding 90dbA.

   Noise levels shall be determined in accordance with IEEE Standard #85 Test "Procedure for Air-Borne Noise Measurements on Rotating Electric Equipment.

1.4 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings and Product Data for the following items in accordance with the General Conditions of the Contract.

1. Each type of isolator including spring diameters, deflections, compressed spring height and solid spring height.
2. Sound Lining.

B. Test Reports: Submit certified test reports showing compliance in accordance with General Conditions of the Contract of the following items:

1. Certification that sound lining meets erosion test method described in UL Publication No. 181.

PART 2 - PRODUCTS

2.1 PIPING AND EQUIPMENT ISOLATION

A. Manufacturer: Mason Industries, Inc.

B. Other acceptable manufacturers offering equivalent products: Korfund, Amber/Booth Co., Vibration Mountings and Control Co., Kinetics.

C. Neoprene Mounting Pads (Specification Schedule Type 1)

1. Kinetics Noise Control Type NPD.
2. Minimum static deflection 0.04” for 0.22” thick pad.
3. Cross, double ribbed elastomer in-shear pads, capable of 60 or 120 PSI loading, depending on load density of equipment being isolated.
4. Material thickness as required to provide minimum deflections listed in table at end of the specification section.

D. Double Deflection Neoprene Mountings (Specification Schedule Type 2)

1. Mason Industries Type ND Mounting, Type DNR Rails.
2. Minimum static deflection 0.35 inch.
3. Bolt holes where required.
4. Steel rails above mountings to compensate for overhang where required.

E. Spring Isolator Mountings (Specification Schedule Type 3)

1. Mason Industries Type SLF.
2. Free-standing, laterally stable without housing, complete with 1/4 inch neoprene acoustical friction pads between base plate and support and with leveling bolts that must be rigidly bolted to equipment.
3. Spring diameters no less than 0.8 of the compressed height of the spring at rated load.
4. Springs with minimum additional travel to solid equal to 50 percent rated deflection.

F. Restrained Spring Isolator Mountings (Specification Schedule Type 4)

1. Mason Industries Type SLR.
2. Spring isolator mounting equal to Type SLF but with housing that includes vertical resilient limit stops to prevent spring extension when weight is removed from equipment.
3. Provide hot dipped galvanized mountings exposed to weather.

G. Vibration Hangers (Specification Schedule Type 6)

1. Mason Industries Type DNH.
2. Spring and double deflection neoprene element in series.
3. Neoprene element minimum deflection 0.35 inch.
4. Spring diameters no less than 0.8 of compressed height of spring at rated load.
5. Springs with minimum additional travel to solid equal to 50 percent rated deflection.

2.2 SOUND LININGS

A. Acceptable Manufacturer: Johns Manville Permacote, Linacoustic and Spiracoustic.

B. Other acceptable manufacturers offering equivalent products: Knauf, CertainTeed ToughGuard R.

C. Product: Fibrous glass, acrylic surface coating, stenciled NFPA, conforming to ASTM C1071, ASTM G21 and ASTM G22.

D. Minimum thickness: As indicated in Part 3 of this specification.

E. Sound Absorption Coefficient for 1" thickness per the following:

Frequency (cps)	=	125	250	500	1000	2000	4000	NRC
Coefficient	=	0.09	0.29	0.65	0.78	0.83	0.80	0.70

F. Flamespread: Maximum 25.

G. Fuel contributed and smoke developed: Maximum 50.

H. Suitable for duct velocity of 5000 fpm. Lining shall meet erosion test method described in UL Publication No. 181.

I. Dynamic loss coefficient: Maximum 1.2.

J. Thermal conductivity 0.25 Btu/hr/deg F/in. @ 75°F mean temperature.

2.3 ADHESIVE AND SEALER

A. Acceptable Products: Adhesive, Benjamin Foster "81-99", or accepted equal, Sealer, Benjamin Foster "82-07" or accepted equal.

B. In conformance with NFPA 90A.

C. Flamespread: Maximum 25.

D. Fuel contributed and smoke developed: Maximum 50.

2.4 NON-HARDENING CAULKING

A. Acceptable Products: Tremco "Polybutene", Schuller or accepted equal.

B. Guaranteed to be permanently elastic.

PART 3 - EXECUTION

3.1 GENERAL - PIPING AND EQUIPMENT ISOLATION

A. Unless otherwise noted on the Equipment Mounting Schedule, provide mechanical equipment mounted on vibration isolators to prevent the transmission of vibration and mechanically transmitted sound to the building structure. Vibration isolators to be selected in accordance with the weight distribution so as to produce reasonable uniform deflection. Deflections to be as noted on the Equipment Mounting Schedule included at the end of this section.

B. Coordinate work with other trades to avoid rigid contact with the building. Inform other trades following the isolation work, to avoid any contact which would reduce the vibration isolation.

C. The installation or use of vibration isolators must not cause any change of position of equipment or piping which would result in stresses in piping connections or misalignment of shafts or bearings. In order to meet this objective, maintain equipment and piping in a rigid position during installation. Do not transfer the load to the isolator until the installation is complete and under full operational load.

D. Support the machine to be isolated with a structural steel frame.

E. Provide brackets to accommodate the isolator and provide a mechanical stop. The vertical position and size of the bracket to be recommended by the isolator manufacturer.

F. For restrained spring isolators, use housing as blocking during erection so that installed and operating heights can be the same. Maintain a minimum clearance of 1/2 inch around restraining bolts between housing and spring to avoid interference with spring action. Limit stops to be out of contact during normal operation.

3.2 HANGERS

A. Install type 2 or 3 vibration isolation piping hangers where indicated in Equipment Mounting Schedule at the end of this section and within 20 feet (measured along piping) upstream and downstream of all pumps 3 HP or larger.

B. Install the isolators with the isolator hanger box attached to or hung as close as possible to the structure.

C. Suspend the isolators from substantial structural members, not from slab diaphragm unless specifically accepted.

D. Align hanger rods to clear hanger box.

3.3 EQUIPMENT BASES

A. Provide minimum operating clearance between the equipment frame or rigid steel base frame and the housekeeping pad or floor of 1 inch. Provide minimum operating clearance between concrete inertia base and the housekeeping pad or floor of 1 inch.

3.4 SOUND LININGS

A. Dimensions of lined ductwork are clear inside dimensions after lining has been installed.

B. Sound linings to be held in place with mechanical fasteners as per the latest SMACNA duct liner application standard, with joints and any tears to be coated with Benjamin Foster or accepted equal adhesive. The transverse joints to be coated prior to installation so that the ends of the liner are compressed together while the adhesive is still moist, forming a seal of the leading and trailing edge of each joint. Excess adhesive to be brushed to an even finish over the joint.

C. Provide continuous sheet metal edge protectors at entering and leaving edges of lined duct sections where adjacent to unlined duct sections.

D. Extent of 1” ductwork sound linings:

1. Upstream of toilet/general exhaust fans and relief air fans, a minimum distance of 20'-0".

2. Downstream of VAV boxes.
3. Transfer air ducts and shaft return stub ducts.
4. In supply, return and rectangular exhaust ducting.
5. Return air elbow boots over ceiling grilles.
6. In plenums above supply diffusers.
7. Elsewhere when specifically indicated on drawings.

E. Extent of plenum sound linings:

1. Mixed and outside air plenum walls and ceilings.
2. Supply air discharge and filter plenum walls and ceiling.
3. Return/Exhaust air plenums.
4. Return air plenum from riser to mixed air plenum.
5. Return/Exhaust air plenums inside packaged rooftop units when not factory installed.

3.5 SOUND PROOFING OF CONSTRUCTION

A. Required for opening between ductwork and piping and following construction:

1. Equipment room walls.
2. Floors, except in shafts.
3. Roofs, specifically inside roof curbs for mechanical equipment and where ductwork penetrates roof deck.

B. Sound proofing:

1. Fill openings with tightly packed fibrous glass blanket or board for full depth of penetration.
2. Caulk each side of opening with non-hardening, non-aging caulking compound.

3.6 EXTERNAL VIBRATION DAMPENING

A. For typical floor supply duct take-offs from main supply riser when required to meet specified sound levels, provide 1/8 inch thick duct exterior coating of vibration dampening compound. These treatments to be provided over the rectangular portion (flat sides) of the floor take-off ducts.

3.7 EQUIPMENT MOUNTING SCHEDULE

A. Manufacturer: Mason Industries, Inc.

B. Schedule: See the following pages.

EQUIPMENT VIBRATION ISOLATION SCHEDULE

EQUIPMENT TYPE	SLAB ON GRADE			20 FT. FLOOR SPAN		
	BASE TYPE	ISOL TYPE	MIN. DEFL. (IN.)	BASE TYPE	ISOL TYPE	MIN DEFL. (IN.)
PACKAGED ROOFTOP AIR CONDITIONING UNIT	--	--	--	D	3	.75

BASE TYPES:

A = NO BASE, ISOLATORS ATTACHED DIRECTLY TO EQUIPMENT
B = STRUCTURAL STEEL RAILS OR BASE
C = CONCRETE INERTIA BASE
D = CURB-MOUNTED BASE

ISOLATOR TYPES

1 = RUBBER OR GLASS FIBER PAD
2 = RUBBER FLOOR ISOLATOR OR HANGER
3 = SPRING FLOOR ISOLATOR OR HANGER
4 = RESTRAINED SPRING ISOLATOR
5 = SPRING AND RUBBER IN SERIES HANGER

NOTES:

1. CONTRACTOR SHALL PROVIDE VIBRATION ISOLATION AND CALCULATIONS STAMPED BY A LICENSED PROFESSIONAL ENGINEER.

2. TO AVOID ISOLATOR RESONANCE PROBLEMS, SELECT ISOLATOR DEFLECTION SO THAT NATURAL FREQUENCY IS 40% OR LESS THAN LOWEST OPERATING SPEED OF EQUIPMENT (SEE ASHRAE HVAC APPLICATIONS HANDBOOK, 1999 EDITION).

EQUIPMENT VIBRATION ISOLATION SCHEDULE

EQUIPMENT TYPE	30 FT. FLOOR SPAN			40 FT. FLOOR SPAN		
	BASE TYPE	ISOL TYPE	MIN. DEFL. (IN.)	BASE TYPE	ISOL TYPE	MIN DEFL. (IN.)
PACKAGED ROOFTOP AIR CONDITIONING UNIT	A/B	3	1.5	A/B	3	2.5

BASE TYPES:

A = NO BASE, ISOLATORS ATTACHED DIRECTLY TO EQUIPMENT
B = STRUCTURAL STEEL RAILS OR BASE
C = CONCRETE INERTIA BASE
D = CURB-MOUNTED BASE

ISOLATOR TYPES

1 = RUBBER OR GLASS FIBER PAD
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NOTES:

1. CONTRACTOR SHALL PROVIDE VIBRATION ISOLATION AND CALCULATIONS STAMPED BY A LICENSED PROFESSIONAL ENGINEER.

2. TO AVOID ISOLATOR RESONANCE PROBLEMS, SELECT ISOLATOR DEFLECTION SO THAT NATURAL FREQUENCY IS 40% OR LESS THAN LOWEST OPERATING SPEED OF EQUIPMENT (SEE ASHRAE HVAC APPLICATIONS HANDBOOK, 1999 EDITION).

END OF SECTION 15240

SECTION 15241 - MECHANICAL SEISMIC CONTROL

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Anchorage and seismic restraint systems for all Division 15 isolated and non-isolated equipment, ductwork and piping systems.

B. Equipment/piping/ductwork to be isolated and/or seismically supported shall include but not be limited to the following:

1. Piping
2. Ductwork
3. Unit Heaters

1.2 RELATED WORK

A. Requirements: Provide Mechanical Seismic Control in accordance with the Contract Documents.

B. Section 15010 - Basic Mechanical Requirements.

C. Section 15050 - Basic Mechanical Materials and Methods.

D. Section 15240 - Mechanical Sound and Vibration Control.

1.3 REFERENCES

A. International Building Code, Current Edition in use by Jurisdictional Authority.

B. NFPA Bulletin 90A, Current Edition.

C. UL Standard 181.

D. Tri-Services Manual, Fagel Et Al, 1973.

E. SMACNA Seismic Restraint Manual: Guidelines for mechanical systems.

1.4 SYSTEM DESCRIPTION

A. The Division 15 Contractor shall be responsible for supplying and installing equipment, vibration isolators, flexible connections, rigid steel frames, anchors, inserts, hangers and attachments, supports, seismic snubbers and bracing to comply with the following:

1. Short period design spectral response acceleration coefficient S_{DS}= 1.0.
2. One-second period design spectral response acceleration coefficient S_{D1}= 0.57.
3. Site Class D.
4. Seismic Design Category D.

B. All components have an importance factor I_P of 1.0.

1.5 QUALITY ASSURANCE

A. All supports, hangers, bases, anchorage and bracing for all isolated equipment and non-isolated equipment shall be designed by a professional engineer licensed in the state where the project is located, employed by the restraint manufacturer, qualified with seismic experience in bracing for mechanical equipment. Shop drawings submitted for earthquake bracing and anchors shall bear the Engineer's signed professional seal. All calculations/design work required for the seismic anchorage and restraint of all Division 15 equipment and systems shall be provided by a single firm.

B. The above qualified seismic engineer shall determine specific requirements for equipment anchorage and restraints, locations and sizes based on shop drawings for the mechanical equipment which have been submitted, reviewed and accepted by the Architect/Engineer for this project.

C. Seismic Engineer or the Engineer’s Representative shall field inspect final installation and certify that bracing and anchorage are in conformance with the Seismic Engineer’s design. A certificate of compliance bearing the Seismic Engineer’s signed Professional Engineer’s seal shall be submitted and shall be included in each copy of the Operation and Maintenance Manuals.

D. The Division 15 Contractor shall require all equipment suppliers to furnish equipment that meets the seismic code, with bases/skids/curbs designed to receive seismic bracing and/or anchorage. All isolated and non-isolated mechanical equipment bracing to be used in the project shall be designed from the Equipment Shop Drawings and certified correct by the equipment manufacturer for seismic description listed in section 1.04 above, with direct anchorage capability.

1.6 SUBMITTALS

A. A single submittal shall be provided for all seismic anchorage and restraints for all Division 15 equipment and systems provided as part of this project. Individual submittals for specific systems will not be accepted.

B. Submit shop drawings, calculations, and printed data for the following items under provisions of the General Conditions of the Contract:

1. Complete engineering calculations and shop drawings for all seismic requirements for all equipment to be restrained as outlined in 15241-1.1 and as detailed on drawings.
2. The professional seal of the engineer who is responsible for the design of the Seismic Restraint System.
3. Details for all seismic bracing.
4. Details for steel frames, concrete inertia bases, and housekeeping pads. Include dimensions, embed depths, dowelling details, and concrete reinforcing requirements.
5. Clearly outlined procedures for installing and adjusting the isolators, seismic bracing anchors, snubbers, cables, and bolt connections.
6. Floor plan noting the locations, size, and type of anchorage and restraint to be used.
7. Include confirmation that all calculations are based on the design criteria listed in Paragraph 1.4.A of this Section.
8. Certificate of Compliance.

PART 2 - PRODUCTS

2.1 RESTRAINT EQUIPMENT AND SYSTEMS

A. Acceptable Manufacturers and Suppliers for Non-Isolated Systems:

1. Mason Industries, Inc.
2. Korfund
3. Amber/Booth Company
4. Vibration Mountings and Control Company
5. Kinetics
6. International Seismic Application Technology
7. Tolco

B. Manufacture and design of restraints and anchors for isolated equipment shall be by the manufacturer of the vibration isolators furnished for the equipment in accordance with Section 15240.

2.2 SNUBBERS

A. Snubbers shall be all-directional and consist of interlocking steel members restrained by replaceable shock absorbent elastomeric materials a minimum of 3/4 inch thick.

B. Snubbers shall be manufactured with an air gap between hard and resilient material of not less than 1/8 inch or more than 1/4 inch.

C. Snubbers shall be Mason Industries Z - 1011 or accepted equivalent.

PART 3 - EXECUTION

3.1 DESIGN AND INSTALLATION

A. General:

1. All mechanical equipment, piping and ductwork shall be braced, anchored, snubbed or supported to withstand seismic disturbances in accordance with the criteria of this specification. Provide all engineering, labor, materials and equipment for protection against seismic disturbances as specified herein. The following mechanical components are exempt from seismic restraint requirements:

   a. Components in Seismic Design Categories A and B (see 1.4-A-5 above).
   b. Components in Seismic Design Category C (see 1.4-A-5 above) that have an importance factor I_P of 1.0 (see 1.4-B above).
   c. Components that have an importance factor I_P of 1.0 (see 1.4-B above), that are mounted less than four feet above the floor, that weigh less than 400 pounds, and that have flexible ductwork, piping, and conduit connections.
   d. Components that have an importance factor I_P of 1.0 (see 1.4-B above), that weigh 20 pounds or less, and that have flexible ductwork, piping, and conduit connections.

2. Powder-actuated fasteners (shot pins) shall not be used for component anchorage in tension applications in Seismic Design Category D, E, or F.

3. Attachments and supports for mechanical equipment shall meet the following provisions:

   a. Attachments and supports transferring seismic loads shall be constructed of materials suitable for the application and designed and constructed in accordance with a nationally recognized structural code such as, when constructed of steel, AISC, Manual of Steel Construction (Ref. 9.8-1 or 9.8-2).
   b. Friction clips shall not be used for anchorage attachment.
   c. Expansion anchors shall not be used for mechanical equipment rated over 10 hp (7.45 kW). Exception: Undercut expansion anchors.
   d. Drilled and grouted-in-place anchors for tensile load applications shall use either expansive cement or expansive epoxy grout.
   e. Supports shall be specifically evaluated if weak-axis bending of light-gauge support steel is relied on for the seismic load path.
   f. Components mounted on vibration isolation systems shall have a bumper restraint or snubber in each horizontal direction. The design force shall be taken as $2F_p$. The intent is to prevent excessive movement and to avoid fracture of support springs and any non-ductile components of the isolators.
   g. Seismic supports shall be constructed so that support engagement is maintained.

B. Spring Isolated Equipment:

1. All vibration isolated equipment shall be mounted on rigid steel frames or concrete bases as described in the vibration control specifications unless the equipment manufacturer certified direct attachment capability. Each spring mounted base shall have a minimum of four all-directional seismic snubbers that are double acting and located as close to the vibration isolators as possible to facilitate attachment both to the base and the structure. Snubbers shall be installed with factory set clearances.

C. Non-Isolated Equipment:

1. The Division 15241 Contractor shall be responsible for thoroughly reviewing all drawings and specifications to determine all equipment to be restrained. This Contractor shall be responsible for certifying that this equipment is mounted and braced such that it adheres to the system description criteria in part 1.04 of this specification section.

D. Piping:

1. Seismic braces for piping may be omitted when the distance from the top of the pipe to the supporting structure is 12" or less.
2. A rigid piping system shall not be braced to dissimilar parts of a building or two dissimilar building systems that may respond in a different mode during an earthquake. Examples: Wall and a roof; solid concrete wall and a metal deck with lightweight concrete fill.
3. Unbraced piping attached to in-line equipment shall be provided with adequate flexibility to accommodate differential displacements.
4. At the interface of adjacent structures or portions of the same structure that may move independently, utility lines shall be provided with adequate flexibility to accommodate the anticipated differential movement between the ground and the structure.
5. Provide large enough pipe sleeves through walls or floors to allow for anticipated differential movements.

E. Ductwork:

1. Seismic restraints are not required for HVAC ducts with importance factor I_P of 1.0, provided that either of the following conditions are met for the full length of each duct run:

   a. HVAC ducts are suspended from rod hangers and hangers are 12 inches or less in length from the point rod attaches to duct, to the point rod connects to the supporting structure. Rods must be secured to both top and bottom cross angles with locking nuts above and below angle iron.
   b. HVAC ducts have a cross-sectional area of less than 6 square feet.
   c. This exception is not valid if the top of ductwork is not secured to hanger rods to limit pendulum length to 12 inches.

2. Equipment items installed in-line with the duct systems with an operating weight greater than 75 pounds shall be supported and laterally braced independently of the duct system.

END OF SECTION 15241

SECTION 15250 - MECHANICAL INSULATION

PART 1 - GENERAL

1.1 RELATED WORK

A. Requirements: Provide insulation in accordance with the Contract Documents.

B. Related work specified in other Sections:

Section 15010 - Basic Mechanical Requirements
Section 15050 - Basic Mechanical Materials and Methods
Section 15240 - Mechanical Sound and Vibration Control
Section 15450 - Plumbing Equipment
Section 15650 - Refrigeration
Section 15880 – Air Distribution

1.2 SYSTEM DESCRIPTION

A. The mechanical insulation work required by this Section shall include materials and methods as described herein and on the Drawings and as required by applicable energy codes.

B. The work includes, but is not limited to providing insulation on the following:

1. Plumbing Systems:

Domestic Hot Water-Supply, Recirculating, Hot Water Converters, and Storage Tanks
Tempered Domestic Water-Supply, Recirculating and Storage Tanks
Tempered Domestic Water Circulating
Domestic Cold Water
Primary Roof Drain System
Overflow Roof Drain Bowls

1.3 QUALITY ASSURANCE

A. Qualifications: The firm executing the work of this Section shall have at least 3 years successful installation experience on projects with mechanical insulations similar in scope and nature to that required for this Project.

B. Requirements of Regulatory Agencies: All insulation shall be in accordance with Jurisdicational Building Code and State and Federal Energy Conservation Standards.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's specifications and installation instructions for each type of mechanical insulation in accordance with the General Conditions of the Contract. Include schedule showing manufacturer's product number, thickness and furnished accessories for each mechanical system requiring insulation.

B. Provide schedule of pipe sizes with insulation thickness at corresponding fluid temperatures.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery of Materials: Deliver insulation, coverings, adhesives, and coatings to site in containers with manufacturer's stamp or label affixed showing fire hazard ratings of products.

B. Storage of Materials: Protect insulation against dirt, water, chemical and mechanical damage. Do not install damaged insulation; remove from project site.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers of insulation materials shall be as follows:

Certain-teed
Owens-Corning
Johns Manville
Armstrong
Knauf
Dow Chemical
3M/Thermal Ceramics (FireMaster)
Unifrax (Fyrewrap)
SpecSeal (Claymac)
Renler (Pyroscat FastR Wrap)
Gilsulate International, Inc. (Gilsulate 500XR Loose-Fill Insulation)

2.2 MATERIALS

A. Conductivity:

TYPE OF INSULATION	MAXIMUM THERMAL CONDUCTIVITY/INCH
Calcium Silicate	0.47 at 600 degrees Fahrenheit
Glass Fiber Pipe Insulation	0.25 at 75 degrees Fahrenheit
Glass Fiber Rigid Equipment Insulation	0.25 at 75 degrees Fahrenheit
Glass Fiber Rigid Duct Insulation	0.24 at 75 degrees Fahrenheit
Glass Fiber Blanket Duct Insulation	0.29 at 75 degrees Fahrenheit
Expanded Polystyrene	0.24 at 75 degrees Fahrenheit
Ceramic Fiber Grease Duct Wrap	0.25 at 70 degrees Fahrenheit
Polyisocyanurate Foam	0.19 at 75 degrees Fahrenheit
Granular Loose Fill	See below

B. Duct Board: Rigid glass fiber board with a minimum density of 1-1/2 pounds per cubic foot, a maximum thermal conductivity of 0.24 at 75 deg.F and complying with National Fire Protection Association Pamphlet 90A.

C. Duct Wrap: Blanket-type fiberglass insulation 1-1/2" thick, 0.75 pounds per cubic foot density.

D. Grease Duct Wrap: High-temperature ceramic fiber blanket, foil/scrim encapsulation, max-service temp. = 2300°F.

E. Vapor Barrier Coatings: To have a perm rating not more than 0.25 when tested in accordance with ASTM E96, procedure A.

F. Adhesives, Sealers, Facings and Vapor Barrier Coatings: To be compatible with materials to which applied, and shall not corrode, soften, or otherwise attack the pipe or insulation materials in either the wet or dry state. Use only adhesives, sealers, facings, and vapor barrier coatings as recommended by the manufacturer of insulation materials.

G. Chemicals for Treating Paper: Non-soluble.

H. Non-Collapsing Inserts: Calcium Silicate or Polyisocyanurate (Dow Trymer 2000). No Polystyrene inserts are allowed.

I. Granular, Loose-Fill Insulation: Inorganic, nontoxic, nonflammable, sodium potassium aluminum silicate with calcium carbonate filler. Include chemical treatment that renders insulation hydrophobic.

1. Thermal Conductivity (k-Value): 0.60 at 175 deg F and 0.65 at 300 deg F.
2. Application Temperature Range: 35 to 800 deg F.
3. Dry Density: 40 to 42 lb/cu. ft.
4. Strength: 12,000 lb/sq. ft.

2.3 PERFORMANCE CRITERIA

A. Insulation and accessory materials to meet the following criteria:

1. Insulation Materials: To be noncombustible as defined in National Fire Protection Association Pamphlet 220 and to be Underwriter's Laboratory listed.
2. Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastics and adhesives) with flame-spread rating of 25 or less, and smoke-developed rating of 50 or less, as tested by ANSI/ASTM E 84 (NFPA 255) method.

2.4 HANDICAP LAVATORY INSULATION

A. Insulation System: Molded closed cell insulation, 3/16-inch nominal wall thickness; provide pre-molded fittings to completely cover tail piece, P-trap, trap arm, hot and cold water supply stop valves and exposed supply tubing; include nylon fasteners for all fittings.

B. Handi Lav-Guard manufactured by Truebro; Trap Wrap manufactured by Brocar Products; Zeston Snap-Trap manufactured by Johns Manville or approved equal.

C. Install at all handicap accessible lavatories installed in this project.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

A. Testing of piping and ductwork to be completed prior to application of insulation.

B. Apply insulation tightly over clean, dry surfaces with sections or edges firmly butted together.

C. Make insulation continuous through sleeves or openings in walls and floors.

D. Run sealed vapor barriers continuous throughout all cold surface insulation systems.

E. Avoid the use of staples on vapor barrier jackets. Seal all vapor barrier penetrations with white vapor barrier sealant.

F. Apply adhesives so as not to exceed the coverages recommended by the manufacturers.

G. Leave surfaces clean and ready for painting.

H. Do not insulate cleanouts, access openings or identification plates. Neatly bevel insulation and finishes up to the edges of such openings and stop with sheet metal rings.

I. Provide non-collapsing inserts between pipe and all shields/saddles on all insulated piping 2-1/2" and larger.

3.2 SPECIFIC INSTALLATION REQUIREMENTS

A. Plumbing System:

1. Domestic Cold Water:

Horizontal piping and where freeze protection is required, one-half inch thick fiberglass pipe covering with all service jacket self-seal lap.

2. Roof Drains:

Horizontal mains and vertical from horizontal to and including drain bowls, one-half inch thick fiberglass pipe covering with all service jacket self-seal lap.

Overflow roof drain bowls shall be insulated but not overflow drain piping. Vertical mains shall be insulated.

3. Domestic Hot and Tempered Supply and Circulating Water:

Insulate entire system.
Thicknesses per table of 15250-3.2, A.

4. Domestic Hot Water Heaters, Storage Tanks, and Accumulators (not factory insulated):

Two inch thick fiberglass board, foil faced or faced with Du-All tank wrap or equal. Finish with six-ounce canvas or fiberglass reinforcing mesh and fire retardant lagging adhesive.

5. Fittings:

Premolded PVC fitting covers with Fiberglass insert. PVC covers shall be rated for return air plenum use.

6. Valves:

All systems: Oversized pipe covering of same material and thickness as adjacent pipe covering. Finish with six-ounce canvas and heavy coat of vapor barrier mastic coating.

END OF SECTION 15250

SECTION 15300 - FIRE PROTECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Connections and Fees.

B. Firelines, Extensions as shown on Drawings.

C. System Design Requirements per Jurisdictional Authorities.

D. Underground Exterior Piping as shown on Drawings.

E. Interior and Exterior above Ground Piping.

F. Sprinkler System.

G. Fire Department Connections.

H. All Alarms, Switches and Required Wiring.

1.2 RELATED REQUIREMENTS

A. The General Conditions, Supplementary Conditions and Division 1, General Requirements apply to this Section, and Contractor shall review and adhere to all requirements of these documents.

B. Section 15010 - Basic Mechanical Requirements.

C. The 15300 Contractor shall furnish all equipment, materials, tools, labor, engineering, drawings, etc. necessary for a complete sprinkler system ready for operation in accordance with the requirements of the authority having jurisdiction. The purpose of the furnished specifications and associated drawings is to convey to the Contractor the scope of work required, all of which the Contractor is responsible to furnish, install, adjust and make operable. The Contractor shall examine all existing physical conditions which may be material to the performance of his work. No extra payments will be allowed to the Contractor as a result of extra work made necessary by his failure to do so. Any case of discrepancy or lack of clarity shall be promptly identified to the Owner’s Representative and Engineer for clarification.

1.3 RELATED SECTIONS

A. Section 01230 – Alternates.

B. Section 15050 - Basic Mechanical Materials and Methods.

C. Section 15240 - Mechanical Sound and Vibration Control.

D. Section 15410 - Plumbing Piping: Copper water piping.

E. Section 15411 - Disinfecting Water Supply System.

F. Section 15430 - Plumbing Specialties: Pressure gauges, air gap fittings, pressure relief valves.

1.4 FIRE LINES

A. The work of this section shall start at the water service entrance termination flange installed inside the building and above the floor by the site utilities contractor.

1.5 CONNECTIONS AND FEES

A. System development charges and or similar charges, that in principle allow the right to obtain the services from the utility will be arranged and paid for by the Site Utilities Contractor.

B. Tap fees as they are known to the trade and are the charges for actual materials and labor for tapping, inspection and recording of the tap shall be arranged and paid for by the Site Utilities Contractor.

C. In the event that the serving utility company installs their own taps, service, meters, etc., all costs imposed by this action shall be paid for by the Site Utilities Contractor. Extensions from termination points to connection with building services and systems will be the responsibility of the 15300 Contractor.

D. Be responsible for all pads, vaults, manholes, manhole covers, valve enclosures, valves, services boxes, and required material, all in conformance with requirements of the serving utility company.

E. Contractor shall coordinate with other trades all interface piping and types of connections to be provided for interface.

F. Permit fees shall be provided in the base bid. The 15300 Contractor shall furnish the Owner with a copy of all official documents and written correspondence associated with permits.

1.6 DEFINITIONS

A. The following are references with definition acronyms used in this section:

1. U.L. - Underwriters Laboratory Listed for Fire Protection Systems.

2. F.M. – FM Global or Factory Mutual Research.
3. IRI - Industrial Risk Insurors (aka: F.I.A. Factory Insurance Association.)
4. NFPA - National Fire Protection Association.
5. Jurisdictional Agencies:

    a. Building Department.
    b. Fire Department or Fire Prevention Bureau or Marshal.
    c. Insurance Agency, Carrier, and/or Underwriter as defined in Section 1.7.

6. Engineer refers to the consulting Mechanical Engineer of record.
7. Pipe sizes used in this Specification are Nominal Pipe Size (NPS).
8. Other definitions for fire protection systems are listed in NFPA 13.
9. Working Plans as used in this Section mean those documents (including drawings and calculations) prepared pursuant to the requirements contained in NFPA 13 for obtaining approval of the authority having jurisdiction.
10. Review and Approval will be only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents and shall not extend to means, methods, techniques, sequences or procedures of construction (except where a specific means, method, technique, sequence or procedure of construction is indicated in or required by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

1.7 SYSTEM DESIGN REQUIREMENTS

A. Sprinkler System Requirements:

1. Provide a freeze-protected sprinkler system using dry sprinkler heads or charged with U.S.P. glycerin or propylene glycol to protect vestibules, entry canopy, and similar areas subject to freezing.
2. Provide a wet pipe sprinkler system to protect all other areas of the building, addition, and similar areas as required by code.

B. Occupancy hazard classifications shall be determined in accordance with NFPA 13 unless higher hazard classifications are indicated on the drawings or required by insurance underwriter or jurisdictional authority.

C. Fire protection shall be designed and installed per NFPA 13 and NFPA 14 current published standards and local Jurisdictional Agency requirements. Where a conflict occurs the more stringent standard shall apply.

D. Verify requirements with Jurisdictional authorities, i.e.: Insurance Co. or Underwriter (when specified above), Fire Department or Marshal, or Building Department. Provide system complete, functional and acceptable to Jurisdictions without penalty of any type to the insurance premium rate. Division 15300 Contractor shall coordinate his work with all other sections of these specifications and drawings. No change order will be issued for lack of coordination or lack of verification of requirements of Jurisdictional Authorities.

E. System shall be hydraulically calculated per Jurisdictional Agency Standards.

F. All calculations shall include flow test results. Flow tests shall be performed by this Contractor and submitted to the Fire Department. Prior flow tests on file with jurisdictional agencies may be used in lieu of new flow tests only when previous test has been made within 3 months of project start date.

G. The system shall be designed to account for seasonal changes and for future degradation of the water supply system, using previous seasonal flow tests from the water utility to determine the expected range of pressure fluctuation at the project site.

H. Be responsible for accurate measurements, coordination with other trades, required offsets, scheduling, timely submittals, material delivery, job manning, and conformance to construction schedules.

I. Provide backflow protection in accordance with jurisdictional requirements. Verification as to acceptance by jurisdictional authority and fire insurance underwriter shall be the responsibility of this Contractor.

J. All areas shall be classified in accordance with NFPA 13 with respect to hazard classification and shall have automatic sprinkler systems designed for the appropriate classification.

K. Fire Protection Contractor shall furnish and install all alarm and supervisory switches or devices required for the automatic sprinkler system, installed so as to provide an electrically supervised system.

L. The number and location of fire department connections shall be coordinated with the Architect and local Fire Department. The fire department connections shall be piped directly into the building fire protection loop or standpipe system.

M. Each sprinkler riser control valve shall be equipped with a valve supervisory switch and a waterflow switch on piping down stream of the last control valve. Drain piping for each fire protection riser shall be sized and located to accommodate full flow from the main drain under normal system pressure.

N. When project is located within a seismic zone which is subject to earthquakes, sprinkler systems shall be protected per NFPA 13 to prevent breakage.

1.8 QUALITY ASSURANCE

A. The firm, company, corporation, or partnership producing and providing the material and labor of this Section shall have at least 3 years experience performing scope of work described and required by these Contract Documents.

B. Acceptable Fire Protection Contractors meeting the above requirements are as follows:

1. Delta Fire Protection, Salt Lake City, UT

2. Alta Fire Protection, Salt Lake City, UT
3. Fire Engineering Company, Salt Lake City, UT
4. Chaparral Fire Protection, Salt Lake City, UT
5. Firetrol Protection Systems, Salt Lake City, UT
6. Grinnell Fire Protection, Salt Lake City, UT
7. Western Automatic Sprinkler, Salt Lake City, UT
8. Preferred Fire Protection Company, Salt Lake City, UT
9. Aurora Fire Protection, Salt Lake City, UT

C. Contractors not listed must submit for acceptance 10 calendar days prior to bid date. Proof of prior experience for Contractors not listed shall be submitted to the Engineer in writing, giving total and complete information of dates, name, address of owner, and location of all projects completed during past 3 years with specific references as to Engineers, and prime contractors involved. List names of companies, phone numbers and project manager's name.

D. Codes and Standards:

1. All work shall conform to the requirements of the following NFPA Standards and Recommended Practices as appropriate for the type of service except as specifically noted in each Section:

   a. "Installation of Sprinkler Systems", NFPA 13 - 2002 Edition.
   b. "Installation of Standpipe and Hose Systems", NFPA 14 - 2002 Edition.
   c. "Installation of Fire Pumps", NFPA 20 - 2002 Edition.
   d. "National Electrical Code", NFPA 70 - 2002 Edition.
   e. "National Fire Alarm Code", NFPA 72 - 2002 Edition.
   f. "Inspection, Maintenance and Testing of Water- Based Suppression Systems", NFPA 25 - 2002 Edition.

2. All building construction work shall conform to the 2006 International Building Code and 2006 International Fire Code.
3. All work shall conform to the federal, state and local regulations governing this installation.
4. Should any conflicts occur between any code or standard, the most stringent requirement(s) shall apply.
5. The Fire Protection Contractor shall be subject to the interpretation of statutory requirements by the local Fire Department. Acceptance of the completed systems by the local Fire Department is required.

1.9 TECHNICAL SUBMITTALS

A. Timely submittals are essential to on-time completion of the project. The Owner will incur no obligation to extend the contract completion date, or to reduce or waive any liquidated damages due, as a result of the Fire Protection Contractor's failure to provide the specified submittals in a timely and acceptable fashion.

B. The information shown on each technical submittal shall be complete with respect to quantities, dimensions, specified performance and design criteria, products, materials, and similar data to enable the Owner, Engineer and Architect to review the information as required. Only complete submittals will be reviewed. Incomplete submittals will be rejected and returned to the Fire Protection Contractor without being reviewed.

C. Each technical submittal shall include a cover letter providing a description of each variation that the submittal may have from the requirements of the Contract Documents. In addition, the Fire Protection Contractor shall provide specific notation on each Working Plan, sample, catalog cut, data sheet, installation manual, etc. submitted for review and approval, of each such variation.

D. No construction or installation will be authorized until the required submittals are received and reviewed by the Owner, Engineer, and Architect. Any construction or installation performed without written authorization from the Owner shall be entirely at the Fire Protection Contractor's own risk.

E. The required Technical Submittals for all systems and equipment installed in accordance with these specifications include:

1. Working Plans, per NFPA 13.
2. Water Supply Information, per NFPA 13.
3. Hydraulic Calculations, per NFPA 13.
4. Operation and Maintenance Manual.
5. Test Protocols.
6. Fire Protection Contractor’s Material & Test Certificates for Aboveground Piping and for Underground Piping, per NFPA 13.
7. Record Drawings.

F. Provide six copies of each required Working Plan, manufacturer’s data sheet, water supply information, hydraulic calculations, and test protocol submittal within 60 days of award of contract.

G. Provide two copies of each required Operation and Maintenance Manual, Material & Test Certificates, and Record Drawing submittal a minimum of 10 working days prior to final acceptance testing.

H. All drawings and diagrams shall be CAD generated using AutoCAD Version 2004, prepared on drawing sheets 30" x 42" in size, and shall contain no extraneous information. Marked up copies of catalog data sheets or manufacturer’s “typical” diagrams are not acceptable in lieu of the required drawings or diagrams. All other information required for this submittal shall be submitted in one or more appropriately labeled and indexed 3-ring binders.

I. All drawings and diagrams shall include the Fire Protection Contractor's title block, complete with drawing title, Fire Protection Contractor's name, address, date (including revisions), and preparer's and reviewer’s initials.

J. Upon approval of the Working Plans, including completion of any required revisions, the Fire Protection Contractor shall provide one (1) complete, reproducible set and three blueline sets for the Owner, Engineer, and Architect's use in performing field observations during construction.

K. Working Plans for sprinkler systems shall be complete and in full accordance with NFPA 13 Chapter on Plans and Calculations.

1. All drawings and calculations shall be reviewed and accepted by the jurisidictional fire department, building department fire marshal, as applicable, and the insurance carrier or insurance reviewing authority prior to submitting to the Engineer. Indication of review and acceptance by all agencies, as appropriate, shall be certified by name of reviewer, agency, and date affixed to the plans or reproducibles submitted to the Engineer. None will be accepted or reviewed until compliance with these terms has been established.

L. Operation and Maintenance Manuals shall be prepared specifically for this project and bound in an indexed 3-ring binder, containing:

1. A detailed description of routine maintenance and testing as required and recommended and as would be provided under a maintenance contract, including a testing and maintenance schedule and detailed testing and maintenance instructions for each type of device installed. This description shall include:

   a. A listing of the individual system components that require periodic testing and maintenance.
   b. Step-by-step instructions detailing the requisite testing and maintenance procedures and the intervals at which those procedures should be performed, for each type of device installed. These instructions shall include copies of NFPA 25 - Inspection, Testing and Maintenance of Water-Based Fire Protection Systems and NFPA 72 - National Fire Alarm Code.

2. A schedule, which correlates the step-by-step testing and maintenance procedures with the listing of individual components. This schedule shall be completed for the duration of the warranty period or for one complete testing/maintenance cycle whichever is longer.
3. A service directory, including installing company's name and telephone numbers for whoever should be called to obtain both normal warranty service and 24-hour emergency service.
4. Drawings and diagrams, as required.
5. System Calculations.
6. Test reports for system, flow rates, and residual pressures.
7. Certified pump curves (all pumps).
8. Wiring diagrams for all system devices.

M. Upon completion of the installation, submit Record Drawings and Contractor's Material & Test Certificates for Aboveground Piping and for Underground Piping, per NFPA 13.

N. Record Drawings shall include all variations from the approved Working Plans, for whatever reason, including those occasioned by modifications, change orders, optional materials and/or required coordination between trades. Variations shall be indicated in sufficient detail to accurately reflect the as-built conditions. Upon completion of the work, before final acceptance, the Fire Protection Contractor shall deliver to the Owner, two (2) additional full size sets of blue lines, one (1) set of reproducible record drawings and one set of AutoCAD drawing data files.

1.10 PROJECT CONDITIONS

A. Contractor shall not install any piping until he has assured himself that the piping can be run as contemplated in cooperation with Contractors of other Divisions of the Work and the physical constraints of the Structural and Architectural Work.

1.11 WARRANTIES

A. Provide original copies of all warranties and extended warranties for specific equipment where specified and in accordance with Section 15010.

PART 2 - PRODUCTS

2.1 PRODUCT LISTINGS AND APPROVALS

A. All system components for which UL listings categories exist shall be listed by Underwriters Laboratories (UL) or Factory Mutual Research (FM).

1. All components shall be listed in the current edition of the UL Fire Protection Equipment Directory. Components shall be delivered to the project site with factory applied UL stickers.
2. Components for which UL listing approvals are “pending” are not acceptable.

B. All system components shall be used in accordance with the manufacturer’s recommendations and their listing.

C. All system components are subject to the approval of the engineer with regard to their fitness for the intended application.

2.2 UNDERGROUND EXTERIOR PIPING

A. Pipe, Fittings and Joints, Exterior and Buried:

1. General: The use of cast-iron, asbestos cement, steel, or other piping materials and systems is prohibited, unless specifically accepted by the Engineer.

2. Pipe Fittings and Joints:

a. Ductile iron pipe with mechanical joint fittings. Joints to be provided with set screw retainer glands.

Make:	U.S. Pipe Company
Size:	2" thru 48"
Laying Condition:	Type 1
Thickness Class:	50 or 51 as required by U.S. Pipe.
Standards:	ANSI A21.SD/A21.51 AWWA C-150/151, U.L., F.M., NSF.
Pressure Rating:	250 psi
Fittings:	Ductile iron conforming to ANSI A21.10/A21.16 and AWWA C-110/111.
Retaining Glands:	Set screw type ductile.
Hydrant Connections:	Tee DI rotatable x MJ Hydrant Connector. DI rotatable 13" long x MJ

3. Polyvinylchloride pipe with mechanical joint, ductile fittings, and joint restraints:

Make:	Manville "Blue Brute".
Size:	4" thru 12"
Laying Condition:	Type 1 as defined by U.S. Pipe Co.
Class:	200 (DR 14) as determined by dia. of pipe O.D. divided by the wall thickness (SDR method) conforming to ASTM D-1599 burst test (985 psi minimum) and minimum 100 ft-lbs of impact per ASTM D-2444. Meet all requirements of AWWA C-900, U.L., F.M., and N.S.F.
Pressure Rating:	200 psi minimum operating @ 73 deg. F
Fittings:	Ductile iron conforming to ANSI A21.10/A21.11 and AWWA C-110/111 Mechanical Joint pattern only.
Retaining Glands:	Do not use set screw retaining glands on this pipe. Use felt padded pipe clamps, coated rods, and concrete thrust blocks for all turns, offsets, and fittings.

Note: Straight lengths of piping, not offset or deflected, may be J-M "Ring Tite" locked joints in lieu of mechanical joint ductile iron connectors or fittings.

4. Fiberglass reinforced PVC pipe with mechanical joint ductile iron fittings, for use where pressures exceed 200 psi up to 350 psi:

Make:	Manville "Blue Brute".
Size:	4" thru 12"
Laying Condition:	Type 1 as defined by U.S. Pipe Co.
Class:	350 (4"=DR 32, 6" & 8"=DR 36, 10" & 12"=DR 41)
Pressure Rating:	350 psi minimum operating @ 73 deg. F
Fittings:	Ductile iron conforming to ANSI A21.10/A21.11 and AWWA C-110/111 Mechanical Joint pattern.
Retaining Glands:	Do not use set screw retaining glands on this pipe. Use felt padded pipe clamps and coated rods and concrete thrust blocks for all turns, offsets, and fittings.

Note: Straight lengths of piping not offset or deflected may be J-M "Lock-ring" joints in lieu of mechanical joint fittings or connectors.

5. Rotatable Fittings:

   a. Provide for all service risers, fire hydrants and valves, U.S. Pipe Company U-591 and U-592 MJ x PE or rotatable MJ gland tees and connecting pieces to provide plumb and true hydrant, valve and service riser settings.

B. Tapping Tees and Valves:

1. Where the water utility does not install its own service tap, provide tapping tees and valves for wet taps. Provide service saddle, valve, and service box with indexed cover in accordance with the utility’s standards.

C. Backflow Preventer: Provide backflow preventer in accessible free draining pit or vault, or above ground in heated enclosure or area, or above ground heat traced with self regulating cable, in accordance with Section 15050.

1. Double check assembly, U.L. Classified, FM Approved, with shut-off valves. Ames C200, or approved equal.
2. Reduced pressure assembly, U.L. Classified, FM Approved, with shut-off valves. Ames C400, or approved equal.

D. Thrust Blocks - Tie Rods:

1. Provide 3000 lb type II concrete thrust blocks with soil contact area based on not more than 2000 psf horizontal soil bearing quality, and enveloping 1/2 of pipe, fitting, or valve. Provide saddle reinforcing as required.
2. Submit calculations for each thrust block and dead man provided. Provide 1/2" minimum machine thread rods and clamps (felt padded clamps for plastic pipe) on all service entries from last joint underground to riser elbow or wall entry and to first joint in the building. All rods, clamps, and bolts double coated

with "ZRC" brand cold galvanizing coating after installation and draw up. Provide 1 coat of coal tar coating over galvanizing. NOTE: Clamps and rods to not preclude the requirements for thrust blocks or deadmen.

2.3 SOLVENTS FOR PLASTIC PIPING

A. Solvents for plastic piping joints shall be certified to meet SCAQMD Rule 1168/316A. This includes but is not limited to PVC, CPVC, and ABS piping, all grades and sizes.

2.4 INTERIOR AND EXTERIOR ABOVE-GROUND PIPING

A. Pipe and Joints:

1. Black steel and galvanized steel threaded or roll grooved schedule 40 conforming to ASTM A-135 or A-53. Light wall (Schedule 10) conforming to ASTM A-135 or ASTM A-795, where prior approval is obtained from Owner and jurisdiction having authority. All pipe shall conform to NFPA #13, Chapter 3 and Jurisdictional Authorities and Insurance Agency. Where required to meet insurance agency or jurisdictional requirements, all dry pipe system and drain piping shall be galvanized.

B. Fittings:

1. Threaded cast iron, pressure class in accordance with developed system pressures, conforming to ASME B16.4. Threaded malleable iron, pressure class in accordance with developed system pressures, conforming to ASME B16.3.
2. Weld type fittings: Buttweld conforming to ASME B16.9. Flanges conforming to ASME B16.25. Socket weld conforming to ASME B16.11. All welds by certified welder in accordance with Section 15050.
3. Grooved fittings shall conform to ASTM-A47 (malleable), ASTM 536 (ductile), or ASTM-106 GRB (forged steel), ASTM A-53 type E, F, or S GRB (nipples), ASME B-16.5 or B16.1 cast iron and carbon steel flanges.

C. Valves:

1. All valves are to be indicating type.
2. All valves U.L. listed, F.M. approved.
3. Refer to Section 15050 for valve specifications.

D. Hangers:

1. All hangers, attachments and components U.L. listed, F.M. approved.
2. All piping hangers shall conform to Jurisdictional Authorities requirements.
3. Powder driven studs shall not be included in normal installation. Permission to use this type anchoring system must be accepted by the Structural Engineer prior to submitting pricing or bids to any contractor or agent relative to this project.

2.5 SPRINKLER SYSTEM

A. Acceptable Manufacturers: The following manufacturers are acceptable, providing the product to be considered is equivalent in every respect to the nomenclature, style, material, finish, and color provided by the specified make and model.

1. Sprinkler Heads, Alarm, Dry and Deluge Valves, Accelerators, Detector Check Valves, Water Motor Gongs, Air Maintenance Devices, Sprinkler Emergency Cabinets, and Specialties: Reliable, Viking, Notifier, Victaulic, Croker, Potter, Elkhart, Tyco.

B. Sprinkler Heads:

Heads shall be U.L. Listed and of the type required to properly protect the intended space. Heads shall be of ordinary-temperature classification except as required by ceiling temperature, location, or service as allowed or required by code. Provide quick-response heads in all light hazard occupancies.

LOCATION	**ORIENTATION**	**HEAD FINISH**	**COVER OR ESCUTCHEON**
Areas with Hard Ceilings	Recessed	Chrome	White
Open Areas (No Ceilings)	Upright/Pendant	Brass	-
Vestiburles/Canopies	Dry	Brass	Chrome

C. Escutcheons shall be part of the U.L. Listed sprinkler assembly.

D. Sprinkler Head Cabinets:

1. Steel with red enamel finish for 6, 12, or 24 heads complete with appropriate heads, wrench and mounting.

E. Sprinkler Head Guard:

1. Steel wire cage, chrome finish.

F. Water Flow and Pressure Switches:

1. Paddle Type Flow Switch U.L. Listed, for pipe sizes 1" thru 8", for vertical or horizontal mounting, retard adjustment from 0 to 70 seconds instantly recycling, 10 amp, 120v AC, dual contacts. Notifier Model WFD, or approved equal.
2. Pressure Switch for dry, deluge, alarm, and pre-action valves, U.L. Listed, 10 amp, 120v AC, dual contacts. Potter Model PS40A, or approved equal.

G. Supervisory Switches:

1. Post indicator valve, and gear operator type, U.L. Listed, weatherproof metal housing, threaded conduit entrance, 10 amp, 120v AC, dual contacts. Notifier Model PIBV2, or approved equal.
2. Gate, OS&Y, and other valves, U.L. Listed, weatherproof metal housing, threaded conduit entrance, 10 amp, 120v AC, dual contacts. Notifier Model OSY2, or approved equal.

H. Alarms:

1. Exterior Audible and Visual Alarm, U.L. Listed for outdoor use, weatherproof faceplate, horn and strobe. Notifier Model GMS, or approved equal.

   Water Motor Gong, U.L. Listed, outdoor wall mounted, weatherproof metal housing and gong, red finish, inlet strainer. Central Model F-2, or approved equal.

2.6 FIRE DEPARTMENT CONNECTION - INLET (SIAMESE)

A. Cast brass, single clapper, straight or angle style as indicated. Provide siamese connections of sizes, styles and patterns required, caps and chains, and wall plate.

B. Style: Exposed.

C. Finish: Rough Chrome.

2.7 WALL HYDRANT CONNECTION - OUTLET

A. Cast Brass, flush type. Provide wall hydrant outlets of sizes, styles, and pattern required with inlet control valve and valve access.

B. Finish: Cast Brass.

C. Provide Index Plates "Wall Hydrant" - "Wall Hydrant Control Valve" as required.

PART 3 - EXECUTION

3.1 PREPARATION

A. Field Measurements: Verify all dimensions before proceeding with the work. Obtain field measurements for work required to be accurately fitted to other construction. Be responsible for the accuracy of such measurements and precise fitting and assembly of finished work. Prefabrication of systems is done at this Contractor's own risk.

B. Coordination: Coordinate all work and placement of components with other trades, thorough coordination of design and field installation is expected. Remedial field work may be required to eliminate conflicts and provide an acceptable finished product.

3.2 EXCAVATION, BACKFILL, CUTS AND RESTORATION

A. Provide all excavations and backfill in accordance with Section 15050 - Basic Mechanical Materials and Methods.

B. Cuts - Restoration:

1. All concrete, asphalt, or other hard permanent surface shall be saw cut. Turf areas shall be cut clean with straight edge.
2. Restore all planted, paved, and surfaced areas to original color, texture and condition, replanting where necessary and left in the same or better condition as was found existing.

3.3 INSTALLATION

A. General: Provide a complete operable system designed and installed in accordance with applicable local, state, federal and jurisdictional codes, enforcement agencies and insurance rating or underwriting agencies.

B. All systems shall be drainable with proper drainage devices, and drain terminations either to exterior of building or to proper receptacles within building.

C. All systems shall be supported and braced for conformance to proper and applicable standards.

D. Care shall be taken with chrome plated or other polished finish components so that marring does not occur to the finish, and installation provides for a uniform pattern and true installation.

E. Where piping passes thru masonry units or concrete walls or floors or other building construction, sleeves may be used. Where exposed piping passes thru finished work, chrome plated, or other finish acceptable to Architect, split wall plates or escutcheons shall be installed to fit snugly around piping. Where rated walls are penetrated, approved safing shall be provided at each hole to assure effectiveness of construction as a fire stop.

F. All openings for piping should be anticipated and coordinated with General Contractor. Indicate such openings on the shop drawings. Any additional cutting of openings must be coordinated with the General Contractor.

G. Contractor shall complete the automatic fire sprinkler ready for operation, in all respects, as soon as possible. When system is complete and ready for continuous operation, activate the system for its intended use. After system has been activated for continuous use, water charges, if any will be paid for by the Owner.

H. Use no face bushings.

I. Provide seismic restraints in accordance with Jurisdictional Agencies.

J. The sprinkler piping shall be concealed from view in all common and public areas with a finished ceiling. Exposed piping shall be cleaned and left ready for painting by others.

K. Provide seismic separation assembly in accordance with NFPA 13 where pipes cross building seismic separation joints or expansion joints.

3.4 PERFORMANCE

A. General: Systems shall be engineered and designed for proper densities, ease of maintenance and accessibility. Final main drain flow tests shall be made to prove system design and installation.

3.5 CLEANING

A. General: Flush all systems free of all debris and certify system clean and ready for use.

3.6 TESTING AND CERTIFICATE OF COMPLETION

A. The entire system shall be hydrostatically tested at not less than 200 psig for not less than 2 hours with 0 psig pressure drop. Tests shall be witnessed by the Architect's or General Contractor’s representative - mandatory.

B. Obtain certificate of compliance and completion for jurisdictional agencies, as applicable and present to Owner - mandatory.

END OF SECTION 15300

SECTION 15410 - PLUMBING PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Water Piping.

B. Soil, Waste and Vent Piping.

C. Storm Water Piping.

D. Testing.

1.2 PRODUCTS INSTALLED BUT NOT FURNISHED IN THIS SECTION

A. Solenoid valves for evaporative cooling systems specified in Section 15851 - Air Handling Systems on Roof.

1.3 RELATED REQUIREMENTS

A. The General Conditions, Supplementary Conditions and Division 1, General Requirements apply to this Section, and Contractor shall review and adhere to all requirements of these documents.

B. Section 15010 - Basic Mechanical Requirements.

1.4 RELATED SECTIONS

A. Section 15050 - Basic Mechanical Materials and Methods.

B. Section 15240 - Mechanical Sound and Vibration Control.

C. Section 15241 - Mechanical Seismic Control.

D. Section 15250 - Mechanical Insulation.

E. Section 15411 - Disinfecting Water Supply System.

F. Section 15430 - Plumbing Specialties.

G. Section 15440 – Plumbing Fixtures.

H. Section 15450 – Plumbing Equipment.

1.5 SUBMITTALS

A. Submit Product Data for the following items under provisions of the General Conditions of the Contract:

1. Water Piping, Fittings, and Joints.

PART 2 - PRODUCTS

2.1 WATER PIPE, TUBE, FITTINGS AND JOINTS

A. Exterior Buried:

1. Copper Tube, Fittings, and Joint Material:

a. Copper tube ASTM B88 Type K shall be brazed to wrought or cast fittings using AWS class BCuP brazing filler metal.
b. Wrought copper and bronze solder joint fittings shall conform to ANSI B16.22.
c. Cast bronze solder joint fittings shall conform to ANSI B16.18.

2. Cast Iron Pipe Fittings and Joints:

a. Gray cast iron pipe, centrifugally cast, 18/40 physicals, cement lined, mechanical joint, thickness class 23 minimum. 300 psi minimum working pressure "laying condition A" as designated by USA Standard A21.1 and 8 foot bury.
b. Mechanical joints and fittings shall be furnished with set screw retaining glands and shall conform to ANSI/AWWA C110/A21.10 and ANSI/AWWA C111/A21.11.
c. Mechanical joint fittings shall be Ductile Iron, 350 psi working pressure up to 24" size.

3. Ductile Iron Pipe Fittings and Joints:

a. Class 150, ductile iron pipe centrifugally cast, thickness class 2, cement lined, mechanical joint, 350 psi minimum working pressure "laying condition A" as designated by USA Standard A21.51 and 8 foot bury.
b. Mechanical joints and fittings shall be furnished with set screw retaining glands and shall conform to ANSI/AWWA C110/A21.10 and ANSI/AWWA C111/A21.11.

4. Polyvinylchloride Water Pipe, Fittings, and Joints:

a. Rigid polyvinylchloride (PVC) pipe for potable water systems shall conform with NSF Standards #14 and #61. NSF pw logo shall be affixed (printed or molded) on all pipe fittings and joining materials. Materials

shall meet requirements of cell classification 12454-A or -B per ASTM D-1784.

b. Pipe to be IPS size conforming to ASTM D 2241, be provided with integral bell end steel reinforced gasket and comply with ASTM D 3139.

c. Pipe markings shall include nominal and O.D. base sizes, PVC 1120, DR 21, AWWA pressure class 200, ASTM D 2241, manufacturer name or trademark, production code, and NSF seal, AWWA C-900, UL as appropriate.

d. Certified 800 psi test, in accordance with AWWA loading criteria, must be furnished to the Engineer for supplied pipe.

e. Solvent cement to be low volatile organic compound (VOC) to meet South Coast Air Quality Management District (SCAQMD) Rule #1168. Product: IPS Weld-On #2700 or equal.

B. Interior Buried:

1. Provide type K annealed (soft) copper water tube conforming to ASTM B-88 with 95% tin 5% antimony solder joints using wrought fittings. No joints below grade. Provide continuous tube for all buried tubing using tube bends in lieu of fittings. Exterior tube may be coupled where requirements are in excess of standard mill lengths by using wrought pressure couplings with stops and silver solder brazed Joints. Lengths coupled in this manner, where necessary and acceptable to the Engineer, will meet the intent of the no fitting requirement of this Specification. Interior buried tube shall meet the same criteria and requirements.

C. Interior Tube Supported by Hangers and Clamps:

1. Provide ASTM B88 Type L hard drawn copper tube for all water distribution piping inside building/structure, with wrought copper fittings and couplers up to 6", cast brass or bronze fittings and couplers for sizes 6" and larger. Joints shall be made with 95-5 Class SnSb solder or Victaulic CTS roll-grooved couplers and fittings for 3” and larger tube.

2.2 SOIL DRAIN WASTE, VENT AND STORM PIPE FITTINGS AND JOINTS

A. General:

1. Cast iron pipe centrifugally cast service weight (SV) soil pipe with cast iron drainage fittings. Joint materials and systems may be hub and spigot with neoprene gaskets and lubricant conforming to ASA-021 and ASTM C-564 SV pattern. Gaskets shall be equal to U.S. Pipe Company Veri-tite conforming to ASTM-C564 and CISPI HSN75 and be certified in writing to the Engineer that the following criteria has been met, thru testing by a recognized independent testing laboratory.

Criteria: Sizes 2" thru 6" shall withstand 15 psig hydrostatic pressure for 10 minutes with <u>unrestrained</u> joints, and no leakage, and using restrained joints must be able to withstand 25 psig air pressure and 40 psig hydrostatic pressure with no

leakage. Offset joints shall withstand 1056 pounds of horizontal force without joint separation or detectable leakage.

B. Buried Pipe:

1. Provide SV hub and spigot cast iron pipe and fittings to 5'-0" beyond building excavation line, continue past this point with SV cast iron or XS vitrified clay to termination points with hub and spigot joints. At Contractor's option and where approved by local jurisdiction, No-Hub standard weight cast iron pipe with either M-G couplings or heavy-duty stainless steel shielded couplings may be used in lieu of hub and spigot with Ty-Seal neoprene gaskets. The heavy-duty shielded couplings shall comply with ASTM C1540, with ASTM C564 neoprene gaskets, minimum 0.008" stainless steel shields with transverse corrugations across longitudinal corrugations, standard 304 stainless steel clamps and 305 stainless steel screws. Entire assembly shall be suitable for direct burial, be corrosion resistant, and accommodate pipe deflection.

C. Interior Pipe Supported By Hangers and Clamps:

1. Provide S.V. cast iron pipe No Hub System using hubless cast iron soil pipe couplings certified to withstand a minimum of 50 psi internal pressure. Where stack pressures may theoretically exceed 50 psi, use clamp all couplings with restrained joints horizontal and vertical up to 80 psig. For pressures above 80 psi, use Schedule 40 ASTM A-120 galvanized steel pipe with threaded cast iron drainage fittings. Roll grooved schedule 40 pipe with Victaulic Style 77M galvanized couplers may be used on horizontal and vertical stacks and mains. Use Teflon tape or compound for all threaded joint make-up.
2. Sump pump discharge from the pump to the point the waste stream flows continuously via gravity shall be Schedule 40 galvanized steel pipe with NPT threaded joints and fittings.
3. Copper Waste, Vent and Soil Pipe and Fittings shall be prohibited on this project.

PART 3 - EXECUTION

3.1 WATER TUBE, FITTINGS AND JOINTS

A. General:

1. All copper tube and fittings shall be reamed and buffed prior to soldering or brazing.
2. The use of lead solder of any class, for joint make-up or back-up for finishing is prohibited.
3. Refer and conform to the Copper Development Association instructions for proper preparation and actual installation practice for all soldered and brazed joints.
4. Support water tube in accordance with Section 15050.
5. Pull tee (T-drill) fittings are forbidden.

3.2 SOIL, DRAIN, WASTE, VENT AND STORM PIPE FITTINGS AND JOINTS

A. General:

1. Provide bedding, restraints and hangers as appropriate and in accordance with manufacturers recommendations based upon type of pipe, fittings, joints, and bury depth using final finished grading as the basis.
2. Piping shall be run true, plumb, and straight, with all restraints and hangers adjusted to carry their proportional load and locked to prevent pipe "wag" misalignment, movement or shear.
3. Provide anchors for piping risers on every floor using riser clamps, wall brackets, knee brackets, and foot blocks for all vertical piping over 20 feet straight height.
4. Furnish and install all soil, waste and vent piping for the complete sanitary system in accordance with jurisdictional code requirements.
5. All soil and waste piping shall be run at the following minimum slope unless otherwise indicated on drawings.

Slope of Horizontal Drainage Pipe	
Size (In.)	Min. Slope (In./Ft.)
2-1/2 or less	1/4
3 to 6	1/8
8 or larger	1/16

6. Bushings in soil waste or vent piping shall be prohibited. Tapped spigots or tees shall be used when changing from cast iron pipe to steel waste or vent piping, and for appropriate cleanout plugs.
7. Vertical Piping: All vertical soil and vent stacks shall be supported with riser clamps at each floor slab. When soil stacks over two stories in height terminate at the bottom on slab fill or native soil, provide stack base elbows set on 24" x 24" x 8" thick minimum poured reinforced concrete pads set directly on undisturbed native soil or fill compacted to same density as undisturbed earth.
8. Horizontal Piping (suspended):

   a. Supports - Horizontal piping shall be supported at sufficiently close intervals to keep it in alignment and prevent sagging.
   b. Cast iron soil pipe - Where joints occur, suspended cast iron soil pipe shall be supported at not more than five (5) foot intervals; except that pipe exceeding five (5) feet in length, may be supported at not more than ten (10) foot intervals. Supports shall be adequate to maintain alignment and prevent sagging and shall be placed within eighteen (18) inches of the hub or joint. Hubless or compression gasket joints must be supported at least at every other joint except that when the developed length between supports exceeds four (4) feet, they shall be provided at each joint. Supports shall also be provided at each horizontal branch connection. Supports shall be placed on or immediately adjacent to the coupling. Suspended lines shall be suitably braced to prevent horizontal movement.

c. Threaded pipe - Threaded pipe (IPS), shall be supported in accordance with Section 15050.
d. Rigid support sway bracing shall be provided at changes in direction greater than 45 degrees for pipe sizes 4 inches and larger.
e. For pipe sizes greater than 4 inches, axial restraints shall be provided for drain pipes at all changes in direction and at all changes in diameter greater than two pipe sizes.

9. The waste connections between fixtures and their respective collection and venting systems shall consist of galvanized steel nipples and cast iron drainage fittings.
10. All interior waste, soil, and vent piping up to 1-1/2" shall consist of galvanized steel with cast iron drainage fittings, all piping 1-1/2" and over shall consist of S.V. cast iron soil pipe and fittings.
11. All pipe and fittings shall have affixed thereon the CISPI grade mark of identification.
12. All vents shall be installed through the roof of at least the minimum size as required by jurisdictional code and shall be cast iron.
13. All vents protruding through the roof shall be not less than 2" size and extended to not less than 12 inches above the finished roof. Vents through built-up roofing shall be flashed with 24" x 24" x 4 lb. sheet lead. The flashing shall extend to top of vent and the edges turned down into a cast iron vent pipe. Single ply rubberized roofing systems shall be flashed around vent with top edge of roofing clamped to vent pipe and sealed with compatible sealant.
14. All vents shall be located in accordance with jurisdictional code and in no case less than two (2) feet from roof edge or parapet, or wall line of an "on the roof structure". Vent terminations shall not occur within twenty-five (25) feet of any outside air intake.
15. Provide all expansion joints, braces, earthquake restraints as required by the contract documents (Section 15241) and jurisdictional authority.
16. Buried No-Hub fittings shall <u>not</u> be allowed on this project.

3.3 PROHIBITED PIPE ROUTING

A. Plumbing piping, regardless of contents (water, sewer, vent, etc.) shall <u>not</u> be routed through or above the following locations:

1. Electrical panel rooms
2. Electrical switch gear rooms
3. Electrical transformer rooms
4. File Server Rooms / MDF / IDF

B. Should there be a conflict with the plans and the above paragraph, notify the Engineer immediately for corrective action prior to starting work.

3.4 TESTING

A. Schedule of Testing:

Service	Allowable Test Methods H_2O	CA	N_2	V	Minimum Test Pressure (psig)	Minimum Test Period (minutes)	Allowable Pressure Variance (psig)
1. Potable Water Pipe	X				125	60	-0-
Valves & Fittings		X			100	60	+1/2
2. Sanitary, Storm & Acid Waste and Vent System:							
*Stack Height:							
0-23 FT.	X				10	30	-0-
24-34 FT.	X				15	30	-0-
35-46 FT.	X				20	20	-0-
47-57 FT.	X				25	20	-0-
58-69 FT.	X				30	10	-0-
70-80 FT.	X				35	10	-0-
81-92 FT.	X				40	10	-0-
93-103 FT.	X				45	10	-0-
Over 104 FT.	X				50	10	-0-
3. Compressed Air:							
Single Stage Compressor		X	X		100	30	+ 1/2
Two Stage Compressor		X	X		200	30	+ 1/2
4. Vacuum:				X	-7.4 (15"Hg)	30	-0-
5. Distilled and Deionized			X		60	30	-0-

B. Testing connections for hydrostatic tests shall be made at the base of the system, CA, N2 and vacuum testing can be made from connections anywhere in the system tested.

C. In the event that tests fail, use a standard soap and brush inspection using "Trouble Bubble" Liquid high density soap as manufactured by Jersey Meter Co., Patterson N.J. Formula ST-1. After source of failure is discovered, correct and retest system. Repeat procedure until system sustains required testing successfully.

D. Testing contractor shall give at least 16 working hours notice to the General Contractor/Construction Manager so that arrangements for witnessing tests can be made. The General Contractor/Construction Manager shall witness and SIGN the required test form.

E. All joints, valves, fittings and piping accessory items shall be exposed to view during tests whether pipe is above or below ground. "Closed in" or "Buried" piping shall be re-exposed during testing.

F. Proper restraining of piping and test plugs shall be accomplished prior to test.

END OF SECTION 15410

SECTION 15411 - DISINFECTING WATER SUPPLY SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Disinfection of Domestic Water Supply System.

1.2 RELATED WORK

A. Requirements: Provide Disinfecting Water Supply System in accordance with the Contract Documents.

B. Section 15010 - Basic Mechanical Requirements.

C. Section 15410 - Plumbing Piping.

1.3 DEFINITIONS

A. Disinfectant residual means the quantity of disinfectant in treated water.

B. pH factor means the measure of alkalinity and acidity in water.

C. ppm means parts per million.

1.4 CONTRACTOR'S QUALIFICATIONS

A. Water Treatment Contractor: At least three years experience performing work specified herein.

B. Bacteriological Laboratory: Certified by Serving Water Board or District and be in compliance with the State and U.S. Safe Drinking Water Act.

1.5 REGULATORY AGENCY REQUIREMENTS

A. Comply with requirements of Local and State Regulations.

1.6 SUBMITTALS

A. Submit for review and acceptance the following items under provisions of the General Conditions of the Contract:

1. Water treatment contractor's evidence of experience.
2. Bacteriological laboratory's evidence of certification.

B. Submit printed data for the following items under provisions of Operating and Maintenance Data paragraph in Section 15010:

1. Disinfection Report:

a. Include the following:

Date issued.

Project name and location.

Treatment Contractor's name, address, and phone number.

Type and form of disinfectant used.

Time and date of disinfectant injection start.

Time and date of disinfectant injection completion.

Test locations.

Initial and 24 hour disinfectant residuals in ppm for each outlet tested.

Time and date of flushing start.

Time and date of flushing completion.

Disinfectant residual after flushing in ppm for each outlet tested.

2. Bacteriological Report:

a. Include the following:

Date issued.

Project name and location.

Laboratory's name, certification number, address and phone number.

Time and date of water sample collection.

Name of person collecting samples.

Test locations.

Time and date of laboratory test start.

Coliform bacteria test results for each Outlet tested. Certification that water conforms or fails to conform to bacterial standards of State and Federal Safe Drinking Water Act.

Bacteriologist's signature.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Protect against damage and discoloration.

B. Maintain caution labels on hazardous materials.

C. Maintain storage room dry and with temperatures as uniform as possible between 60 deg.F and 80 deg.F.

D. Do not store Caustic Soda directly on floor colder than 55 deg.F.

1.8 PROTECTING WORK OF OTHER TRADES

A. Provide necessary signs, barricades, and notices to prevent any person from accidentally consuming water or disturbing system being treated.

B. Protect against damage and discoloration caused by work of this Section.

PART 2 - PRODUCTS

2.1 DISINFECTANT

A. Free chlorine; liquid, powder, tablet, or gas.

2.2 ALKALI

A. Caustic Soda or Soda Ash.

2.3 ACID

A. Hydrochloric type.

PART 3 - EXECUTION

3.1 EXISTING CONDITIONS

A. Prior to starting work, verify that Domestic Water System is completed, flushed and clean.

B. Prior to starting work, notify Construction Manager/General Contractor of any defects requiring correction.

C. Do not start work until conditions are satisfactory.

3.2 PREPARATION OF WATER FOR TREATMENT

A. Verify pH factor of water to be treated.

B. If pH factor is less than 7.4, introduce sufficient alkali during disinfectant injection to produce 7.4 to 7.6 pH level.

C. If pH factor is greater than 7.6, introduce sufficient acid during disinfectant injection to lower pH to 7.4 to 7.6 level.

3.3 SYSTEM TREATMENT

A. Inject disinfectant throughout system to obtain 50 to 80 ppm residual.

B. Starting at outlet closest to water sources, bleed water from each outlet until water produces odor of disinfectant. Repeat process at each outlet throughout system.

C. Test for disinfectant residual at each of the following locations:

1. Ends of piping runs.
2. Remote outlets. (Ends of each multiple fixture branch line)
3. Tanks and domestic water heaters.
4. At least 15% of outlets on each floor as directed by Architect/Engineer.

D. Maintain disinfectant in system for 24 hours.

E. If resultant disinfectant residual test is less than 25 ppm, repeat System Treatment.

3.4 FLUSHING

A. Flush disinfectant from entire system; permit no more than residual rate of supplied incoming water.

3.5 BACTERIOLOGICAL TEST

A. Instruct Bacteriological Laboratory to take water samples no sooner than 24 hours after flushing system.

B. Take water samples at each of the following locations:

1. Where water enters system.
2. Ends of piping runs.
3. Remote outlets.
4. Tanks.
5. At least 10% of outlets on each floor other than those used for testing disinfectant residual, where directed by Architect/Engineer, but in no case less than 2 outlets per floor.

C. Analyze Water Samples in accordance with Standard Methods for the examination of Water & Waste Water, published by American Water Works Assoc., 6666 W. Quincy Ave., Denver, CO 80235.

D. If Bacteriological Test proves water quality to be unacceptable, repeat System Treatment.

3.6 PRODUCT CLEANING & REPAIRING

A. Including work of other trades, clean, repair and touch-up, or replace when directed, products which have been soiled, discolored, or damaged by work of this Section.

B. Remove debris from Project Site upon work completion or sooner, if directed.

END OF SECTION 15411

SECTION 15430 - PLUMBING SPECIALTIES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Drains and drainage products.
B. Downspout nozzle.
C. Cleanouts.
D. Safe pans and drain flashings.
E. Sillcocks, yard hydrants, hose bibbs and hose stations.
F. Pressure gauges, thermometers, and test plugs.
G. Shock arrestors.
H. Backflow preventers.
I. Pressure reducing valves.
J. Pressure and temperature relief valves.
K. Trap chargers and accessories.

1.2 RELATED WORK

A. Requirements: Provide Plumbing Specialties in accordance with the Contract Documents.

B. Section 15010 - Basic Mechanical Requirements.

C. Section 15050 - Basic Mechanical Materials and Methods.

1.3 SUBMITTALS

A. Submit Product Data for the following items under provisions of the General Conditions of the Contract:

1. Floor Drains (FD)
2. Floor Sinks (FS)
3. Roof Drains (RD)
4. Overflow Drains (OD)
5. Downspout Nozzles (DSN)
6. Sillcocks (SC), Ground Hydrants (GH) and Yard Hydrants (YH)
7. Hose bibbs (HB) and Hose Stations (HV)
8. Pressure gauges (PG)
9. Thermometers (T)
10. Shock Arrestors (SA)
11. Backflow Preventer (BP)
12. Pressure Reducing Valve (PRV)

B. Submit printed Operating Instructions and Maintenance Data for the following items under provisions of Operating and Maintenance Data paragraph in Section 15010:

1. Backflow Preventer (BP)
2. Pressure Reducing Valve (PRV)

1.4 WARRANTIES

A. Provide original copies of all warranties for specific equipment where specified and in accordance with Section 15010.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Where acceptable manufacturers are listed, these manufacturers must submit products that are in fact equivalent in all respects of materials, design, function, and appearance to the manufacturer listed as the base manufacturer in the specification body or drawing schedules. Deviations of any type will not be acceptable.

B. Where other acceptable manufacturers are not listed, only the base manufacturer will be accepted.

C. All items of like nomenclature shall be supplied by one manufacturer only.

2.2 FLOOR DRAINS (FD)

A. Acceptable manufacturers: Wade series 1100, JR Smith series 2005, Josam series 30000, Zurn series Z-415, Watts FD-100 series.

B. Schedule: See Drawings.

2.3 FLOOR DRAINS, HEAVY DUTY

A. Acceptable manufacturers: Wade series 1240, JR Smith series 2330, Josam series 31200, Zurn series Z-512, Watts FD-340 series, MIFAB series F-1340C.

B. Schedule: See Drawings.

2.4 FLOOR SINKS (FS)

A. Acceptable manufacturers: Wade series 9110/9140, JR Smith series 3100/3150, Josam series 49000/49040, Zurn series Z-1900/Z-1910, Watts FD-860 series, MIFAB series FS-1520/FS-1730.

B. Schedule: See Drawings.

2.5 ROOF DRAINS

A. Acceptable manufacturers: Wade series 3000/3200, JR Smith series 1010/1330, Josam series 21500/22080, Zurn series Z-100/Z-125, Watts RD-300/200 series, MIFAB series R-1200.

B. Schedule: See Drawings.

2.6 OVERFLOW DRAIN

A. Acceptable manufacturers: Wade series 3000/3200, JR Smith series 1010/1330, Josam series 21500/22080, Zurn series Z-100/Z-125, Watts RD-300/200 series, MIFAB series R-1200-R.

B. Schedule: See Drawings.

2.7 DOWNSPOUT NOZZLES

A. Acceptable manufacturers: Wade series 3940, JR Smith series 1770, Josam series 25010, Zurn series Z-199, Watts RD-940 series, MIFAB series R-1940.

B. Schedule: See Drawings.

2.8 FLOOR CLEANOUTS

A. Acceptable manufacturers: Wade series 6000, JR Smith series 4020/4100/4200, Josam series 56000, Zurn series Z-1400, Watts CO-200-R/200-RX/200-US series, MIFAB series C1100-R/C1100-XR/C1100-UR.

B. Cast iron adjustable body, ABS plug, vandal-proof security screws:

1. Provide flange and flashing clamp for Cleanouts in areas with waterproof membrane and all cleanouts above slab-on-grade.
2. Provide nickel bronze top to match floor finish as indicated in the Architectural finish schedule. Provide heavy duty nickel bronze top for cleanouts in storage rooms, kitchens, and similar areas. Provide heavy duty cast iron or ductile iron top for cleanouts in equipment rooms, traffic areas, parking areas, and similar unfinished areas.

2.9 WALL CLEANOUTS

A. Acceptable manufacturers: Wade series 8560 with 8480R, JR Smith series 4530, Josam series 58790, Zurn series 1446, Watts CO-460-RD series, MIFAB series C-1460.

B. Cast iron clean out tee, ABS plug, vandal proof security screws, stainless steel cover with screw.

2.10 GRADE CLEANOUTS

A. Acceptable manufacturers: Wade series 8300 MF with 6000 spigot outlet, JR Smith series 4250, Josam series 58850, Zurn series Z-1474 with Z-1449, Watts CO-300 series, MIFAB series C-1300.

B. Heavy duty cast iron clean out housing, heavy duty cast iron or ductile iron cover, cast iron ferrule, ABS plug, vandal proof security screws.

1. Provide piping system identification cast into cover; "SAN" for sanitary waste cleanouts, "STORM" for storm drainage cleanouts.

2.11 SAFE PANS AND DRAIN FLASHINGS

A. Provide one of following systems:

1. 4 lb./sq.ft. sheet lead with 15 lb. asphaltic felt sub pan (underliner).
2. #24 B&S gauge (0.021") minimum sheet copper with l5 lb. asphaltic felt sub pan (underliner).
3. 0.040" non-plasticized chlorinated polyethylene sheet with 30 lb. felt underliner.
4. 3 ply 15 mil polyvinylchloride sheet with 30 lb. felt underliner.

2.12 WATER HEATER SAFETY PAN (WHSP)

A. Provide Shamrock Industries Inc. or equivalent gray polyethylene pan 2" larger than heater diameter with side or bottom drain fitting as required by drawings on electric water heaters installed above ceilings, under counters or on wood flooring.

B. Provide Ruud Mfg. Co. "Heater Pan" or equivalent spun aluminum pan with side or bottom drain fitting as required by drawings on gas fired water heaters installed on combustible foundations with 3/4" thick fire proof liner between pan and combustible construction.

2.13 SILLCOCK, WALL BOX, NON-FREEZE

A. Acceptable manufacturers: Woodford series B65, JR Smith series 5509, Josam series 71150, Zurn series Z-1300, Wade series 8600,175, Watts HY-725 series.

B. Schedule: See Drawings.

2.14 HOSE BIBBS

A. Acceptable Manufacturers: Chicago Faucet, Woodford, T&S Brass.

B. Schedule: See Drawings.

2.15 STATIONARY PRESSURE GAUGES

A. Acceptable manufacturers: Trerice 600C Series, Weksler Regal Series, Weiss Instruments.

B. Schedule:

Plan Code	PG-1	PG-2
Type	4-1/2” Dial	4-1/2” Dial
Bourbon Tube/Socket	Phosphor Bronze Tube Brass Socket	Stainless Steel Tube 316 Stainless Steel Socket
Accuracy	ANSI B40.1 Grade 1A 1% F.S. over middle half of range	ANSI B40.1 Grade 1A 1% F.S. over middle half of range
Case	Cast Aluminum	Cast Aluminum
Window	Clear Glass	Clear Glass
Snubber	Yes	Yes
Coil Syphon	For Steam Service	For Steam Service
Gauge Cock	Yes	Yes
Set Hand	No	No
Silicone Filled	No	No
Weatherproof	No	No

C. Range: Select gauges for the following standard ranges unless otherwise indicated on drawings, or as required for special systems.

1. Domestic Water 0 to +160 psi

2.16 STATIONARY THERMOMETERS

A. Acceptable manufacturers: Trerice Industrial Series, Ametek Industrial Series, Weiss Instruments, Miljoco.

B. Schedule:

Plan code:	T-1
Type	Adjustable angle
Case	9" cast aluminum
Window	Clear acrylic
Tube	Red mercury
Stem	Aluminum, insertable
Separable Socket	Brass

C. Range: Select thermometers, for the following standard ranges unless otherwise indicated on Drawings, or as required for special systems.

1. Domestic Hot Water 30 to 240 °F

2.17 SHOCK ARRESTORS FOR WATER (SA)

A. Manufacturer: Precision Plumbing Products Co., Wade Shokstop, J.R. Smith series 5000, Josam series 75000, Zurn Z-1700, Watts SS series.

B. Schedule:

PLAN CODE	"P.D.I." SIZE	FIXTURE UNITS
SA-A	A	1-11
SA-B	B	12-32
SA-C	C	33-60
SA-D	D	61-113
SA-E	E	114-154
SA-F	F	155-330

2.18 PRESSURE REDUCING VALVE (PRV)

A. Acceptable manufacturers: Watts series N223B, Conbraco, Hoffman.

B. 300 psi bronze body, replaceable seat, strainer, adjustable outlet pressure, thermal expansion by-pass. Suitable for water temperature up to 160 °F.

C. Approved under ASSE 1003 and IAPMO.

2.19 TEMPERATURE AND PRESSURE RELIEF VALVES (T&P)

A. Acceptable Manufacturers: Kunkle, Watts, Conbraco, McDonnell and Miller.

B. Schedule:

TYPES	SIZE	MAKE	MODEL	SERVICE	MAX PRESS	ASME MAX TEMP	ASME RATING BTUH MAX.
T & P	3/4"	Kunkle	137	Water Pressure Vessel	125 psig	250°F	2,230,000
Press	3/4"	Kunkle	84-45	Air	125 psig	300°F	NA
Vac	3/4"	Kunkle	80-45	Vacuum	15" Hg	300°F	NA
T & P	3/4"	Watts	40XL8	Water Heater	125 psig	210°F	777,600

2.20 TRAP CHARGERS AND ACCESSORIES (No Plan Code)

A. Manufacturer: Precision Plumbing Products, Co. ("P.P.P.")

B. Electronic Trap Primers:

1. Electric solenoid valve actuated with integral electronic timer with manual override switch, water inlet, water supply isolation valve, atmospheric vacuum breaker, water hammer arrestor, calibrated manifold for equal quarter distribution; all housed in steel box with cover for surface mounting or recessed mounting in wall.

2. Schedule:

MODEL	DISTRIBUTION UNIT
Auto Prime 500	1 thru 4 outlets per unit as shown on drawings.
Prime Time PT/PTS	4 thru 30 outlets per unit as shown on drawings.

PART 3 - EXECUTION

3.1 DRAINS

A. Coordinate drain placement with Contractor for Division 3 - Concrete.

B. Drain, strainer, and grate finishes shall be as specified, cover all finished surfaces during construction to prevent damage.

C. Install drains with "P" pattern traps and vents as required.

D. All drain bodies shall be plugged during construction to prevent foreign objects, dirt, concrete, etc. from entering the drain and drainage piping.

E. Drains shall be set flush and level with finished surfaces, with grate pattern parallel or perpendicular to adjacent walls or floor patterns.

F. Flash all drains on roofs, upper floors, and floor over crawl spaces with 24"x24" minimum flashing pans. Shower pans shall be turned up in walls to a minimum of 6" above the shower receptor threshold.

G. Clean and polish all drain bowls, rims, strainers, and grates prior to final inspection.

3.2 CLEANOUTS

A. Provide cleanouts at 50 feet on center for all interior sanitary and storm piping, and at each base of waste, soil or storm pipe stack or drop, 100 feet on center for all exterior sanitary and storm piping or as required by jurisdictional code.

B. Provide appropriate access tops for imposed construction.

C. Coordinate interior floor cleanout locations with contractor for Division 3 - Concrete.

D. Cleanouts to be provided with ABS or Delrin plugs. Lead sealed, brass, or cast iron plugs will not be acceptable unless specifically required by jurisdictional code authority.

E. Provide 24"x24" minimum flashing pans and clamp devices for all cleanouts located on upper floors or floors over crawl spaces.

F. Where cleanout arms extend horizontally and/or vertically more than 15 feet from the sewer main which they are serving, provide 2" minimum vent off the end of the arm and connect to the building vent system.

G. Clean and polish all cleanout access covers prior to final inspection.

H. Cleanout access covers shall be flush and level with finished building surfaces.

I. Install cleanout plugs on exposed or accessible piping. Plugs shall be line size up to 3" and over 8", 4" plugs for sizes 4" thru 8".

J. Provide wall cleanouts where piping is concealed in walls or non-accessible chases, use tapped cleanout tee or tapped extension to within 4" of wall face. Do not use no-hub type blind plugs for wall cleanouts.

K. Provide 12"x12"x8" thick 3000 lb. concrete pads for all grade cleanouts. Concrete shall be in accordance with Division 3 - Concrete. Tops of pads to be 1" above finish grade and cleanout access flush and level and centered in pad surface.

3.3 DOWNSPOUT NOZZLES (DSN)

A. Terminate storm and overflow drains into full size nickel bronze downspout nozzles, seal annular space between wall opening and pipe with silicone seal, anchor nozzle wall flange with three 1/4" flat head machine bolts and lead expanders. Set DSN a minimum of 6" and a maximum of 12" above the splash block surface, unless otherwise noted.

B. Install drain pipe to thread adaptors and threaded galvanized schedule 40 nipples or short pipe through exterior wall for threading on the DSN. T.O.E. nipples or short pipe may be used for "NO-HUB" system where galvanized and drain pipe are joined by an approved No Hub coupling adaptor. Anchor pipe to building immediately downstream of adaptor.

C. Coordinate required location of standard splash blocks at all DSN locations for Construction Manager/General Contractor.

3.4 SAFE PANS AND DRAIN FLASHINGS (no plan code)

A. Provide safe pans for all shower bases, shower rooms, wet rooms and kitchen areas. Pans shall extend wall to wall and turn up at least 6" above finish floor level or receptor rims into wall construction. Pans shall be laid over non-puncturing base such as heavy asphaltic felt, fine sand that bears no silica, or other acceptable material.

B. All drains on upper floors or over crawl spaces shall be flashed with flashing extending a minimum of 12" beyond the drain top dimensions.

C. Seams to be folded and shaped as required:

1. Solder lead seams.
2. Solder sheet copper seams with 50/50 (50% tin, 50% lead) or 45/55 (45% tin, 55% lead) commercial grade solder.
3. Solvent weld PVC and un-plasticized chlorinated polyethylene seams.

3.5 WATER HEATER SAFETY PAN (WHSP)

A. Install safety pans for all electric water heaters installed above ceilings, under counters or on wood flooring.

B. Install safety pans for all gas fired water heaters installed on combustible foundations.

C. Provide structural supports, air gapped pan drains, drain extensions and pan drain connections as required.

3.6 SILLCOCKS (SC)

A. Provide sillcocks at 100 feet maximum spacing around building perimeter, and at other locations shown on Drawings.

B. Provide all sillcocks with accessible stop and drain valves in heated areas, provide access panels where required.

C. Provide flush or surface mounting, square and plumb to building walls, with supply tube pitched for complete drainout.

D. Anchor all sillcocks with anchor flange provided by manufacturer.

E. Caulk annular space between walls and sillcock and sillcock piping with non-hardening silicone base sealant.

F. Mount sillcocks at 24" above finished grade or surfacing.

G. Where mounting heights other than 24" are shown on the Drawings, the Drawings shall supercede the Specifications.

H. Vacuum breakers to be non-removable.

I. Clean all surfaces including faceplate, box, access door, cam lock and interior of box prior to final inspection.

J. Sillcocks shall not be operated by hand tools, provide 2 keys per sillcock. Units found to be marred due to hand tool operation or other causes, shall be replaced at no increase to the Contract Sum.

K. Clean and polish entire sillcock prior to final inspection.

3.7 HOSE BIBBS (HB)

A. Provide hose bibbs in each equipment room, toilet room and kitchen area equipped with floor drainage systems and where shown on drawings, maximum spacing shall accommodate 50 feet of hose to any point within the drainage area measured around obstructions and equipment, in lieu of straight line measurement.

B. Anchor hose bibb within wall for rigid flush flange mounting.

C. Install bibb true and plumb with wall flange flush to surface, caulk annular space between wall and flange.

D. Mounting height to be 18" above floor in toilet rooms and immediately under furthest lavatory from entry, 60" above floor in equipment rooms or as shown on drawings.

E. Hose bibbs shall not be operated with hand tools, use only tee handle, furnish one tee handle per bibb. Units found marred due to hand tool operation or other causes will be replaced at Contractors expense.

F. Clean and polish hose bibbs prior to final inspection.

3.8 STATIONARY PRESSURE GAUGES (PG)

A. Provide gauges for steam, water, air and vacuum systems, complete with gauge cocks and snubbers, where required by Drawings.

B. Install in semi or upright position, tilted so as to be readable from floor level.

C. Clean gauge, and glass, and calibrate by test prior to final inspection.

3.9 STATIONARY THERMOMETERS (T)

A. Install thermometers where indicated on Drawings in upright position with case tilted to be readable from floor level.

B. Clean case and glass prior to final inspection.

3.10 SHOCK ARRESTORS FOR WATER (SA)

A. Provide shock arrestors in accordance with Plumbing Drainage Institute (PDI) Standard WH-201 and as shown on drawings.

B. Provide 8"x8" minimum access panels centered on each shock arrestor that is otherwise inaccessible.

C. Shock arrestors shall be mounted as close to the line or quick closing valve as possible. Remote mounting or excessive (over 6") nipple mounting will not be acceptable.

D. Gate valves installed at each shock arrestor will not generally be required. Furnish only where specifically shown on drawings.

E. Each shock absorber piston shall be exercised at least once prior to final installation. (Physically move the piston up into chamber from throat of unit. Use wooden push rod only in the performance of this exercise.)

3.11 PRESSURE REDUCING VALVE (PRV)

A. Provide unistrut or similar frame for mounting all components of the pressure reducing valve station.

B. Arrangement shall be as shown on Drawings including by-pass.

C. Provide drain valves both sides of station on headers on low points.

D. Provide unions, strainer, valves, petcocks, gauges, straps and other accessories as detailed on Drawings.

E. Set each pressure reducing valve using full system pressure and flow individually to outlet pressures specified.

F. All gauges shall be installed to be readable from floor level. Provide petcocks on each gauge connection.

3.12 TEMPERATURE AND PRESSURE RELIEF VALVES (T & P)

A. Provide temperature and pressure relief valves, with full size drains extended and air gapped to floor drains or approved receptor. Provide relief valves on all water heaters, pressure vessels and closed piping systems.

3.13 TRAP CHARGERS AND ACCESSORIES

A. Provide trap primer valve, gooseneck connection, distribution boxes, distribution tubing, air gap or vacuum breaker, extension drains, and pattern traps with charger connections for all emergency floor drains.

B. Support and brace charger, distribution boxes, piping and connections as appropriate.

3.14 WASHER WALL BOXES (WWB) AND DRYER WALL BOX (DVWB)

A. Set level and plumb and at height required by furnished appliances.

B. Coordinate with Appliance Supplier.

C. Provide water, waste, and vents as required.

D. Provide shock arrestors on hot and cold supplies to box as close to box connections as possible - provide 8"x8" access panel to each shock arrestor.

END OF SECTION 15430

SECTION 15440 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Plumbing Fixtures and Trim.

B. Plumbing Fixture Accessories.

1.2 RELATED REQUIREMENTS

A. The General Conditions, Supplementary Conditions and Division 1, General Requirements apply to this section and Contractor shall review and adhere to all requirements of these documents.

B. Section 15010 - Basic Mechanical Requirements.

1.3 RELATED SECTIONS

A. Section 15050 - Basic Mechanical Materials and Methods.

B. Section 15410 - Plumbing Piping.

C. Section 15430 - Plumbing Specialties.

D. Section 15450 – Plumbing Equipment.

1.4 REFERENCES

A. Comply with the applicable provisions and recommendations of the following:

1. ANSI A112.19.1 - Enameled Cast Iron Plumbing Fixtures.
2. ANSI A112.19.2 - Vitreous China Plumbing Fixtures.
3. ANSI A112.19.3 - Stainless Steel Plumbing Fixtures.

1.5 SYSTEM DESCRIPTION

A. Provide all plumbing fixtures, materials, labor, accurate rough-in setting, leveling and adjustments of all fixtures, trim and specialties.

1.6 QUALITY ASSURANCE

A. Qualification:

1. Provide fixtures trim and specialties in accordance with style, type, quality and function as established by the named manufacturer and model specified for each item.
2. Provide all installations in accordance with jurisdictional code and health authorities standards, restrictions and recommendations.
3. Provide all fixtures and trim using a single manufacturer where possible, deviation will be allowed only where specifications indicate otherwise.

1.7 SUBMITTALS

A. Submit Product Data for the following items under provisions of the General Conditions of the Contract:

1. Fixtures.
2. Carriers.
3. P-Traps.
4. Disposers.
5. Faucets, showerheads, valves, cocks, supplies and stops.
6. Finishes, material and colors.
7. Fixture specialties.

B. Submit printed Operating Instructions and Maintenance Data for the following items under provisions of Operating and Maintenance Data paragraph in Section 15010:

1. Valves, faucets, cocks.
2. Disposers.
3. Plumbing fixtures.
4. Specialties.

1.8 WARRANTIES

A. Provide original copies of all warranties and extended warranties for specific equipment where specified and in accordance with Section 15010.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Cast iron and vitreous china: Kohler - Eljer - American Standard - Crane.

B. Stainless steel sink 304, 18 gauge minimum: Elkay - Just.

C. Electric Water Coolers: Elkay - Halsey Taylor - Cordley - Haws - Sunroc - Filtrine - Oasis.

D. Water Mixing Valves Thermostatic, or Pressure Balanced: Leonard - Symmons - Kohler - Powers - Lawler.

E. Metering Faucets: Bradley - Symmons – Speakman - Zurn.

F. Flush Valves: Sloan Royal - Delany Flushboy – Zurn – AquaVantage - Zurn.

G. Toilet Seats: Olsonite - Bemis.

H. Traps, Stops, Supplies, Airgaps, Drains: Kohler - Eljer - American Standard - Bridgeport - Brasscraft - Dearborn - Sayco - Frost - Eastman.

I. Chair Carriers: Josam - J.R. Smith - Zurn - Wade.

J. Faucets: Kohler - Eljer - American Standard - Bradley - Valley - Elkay - Chicago - Delta - Cambridge Brass.

K. Sensor Faucets: Sloan – Zurn – Toto.

2.2 WATER CLOSETS

A. See Drawings.

2.3 LAVATORIES

A. See Drawings.

2.4 URINALS

A. See Drawings.

2.5 SERVICE SINKS

A. See Drawings.

2.6 ELECTRIC WATER COOLERS

A. See Drawings.

2.7 SINKS

A. See Drawings.

2.8 MASTER THERMOSTATIC MIXING VALVES

A. See Drawings.

2.9 MASTER THERMOSTATIC MIXING VALVES

A. Cabinet mounted and exposed type master mixing valves: adjustable setpoint, thermostatic type, adjustable limit stops, ball valve shut-offs, inlet checkstops, outlet thermometer. Provide recessed locking stainless steel cabinet where indicated.

B. Provide valves of sizes and capacities scheduled on Drawings. Provide high-low manifold type where specified and where required to meet specified range of flow.

C. Leonard Type TM, Symmons Series 5.

2.10 FIXTURE SUPPLIES & STOPS

A. Schedule:

DF & Lavatory Supplies:		(¼ turn chrome ball valve, stainless steel braided tube, ½” x 3/8”)		
		(L.K. Stops, 12" Riser, ½” x 3/8”)		
Make:	Brass Craft	Bridgeport	Frost	Dearborn
Model:	SCR 1912	1694 LK	7824-2LK	2712 KCW
DF & Lavatory Supplies:		(W.H. Stops, 12" Riser, 1/2" x 3/8")		
Make:	Brass Craft	Bridgeport	Frost	Dearborn
Model:	CR 1912	1694	7824-2	2712 SCW
Bidet & Sink Supplies:		(L.K. Stop, 20" Riser, 1/2" x 1/2")		
Make:	Brass Craft	Bridgeport	Frost	Dearborn
Model:	SCR 3920	1666 or 1786	8135-2/8218-2	None
Bidet & Sink Supplies:		(W.H. Stop, 20" Riser, 1/2" x 1/2")		
Make:	Brass Craft	Bridgeport	Frost	Dearborn
Model:	CR 3920A	1695 MOD	7816-2	None
Water Closet Tank Supplies:		(L.K.) Stop. 12" Riser, 1/2 x 3/8)		
Make:	Brass Craft	Bridgeport	Frost	Dearborn
Model:	SCR 1912 DL	1770 LK	7925-2LK	3112 KCW

Water Closet Tank Supplies:		(W.H. Stop, 12" Riser, 1/2 x 3/8)		
Make:	Brass Craft	Bridgeport	Frost	Dearborn
Model:	CR 1912 DL	1170	7925-2	3112 SCW

PART 3 - EXECUTION

3.1 INSPECTION

A. Examination: Examine the contract documents and provide all necessary attachments, accessories, support equipment and materials as necessary to fit allocated spaces.

3.2 PREPARATION

A. Field Measurements: Verify all dimensions and installation requirements so that work can be accurately fitted to other construction and in accordance with the intent of the contract documents. Be responsible for accuracy of measurements and adequate space requirements for the precise fitting and assembly of finished work.

3.3 INSTALLATION/APPLICATION/PERFORMANCE/ERECTION

A. Water Closets:

1. Wall Mounted

a. Closet carriers are to be rigidly anchored to the floor structure in accordance with manufactures installation instructions.
b. Wall mounted water closets will be rigidly supported with brass mounting studs on a concealed metal carrier. Transmitting fixture weight loads to the fixture pipe connection or wall framing will not be acceptable.
c. Water closets and trim shall be set level and plumb.
d. Spacing of water closets shall be in accordance with contract documents and jurisdictional codes.
e. Flush valve serving water closets located within the handicap stalls shall be installed with the flush handle to the “open side” of the toilet stall (opposite of the grab bar side).

2. Floor Mounted

a. Floor mounted water closet flanges are to be solidly anchored to the floor with lag screws, or bolts and expanders as appropriate for floor construction.
b. Water closet bowls are to be rigidly anchored to the floor flanges.
c. Provide fixture bolt caps to match fixture color for all exposed fixture bolts and nuts.

d. Water closets and trim shall be set level and plumb. Insert copper shims under base of bowl if required to level unit.
e. Spacing of water closets shall be in accordance with contract documents and jurisdictional codes.
f. Flush valve serving water closets located within the handicap stalls shall be installed with the flush handle to the “open side” of the toilet stall (opposite of the grab bar side).

3. Water Closet Supplies

a. Supplies shall be roughed with "L" copper tube nipple through wall cut to exact length and finished with escutcheon, matching fixture trim finish.

4. Water Closet Seats

a. Secure seats to water closets and adjust self-sustaining check hinge to hold the seat at any raised position. Removable bumpers shall match seat color and be secured.

B. Lavatories:

1. Wall and Counter Mounted

a. Wall mounted lavatory carriers are to be rigidly anchored to the floor structure in accordance with manufacturers installation instructions.
b. Carriers are to be furnished with a metal mounting plate and bearing plate or concealed arm carriers.
c. Wall mounted lavatories are to be supported by concealed metal carriers. Transmitting fixture weight loads to the fixture pipe connection <u>is not acceptable</u>.
d. Wood or metal mounting plates anchored to the wall framing or studs will not be acceptable.
e. Carriers are to become part of the structure and the lavatories shall not exert any weight or stress on the interior wall.
f. Lavatories and trim shall be set level and plumb.
g. Spacing of lavatories shall be in accordance with contract documents and jurisdictional codes.

C. Urinals:

1. Wall Mounted

a. Wall mounted urinal carriers are to be rigidly anchored to the floor structure in accordance with manufacturer’s installation instructions.
b. Wall mounted urinals are to be supported by concealed metal carriers. Transmitting fixture weight loads to the fixture pipe connection will not be acceptable.
c. Wood or metal mounting plates anchored to the wall framing or studs will not be acceptable.

d. Carriers are to become part of the structure and the urinals shall not exert any weight or stress on the interior wall.
e. Urinals and trim shall be set level and plumb.
f. Spacing of urinals shall be in accordance with contract documents and jurisdictional codes.
g. Install urinals in accordance with manufacturers installation instructions.

D. Service Sink:

1. Install service sink in accordance with manufacturers installation instructions.
2. Terrazzo service sinks shall be set on a minimum of 1/4" of silica free sand bedding shimmed with copper shims.
3. Wall mounted service sink trap standards are to be rigidly anchored to the floor structure in accordance with manufacturers installation instructions.
4. Install mop hangers over service sinks, on wall adjacent and perpendicular to faucet mounting, so mops drain into sink.
5. Install hose brackets and attach hoses to service sink faucets.
6. Service sinks and trim shall be set level and plumb.

E. Electric Water Cooler:

1. Wall Mounted
   a.
   b. Electric water cooler carriers are to be rigidly anchored to the floor structure in accordance with manufacturers installation instructions.
   c. Wall mounted electric water coolers are to be supported by concealed metal carriers. Transmitting fixture weight load to the fixture pipe connection will not be acceptable.
   d. Wood or metal mounting plates anchored to studs or wall framing will not be acceptable.
   e. Carriers are to become part of the structure and the electric water coolers shall not exert any weight or stress on the interior wall.

2. Fully Recessed

   a. Fully recessed electric water coolers shall be furnished with wall mounting boxes anchored to building construction. Electric water coolers shall be mounted flush to finished wall.

3. Glass Fillers

   a. Glass fillers shall be furnished with pressurized cooling tank, both items shall be factory installed.

F. Master Thermostatic Mixing Valves:

1. Install master thermostatic mixing valves in accordance with manufacturers installation instructions. Limit maximum temperature to 110 deg. F. by setting temperature limit stop for handle.

G. Fixture Supplies and Stops:

1. Provide fixture supplies and stops on every individual fixture or appliance.
2. Stops shall be compression by compression types with flexible straight copper tube risers, loose key or wheel handles stops. Provide one key per fixture for all loose key (L.K.) stops.
3. All components, stops, risers, inlet pipe and escutcheon shall be chrome plated brass, polished stainless steel, or special finish as specified for fixture trim.
4. Supplies and stops shall be anchored rigidly behind walls, eliminating push or pull movement.

H. Escutcheon Plates:

1. Provide cast brass chrome plated single piece escutcheons for all penetrations of piping thru walls, floors, or ceilings in finished and unfinished areas.

I. Faucets and Flushometers:

1. Faucets and flushometers shall be anchored rigidly behind walls, eliminating any push or pull movement.

J. Caulking:

1. All wall and floor mounted fixtures shall be caulked with a non-hardening white or fixture color match for colored fixtures adhesive elastomeric sealant compound providing a watertight seal at the joint with the walls or floor.

3.4 ELECTRICAL COORDINATION

A. Coordination of electrical service for all electric water coolers, garbage disposal units and whirlpool tubs will be the responsibility of the Division 15 contractor in accordance with Section 15050.

3.5 FIXTURE CONNECTIONS

A. Provide supply and waste connections for fixtures in accordance with the following table of minimum sizes or larger as required by jurisdictional codes, or drawings.

Fixture Description:	Hot Water:	Cold Water:	Waste:	Vent:
Water Closet (WC)				
Flush Valve:	NA	1”	4”	2”
Water Closet (WC)				
Tank Operated:	NA	½”	4”	2”
Lavatory (L):	½”	½”	1-1/4”	1-1/4”
Urinal (U):				
Flush Valve:	NA	¾”	2”	1-1/2”
Service Sinks (SS):	½”	½”	3”	1-1/2”
Sink (S):	½”	½”	1-1/2”	1-1/2”

Fixture Description:	Hot Water:	Cold Water:	Waste:	Vent:
Drinking Fountain (DF):	NA	½”	1-1/4”	1-1/4”
Electric Water Cooler (EWC):	NA	½”	1-1/4”	1-1/4”

3.6 FAUCET OPERATING ROTATION

A. Standard 2 handle faucets shall rotate as follows:

1. Hot Water clockwise to "on", counter clockwise to "off".
2. Cold Water counter clockwise to "on", clockwise to "off".

B. Wrist blade handle faucets:

1. Initial setting at "off" (rest) position shall have handles parallel to the fixture apron or counter front.
2. Hot Water; Counter clockwise to full on (1/4 turn), clockwise to "off".
3. Cold Water; clockwise to full on (1/4 turn), counter clockwise to "off".

3.7 ADJUSTMENT AND CLEANING

A. Adjustment: Adjust all flush valves, faucets, metering devices, shower heads, gas, air and vacuum cocks, and bubblers for proper flow and action after flushing operations are accomplished.

B. Cleaning: Clean all fixtures, trim, accessories and attachments including strainers, traps, aerators, and valves.

END OF SECTION 15440

SECTION 15450 - PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Water Heaters and Accessories

1.2 RELATED WORK

A. Requirements: Provide Plumbing Equipment in accordance with the Contract Documents.

B. Section 15010 - Basic Mechanical Requirements.

C. Section 15050 - Basic Mechanical Materials and Methods.

D. Section 15240 - Mechanical Sound and Vibration Control.

E. Section 15241 - Mechanical Seismic Control.

F. Section 15410 - Plumbing Piping.

G. Section 15430 - Plumbing Specialties.

H. Section 15485 - Natural Gas Systems.

1.3 SUBMITTALS

A. Submit product specification data for the following items under provision of The General Conditions of the Contract:

1. Water Heaters, Accessories and Controls.

B. Submit printed Operating Instructions and Maintenance Data for the following items under provisions of Operating and Maintenance Data paragraph in Section 15010:

1. Water Heaters and Accessories.

1.4 WARRANTIES

A. Provide original warranties for specific equipment of term specified and in accordance with Section 15010.

PART 2 - PRODUCTS

2.1 PRODUCT ACCEPTANCE

A. Acceptable Manufacturers are listed for each product, and manufacturers shall submit products that are in fact equivalent in all respects of material, design, function, size, and appearance to the manufacturer specified. Deviations of any type will not be acceptable.

B. Where acceptable manufacturers are not listed, only the manufacturer specified will be accepted.

C. All equipment of like use and nomenclature shall be supplied by one manufacturer only.

2.2 ELECTRIC POWERED STORAGE TYPE WATER HEATERS

A. Acceptable Manufacturers: A.O. Smith, Hatco, Lochinvar, P.V.I. Industries, Ruud, State Industries, Bradford White.

B. Description and Schedule:

1. Provide energy efficient blanket or foam insulation R=16 minimum, glass-lined tank rated for 150 psi working pressure, 300 psi test ASME Code Construction, ASME Certified and Labeled, UL listed and in conformance with ASHRAE 90.1 Energy Conservation Standards.
2. Provide ASME certified pressure and temperature relief valve, built-in heat trap to prevent thermal siphoning, low watt density, "INCOLOY" immersion heating elements. Density shall not exceed 80 watts per square inch at 240 volts.
3. Provide magnesium anode rod, cold water dip tube, enameled steel jacket, pre-wired, accessible control and wiring block, one thermostat for each element, energy cut off thermostats to be immersion mounted and adjustable from 100 to 190 deg.F, low water level, temperature and pressure gauges, shunt trip disconnect and manual limiting switches.
4. Schedule: See Drawings.
5. Provide five year standard warranty.

PART 3 - EXECUTION

3.1 ELECTRIC POWERED STORAGE TYPE WATER HEATERS

A. Coordinate electrical service and control with division 16 Contractor in accordance with Section 15050 - Basic Mechanical Materials and Methods.

B. Provide an expansion tank on the hot water side of all water heaters.

C. Set level and plumb, adjust elements to proper sequence and temperature setting.

D. Provide ASME temperature and pressure relief valve with full size discharge piped and air gapped to nearest floor drain or other acceptable receptacle.

E. Provide hose and drain valve, mixing valve, blending chamber shut off valves and dielectric connections as required or appropriate.

END OF SECTION 15450

SECTION 15485 - NATURAL GAS SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Pipe and Fittings.

B. Gas Meter.

C. Gas Pressure Regulator.

1.2 RELATED REQUIREMENTS

A. The General Conditions, Supplementary Conditions and Division 1, General Requirements apply to this Section, and Contractor shall review and adhere to all requirements of these documents.

B. Section 15010 - Basic Mechanical Requirements.

1.3 RELATED SECTIONS

A. Section 15050- Basic Mechanical Materials and Methods: Valves, pipe hangers, supports and accessories.

B. Section 15241 - Mechanical Seismic Control.

C. Section 15620 - Fuel Fired Heaters: Gas supply and runout with drip leg and gas cock or valve to heater connection points.

D. Section 15851 - Air Handling Systems on Roof: Gas supply and runout with gas cock or valve to rooftop packaged air handler connection points.

1.4 REFERENCES

A. ANSI B31.2 - Fuel Gas Piping.

B. NFPA 54 (ANSI Z223.1) - National Fuel Gas Code.

C. ANSI Z223.1a - Supplement to National Fuel Gas Code.

1.5 DEFINITIONS

A. The following are references with definition acronyms used in this section:

1. U.L. - Underwriters Laboratory Listed for Fire Protection Systems.
2. F.M. - Factory Mutual Engineering Division.
3. IRI - Industrial Risk Insurors AKA: F.I.A. Factory Insurance Association.
4. Jurisdictional Agencies:

a. Building Department.
b. Fire Department or Fire Prevention Bureau or Marshal.
c. Insurance Agency, Carrier, and/or Underwriter.
d. Engineer refers to the consulting Mechanical Engineer of record.

1.6 SYSTEM DESCRIPTION

A. Provide gas supply from gas meter outlet to all gas consuming equipment complete with piping, meters, valves, unions, dirt legs, hangers, supports, anchors, expansion compensators and regulators.

1.7 QUALITY ASSURANCE

A. Welding: Welders shall be certified in accordance with requirements in Section 15050.

1.8 REGULATORY REQUIREMENTS

A. Conform to Regulatory Requirements listed in Section 15010.

1.9 SUBMITTALS

A. Submit Product Data for the following items under provisions of the General Conditions of the Contract:

1. Regulators.
2. Meters.

B. Submit printed Operating Instructions and Maintenance Data for the following items under provisions of Operating and Maintenance Data paragraph in Section 15010:

1. Regulators.
2. Meters.

C. Submit certified test reports, dated and signed by authorized person showing compliance of tests of the fuel gas systems, in accordance with the Contract Documents.

1.10 SEQUENCING/SCHEDULING

A. Coordinate all work with all other trades and utility companies for elimination of interference, utilization of combined hanger support systems, timely routing and installation of systems, verifications of existing connector utilities, locations, depths, connection regulation, proper valving and junction structures or fittings. Location of meters, and remote readers as applicable and appropriate.

1.11 WARRANTIES

A. Provide original copies of all warranties for specific equipment where specified and in accordance with Section 15010.

1.12 GAS SERVICE

A. Arrange with Utility Company to provide gas service to indicated location with shut-off at terminus. Consult with Utility as to extent of its work, costs, fees and permits involved. 15485 Contractor shall pay such costs and fees; obtain permits.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Interior Exposed or Accessible:

1. Size 1/2" thru 1-1/2":

Pipe: Schedule 40, ASTM A 53
Fittings: Threaded malleable iron
Joint Seal: Teflon
Unions: Black malleable iron ground joint, bronze to iron seat, 150 lb. class, ANSI B2.1 and ASTM A 197.

2. Size 2" and over:

Pipe: Schedule 40, ASTM A53, Type S Grade B
Fittings: Butt weld ASTM A 234
Unions: 150 lb. forged steel weld neck flange, ANSI B16.5 and ASTM A105.

B. Interior concealed non accessible and air plenums:

All pipe and fittings shall be welded per sub-paragraph B2 above.

2.2 GAS METER

A. As provided by utility company.

2.3 GAS PRESSURE REGULATOR

A. General: Provide single stage, steel jacketed, corrosion-resistant gas pressure regulators with atmospheric vent, elevation compensator; with threaded ends for 2" and smaller, flanged ends for 2-1/2" and larger; for inlet and outlet gas pressures, specific gravity, and volume flow required.

B. Provide vent-limited or vented gas pressure regulators as required by appliance served. Vented regulators shall be piped to vent to outdoors per jurisdictional requirements.

PART 3 - EXECUTION

3.1 GENERAL

A. Welding, wiring, sleeves, plates and closures, foundations and pads, excavation and backfill, cutting and patching and installation of piping, valves, pipe hangers, supports, expansion compensators and identification shall be in accordance with Section 15050 - Basic Mechanical Materials and Methods.

B. Provide all fuel gas piping from source to each connection point of all gas fired equipment items listed in "Related Work" paragraph in Part 1. Provide drip leg and gas cock or valve for each equipment item. Make final connections in compliance with equipment manufacturer's instructions. Flexible connections will not be allowed except where explicitly specified.

3.2 PIPING

A. General:

1. Install fuel gas distribution piping in accordance with jurisdiction codes and local Utility Company requirements and in conformity with standards listed in "References" paragraph in Part 1.
2. Install "Tee" fitting with bottom outlet fitted with full size 6" long nipple and capped, at bottom of pipe risers or drops.
3. Use dielectric unions where dissimilar metals are joined together.
4. Use Teflon joint seal on metal gas piping threads, make up with 3 threads showing.
5. Remove cutting and threading burrs before assembling piping.
6. Do not install defective piping or fittings. Do not use pipe with threads which are chipped, stripped or damaged.
7. Plug each gas outlet, including valves, with threaded plug or cap immediately after installation and retain until continuing piping, or equipment connections are completed.
8. Connections to all gas-fired equipment shall include a union downstream of the manual gas shut-off valve.

9. Provide exterior gas piping and fittings with primed and painted surface. Coordinate color with Owner, Architect, and authority having jurisdiction.

B. Buried Piping: Welded and wrapped with joints left exposed until testing has been accepted. Bury 24" below grade minimum.

C. Wrapping:

1. Provide factory applied pipe wrap in accordance with standard of serving utility company. Hand wrap or machine wrap buried exterior gas piping with Scotchwrap 10 mil PVC tape using 50% overlap wrap minimum. Double wrap fittings and joints. Extend fitting wrapping not less than 6 inches past the end of the fitting onto the pipe section. Test pipe and fittings prior to wrapping fittings. Coat steel and iron pipe with Scotchwrap pipe primer before wrapping.

2. Pipe wrapping shall conform to the following schedule:

Pipe Size	Tape Width	Scotchwrap No.	
		Standard	Cold
¼ - ¾ inch	1 inch	50	40
1 - 1-1/2 inch	2 or 4 inch	50	40
2 inch and larger	4 inch	50	40
Color Backing		Black	Green

3. During application of wrap, if the ambient temperature is 40 deg.F or less, use only Scotchwrap No. 40 tape. If ambient temperature is 41 deg.F or more, use only Scotchwrap No. 50.

D. Buried Pipe Identification: Install bright colored continuously printed plastic ribbon tape of not less than 6 inches width and 4 mil thickness 6 to 8 inches below finished grade directly over buried pipe. Provide metalized tape over non-metallic pipe.

E. Interior Concealed Piping: All pipe and fittings shall be welded. Do not install valves of any type in air plenums or concealed spaces.

3.3 HANGERS AND SUPPORT SYSTEMS (Interior)

A. Provide pipe hangers, supports and accessories in accordance with Section 15050 - Basic Mechanical Materials and Methods.

3.4 ROOF SUPPORTS AND ANCHORS

A. Provide Erico brand pipe pier supports spaced per Hanger Specifications in Section 15050 - Basic Mechanical Materials and Methods. Provide pipe straps to anchor pipe to supports.

B. Provide pipe expansion loops as shown and required to eliminate pipe stress due to thermal expansion imposed by solar influence.

C. See details on Drawings.

3.5 VALVES

A. Provide valves in accordance with Section 15050 - Basic Mechanical Materials and Methods.

3.6 GAS COCKS AND GAS VALVES

A. Provide at supply runout connection for each gas-fired equipment item; and on risers and branches where indicated.

B. Locate gas cocks and valves where easily accessible, and where they will be protected from possible damage.

3.7 GAS SERVICE

A. Complete arrangements with Utility Company to provide gas service to indicated location with shut-off at terminus.

B. Extend service pipe from Utility's terminus to inside building wall, under Utility's direction.

3.8 GAS METER

A. Be responsible to verify with utility company the size and thickness, reinforcing and location of all concrete pads, chain link enclosures, gate requirements, bar-hasp-padlock requirements, and size and type of traffic bollards-guards required.

B. Provide concrete pad in accordance with Section 15050 - Basic Mechanical Materials and Methods.

C. Provide enclosures, bumper protection or other accessories which may be required.

D. Install gas meter in accordance with local Utility Company's installation instructions, and comply with requirements of jurisdictional codes.

3.9 GAS PRESSURE REGULATOR

A. Install as indicated; comply with Utility requirements. Pipe atmospheric vent to outdoors (unless a vent-limited regulator is used), full size of outlet. Install gas shut-off valve upstream of each pressure regulating valve.

3.10 TESTS

A. General: Test fuel supply lines with air under pressure before being covered. Use a calibrated, certified static gauge graduated to one pound per square inch.

B. Testing shall be of the complete piping system, before covering, or of individually separable larger portions of the system. Only the last connection to the appliance may be tested under operating conditions. This connection will be tested with soap and brush under line pressures. This connection must remain exposed.

C. Test Procedures: Use either of the following methods at the Contractor's option:

1. 30 psig air pressure for a period of 24 hours with no drop in gauge pressure, indicating the line to be airtight.
2. 100 psig air pressure, with joints tested with standard soap and brush inspection and maintain for 3 hours without drop in pressure.

D. Retesting: Retest piping failing initial tests following correction of defective work. Requirements of initial tests shall apply.

E. Test Records: Record pressure and ambient temperature at start and end of test. Submit written results of test to the Architect/Engineer.

END OF SECTION 15485

SECTION 15575 - BREECHINGS, CHIMNEYS, STACKS, AND FLUES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Type B Flue Vents.

1.2 RELATED WORK

A. Requirements: Provide Breechings, Chimneys, Stacks and Flues in accordance with the Contract Documents.

B. Section 15010 - Basic Mechanical Requirements.

C. Section 15050 - Basic Mechanical Materials and Methods.

D. Section 15450 - Plumbing Equipment.

E. Section 15620 - Fuel Fired Heaters.

1.3 REFERENCES

A. Reference Standards: Except as modified by governing codes and by the Contract Documents, comply with the applicable provisions and recommendations of the following:

ANSI/NFPA 37 - Installation and Use of Stationary Combustion Engines and Gas Turbines.

ANSI/NFPA 211 - Standard for Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances.

ANSI/UL 441 - Standard for Gas Vents.

1.4 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacturer of prefabricated breeching and smokepipe, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

1.5 SUBMITTALS

A. Submit Shop Drawings for the following items under provisions of the General Conditions of the Contract:

1. Positive Pressure Chimney and Manifold System.
2. Lined Prefabricated Chimney and Breeching.
3. Shop Fabricated Metal Breeching.

B. Submit Product Data for the following items under provisions of the General Conditions of the Contract:

1. Type B Flue Vents.

C. Submit printed Operating Instructions and Maintenance Data for the following items under provisions of Operating and Maintenance Data paragraph in Section 15010:

1. Induced Draft Fan.

PART 2 - PRODUCTS

2.1 TYPE B FLUE VENTS

A. Acceptable Manufacturers:

Selkirk Metalbestos
Simpson Dura-Vent
Ameri-Vent
American Metal Products Co.
United McGill
Metal-Fab

B. General: Provide double wall gas vents, UL-listed for Type B, consisting of double wall metal construction pipe sections and fittings and accessories required for complete installation.

C. Material: Inner pipe of sheet aluminum, and outer pipe of galvanized sheet steel.

D. Accessories: Provide manufacturer's standard accessory items including draft hood connectors, tees, caps, elbows, increasers, adaptors, support plates, thimbles, storm collars, roof flashings and vent tops as indicated and required for complete installation.

PART 3 - EXECUTION

3.1 TYPE B FLUE VENTS

A. Install gas vents in accordance with manufacturer's installation instructions. Maintain UL-Listed minimum clearances from combustibles. Assemble pipe and accessories as indicated for complete installation.

B. The gas vent system shall be so engineered and constructed as to develop a positive flow adequate to exhaust all flue gases to outside atmosphere, without condensation within the vent or spillage at any appliance draft hood.

C. All parts of vent system shall be of Underwriters' Laboratories, Inc. listed double wall gas vent piping, and such piping shall be continuous from the appliance outlets into vent top or housing.

D. The gas vent piping shall be installed in full compliance with the terms of its listing, with the Manufacturer's installation instructions, and with jurisdictional Building Code representing good practice for such installations.

E. It shall be the responsibility of the Contractor to provide adequate accessibility, head room, and chase dimensions so that all vent connectors and vertical vents can be correctly sized, spaced and supported.

END OF SECTION 15575

SECTION 15620 - FUEL FIRED HEATERS

PART 1 - GENERAL

1.1 RELATED WORK

A. Requirements: Provide Gas Fired Equipment in accordance with the Contract Documents.

B. Related work specified in other Sections:

Section 15010 - Basic Mechanical Requirements
Section 15050 - Basic Mechanical Materials and Methods
Section 15240 - Mechanical Sound and Vibration Control
Section 15250 - Mechanical Insulation
Section 15485 - Natural Gas System
Section 15990 - Testing, Adjusting and Balancing

1.2 SYSTEM DESCRIPTION

A. The work includes, but is not limited to providing the following:

1. Gas Valves in accordance with Section 15050 - Basic Mechanical Materials and Methods.
2. Exterior Gas Distribution Pipe and Fittings in accordance with Section 15486 - Fuel Gas System.
3. Interior Gas Distribution, Pipe and Fittings in accordance with Section 15485 - Natural Gas System.
4. Liquified Petroleum Gas (Propane) Systems in accordance with Section 15486 - Fuel Gas System.
5. Gas Flue vents in accordance with Section 15575 - Breechings, Chimneys and Stacks.
6. Gas Fired Unit Heaters.
7. Gas Fired Furnaces.
8. Gas Fired Air Handling Unit.
9. Gas Fired High Intensity Radiant Heaters.

1.3 QUALITY ASSURANCE

A. Quality control shall be in accordance with Section 15010 - Basic Mechanical Requirements.

1.4 REFERENCES

A. Reference Standards: Except as modified by governing codes and by the Contract Documents, comply with the applicable provisions and recommendations of the following:

1. Comply with American National Standards Institute (ANSI B31.2) Code for Fuel Gas Piping.

1.5 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings and Product Data for the following items in accordance with the General Conditions of the Contract:

1. Gas Fired Unit Heaters
2. Gas Fired Air Handling Unit

B. Operating Instructions and Maintenance Data: Submit printed Operating Instructions and Maintenance Data for the following items in accordance with Operating and Maintenance Data paragraph in Section 15010.

1. Gas Fired Unit Heaters
2. Gas Fired Air Handling Unit

PART 2 - PRODUCTS

2.1 GAS FIRED UNIT HEATERS

A. Acceptable Manufacturer: ITT Reznor, Lennox, Modine, Janitrol, Trane, Hastings.

B. Provide gas fired unit heaters of size and capacity shown on Drawings.

C. Heat exchanger to be 18 gauge aluminized steel.

D. Units to be complete with 24-volt gas valve and transformer, fan control, summer-winter switch, baked enamel cabinet, gas cock, pressure regulator, auto pilot, draft diverter, and limit control. All units to be AGA approved.

E. Propeller fans to be motor shaft mounted. Motors to be shaded pole with sleeve bearings, pre-lubricated for minimum of five years, cushioned for quiet operation.

PART 3 - EXECUTION

3.1 GAS PIPING

A. Gas piping shall be in accordance with Section 15485 - Natural Gas System.

3.2 GAS FLUE VENTS

A. Provide gas flue vents in accordance with Section 15575 - Breechings, Chimneys, Stacks, and Flues.

3.3 GAS FIRED UNIT HEATERS

A. Install per manufacturer's installation instructions and in accordance with jurisdictional building code.

END OF SECTION 15620

SECTION 15850 - AIR HANDLING FANS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Exhaust Fans (Ceiling Type)

1.2 RELATED WORK

A. The General Conditions, Supplementary Conditions and Division 1, General Requirements apply to this section and Contractor shall review and adhere to all requirements of these documents.

1. Section 15010 - Basic Mechanical Requirements.
2. Section 15050 - Basic Mechanical Materials and Methods.
3. Section 15240 - Mechanical Sound and Vibration Control.
4. Section 15241 - Mechanical Seismic Control.
5. Section 15990 - Testing, Adjusting and Balancing.

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of specified fans with characteristics, sizes, and capacities required, whose specified fan has been in satisfactory use in similar service for not less than 3 years.

1.4 SUBMITTALS

A. Submit shop drawings and product data for the following items under provisions of the General Conditions of the Contract:

1. Shop Drawings: Submit assembly-type shop drawings showing unit dimensions, weight loadings, required clearances, construction details, and field connection details for each fan.
2. Product Data: Submit manufacturer's technical product data for all fans showing dimensions, weights, capacities, ratings, fan performance curves with operating point clearly indicated, motor electrical characteristics, gages and finishes of materials. Provide multiple-speed performance curves for fans with variable speed drives.

B. Submit printed Operating Instructions and Maintenance Data for the following items under provisions of Operating and Maintenance Data paragraph in Section 15010:

1. All fans.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver fans with factory-installed shipping skids and lifting lugs; pack components in factory-fabricated protective containers.

B. Handle fans carefully to avoid damage to components, enclosures, and finish. Do not install damaged components; replace and return damaged components to fan manufacturer.

C. Store fans in clean dry place and protect from weather and construction traffic.

D. Comply with Manufacturer's rigging and installation instructions for unloading fans and moving them to final location.

1.6 EXTRA STOCK

A. Provide one spare set of belts for each belt-driven fan.

PART 2 - PRODUCTS

2.1 EXHAUST FANS (CEILING TYPE)

A. Acceptable Manufacturer: Subject to compliance with requirements, provide ceiling type exhaust fan of one of the following: Penn Co. (Zephyr Model), ILG, Pace, Cook, Jenn-Air, Greenheck, ACME.

B. Type: Shall be of the centrifugal fan, integral grille and housing type, all completely self-contained.

C. Capacity: Capacity and model number of the units shall be as shown on drawings, and shall be certified by AMCA.

D. Motor and Drive: Fan shall be of the direct drive type, and maximum fan motor speed shall be 1150 RPM. Motor shall be of the permanently lubricated ball bearing type, and shall be directly coupled to the fan. The motor and fan shall be easily removable thru the intake grille for service. <Direct drive fans to include solid state speed controllers.>

E. Housing: Shall be constructed of heavy gauge steel, and shall be completely insulated internally with acoustical insulation material to deaden sound.

F. Backdraft Damper: Each fan shall be equipped with a nonmetallic backdraft damper constructed of neoprene and shall be shatterproof under all conditions.

G. U.L. Label: Each fan shall be approved by the Underwriters' Laboratories, Inc. and shall carry the U.L. Label.

H. Intake Grille: Shall be constructed of steel frame and woven steel grille with a minimum free area of 85%. Intake grille shall have a white, factory baked enamel finish.

PART 3 – EXECUTION

3.1 INSTALLATION OF FANS

A. Install fans where indicated, in accordance with equipment manufacturer's installation instructions, and with recognized industry practices, to ensure that equipment complies with requirements and serves intended purposes.

B. Coordinate with other work, including ductwork, floor construction, and electrical work as necessary to interface installation of air handling equipment with other work.

C. Access: Provide access space around fans for service as indicated, but in no case less than that recommended by manufacturer.

D. Do not operate fans for any other purpose, temporary or permanent, until ductwork is clean, filters in place, bearings lubricated, and fan has been test run under observation.

E. Support: Install floor-mounted fans on 4" high reinforced concrete pad, 6" larger on each side than unit base in accordance with Section 15050.

F. Mounting: Mount fans on vibration isolators, in accordance with manufacturer's instructions and Section 15240.

G. Seismic Restraint: Provide seismic restraints in accordance with Section 15241.

H. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.

1. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division 16 sections. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer with rotation in direction indicated and intended for proper performance. If there is no rotation arrow supplied by the manufacturer, install a correct rotation arrow.

I. Duct Connections: Refer to Division 15 Air Distribution sections. Provide ductwork, accessories, and flexible connections as indicated.

3.2 FIELD QUALITY CONTROL

A. Upon completion of installation of air handling equipment, and after motor has been energized with normal power source, test equipment to demonstrate compliance with

requirements. Where possible, field correct malfunctioning equipment, then retest to demonstrate compliance. Replace equipment which cannot be satisfactorily corrected.

3.3 EXTRA BELTS

A. Deliver one spare set of belts for each belt-driven fan unit, obtain receipt from Owner that belts have been received.

END OF SECTION 15850

SECTION 15851 - AIR HANDLING SYSTEMS ON ROOF

PART 1 - GENERAL

1.1 RELATED WORK

A. The General Conditions, Supplementary Conditions and Division 1, General Requirements apply to this Section, and Contractor shall review and adhere to all requirements of these documents.

B. Related work specified in other Sections:

Section 15010 - Basic Mechanical Requirements
Section 15050 - Basic Mechanical Materials and Methods
Section 15240 - Mechanical Sound and Vibration Control
Section 15241 – Mechanical Seismic Control
Section 15250 - Mechanical Insulation
Section 15620 - Fuel Fired Heaters
Section 15990 - Testing, Adjusting and Balancing

C. Work installed but furnished by others:

1. Damper motors for the rooftop evaporative cooling units.

1.2 SYSTEM DESCRIPTION

A. The work includes, but is not limited to providing the following:

1. Package Rooftop HVAC Units

1.3 QUALITY ASSURANCE

A. Quality control shall be in accordance with Section 15010 - Basic Requirements.

1.4 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings and Product Data for the following items in accordance with the General Conditions of the Contract:
1. Packaged Rooftop HVAC Units

B. Operating Instructions and Maintenance Data: Submit printed Operating Instructions and Maintenance Data for the following items in accordance with Operating and Maintenance Data paragraph in Section 15010.
1. Packaged Rooftop HVAC Units

1.5 EXTRA STOCK

A. Provide one complete extra set of filters for each air handling unit.

B. Provide one spare set of belts for each belt-driven air handling unit.

PART 2 - PRODUCTS

2.1 PACKAGED ROOFTOP HVAC UNITS (SINGLE ZONE)

A. Accepted Manufacturers: AAON, Trane, Lennox, McQuay, Carrier, York.

B. Provide packaged rooftop HVAC units of size and capacity shown on Drawings.

C. Units shall be AGA approved specifically for outdoor installation, completely weatherproof, mounted on a common curb type base.

D. Units to be complete with insulated steel casing, baked enamel finish, roof curb, hermetic compressors, aluminized or stainless steel heat exchanger, evaporator, blower, and air cooled condenser.

E. Units shall have automatically resetting electric spark ignition system to prevent pilot outage under all climatic conditions. Spark ignitor only energized during pilot outage. If gas service is interrupted for an extended period of time, units may be restarted at thermostat within building.

F. Refrigeration cycle controls shall include compressor contactors, condenser and evaporator fan contactors, 24-volt transformers, low and high pressure cut-outs, liquid line solenoid valves for system pumpdown, and compressor protection cut-out with reset. Reset relay provided to prevent unit cycling on overloads. If operating conditions trip any safety controls, unit must be reset at thermostat.

G. Units shall be equipped with automatic gas valve, combination fan and limit controls, pressure regulator, manual pilot valve, and main shut-off valve. Automatically resetting pilot safety relay provided.

H. Drain Pans: Shall be provided for evaporator and condenser sections. Evaporator section drain pan internally sealed and insulated.

I. Thermostat: Provide a 24-volt programmable thermostat with 7 day night setback for each unit. Thermostat provides manual or automatic fan operation and system operation control of "heat", "cool", and fan "on", "auto" "off" positions. The only thermostats allowed for this project are White-Rogers Model 1F85-277 (single or two-stage heating), Robertshaw Model 9701i (single stage heating), or Robertshaw Model 9715i (two-stage heating).

J. Units to be equipped with weatherproof outside air intake with manual damper set for 20% outside air.

K. Units to be equipped with "economizer" cycle with motorized outside, return, and exhaust air dampers, automatically controlled and pre-wired at the factory.

L. The following options shall be provided on units:

1. Unit disconnect switch.
2. Two (2) steps of compressor unloading.
3. Hot gas bypasss.
4. Low leak outside air dampers (max. 10 cfm/sf @ 4" s.p.).
5. High efficiency motors (90% +).
6. Extended grease lines.
7. Hinged access doors with cam lock handles.
8. 115 volt/1 ph convenience outlet.
9. (5) year extended warranty.
10. Two-stage gas valve.
11. 100% modulating exhaust/return fans.
12. Factory mounted smoke detector wired and mounted (5 ton and larger).

PART 3 - EXECUTION

3.1 INSTALLATION OF AIR HANDLING EQUIPMENT

A. Install air handling equipment where indicated, in accordance with equipment manufacturer's installation instructions, and with recognized industry practices, to ensure that equipment complies with requirements and serves intended purposes.

B. Coordinate with other work, including ductwork, roof structure, floor construction, and electrical work as necessary to interface installation of air handling equipment with other work.

C. Do not operate fans for any purpose, temporary or permanent, until ductwork is clean, filters in place, bearings lubricated, and fan has been test run under observation.

D. Install units on vibration isolators or isolation bases, in accordance with Section 15240 - Mechanical Sound and Vibration Control.

3.2 ELECTRICAL CONNECTIONS

A. Ensure air handling equipment is wired properly, with rotation in direction indicated and intended for proper performance. If there is no rotation arrow supplied by the manufacturer, install a correct rotation arrow.

3.3 PACKAGED ROOFTOP HVAC UNITS

A. Install units on full perimeter support roof curbs where indicated per manufacturer's recommendations. Position units on roof structure as required to avoid ductwork or piping conflicts with roof structure.

3.4 FIELD QUALITY CONTROL

A. Upon completion of installation of air handling equipment, and after motor has been energized with normal power source, test equipment to demonstrate compliance with requirements. Where possible, field correct malfunctioning equipment, then retest to demonstrate compliance. Replace equipment which cannot be satisfactorily corrected.

3.5 FILTERS AND BELTS

A. Install extra set of new filters at completion of air handling system work, and prior to testing, adjusting and balancing work. Obtain receipt from Owner that new filters have been installed.

B. Deliver one spare set of belts for each belt-driven air handling unit, obtain receipt from Owner that belts have been received.

END OF SECTION 15851

SECTION 15880 - AIR DISTRIBUTION

PART 1 - GENERAL

1.1 RELATED WORK

A. Requirements: Provide Air Distribution in accordance with the Contract Documents.

B. Related work specified in other Sections:

Section 15010 - Basic Mechanical Requirements
Section 15050 - Basic Mechanical Material and Methods
Section 15240 - Mechanical Sound and Vibration Control
Section 15250 - Mechanical Insulation
Section 15850 - Air Handling Fans
Section 15990 - Testing, Adjusting and Balancing

1.2 SYSTEM DESCRIPTION

A. The work includes but is not limited to the following:

1. Sheet metal work.
2. Acoustical duct lining and sound attenuators in accordance with Section 15240 - Mechanical Sound and Vibration Control.
3. Grilles, registers and diffusers.
4. Gravity backdraft dampers.
5. Mechanical sound and vibration control in accordance with Section 15240.
6. Painting of duct interiors visible through registers, grilles and diffusers to be painted flat black in accordance with Section 15050.

1.3 QUALITY ASSURANCE

A. Reference Standards: Except as modified by governing codes and by the Contract Documents, comply with the applicable provisions and recommendations of the following:

1. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
2. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA).
3. National Fire Protection Association (NFPA).

1.4 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings and Product Data for the following items in accordance with the General Conditions of the Contract:

1. Sound attenuators.
2. Acoustical duct lining.
3. Grilles, registers and diffusers.

PART 2 - PRODUCTS

2.1 SHEET METAL WORK

A. Metal and Gauge: Unless specified otherwise, galvanized iron to be used throughout, fabricated, and installed so that no vibration or noise results. Fabricate from the best grade of mild steel sheets of the U.S. Standard gauge joint and seal recommended in the latest edition of the Sheet Metal and Air Conditioning Contractors National Association (SMACNA) manual.

B. Flexible connections to be made from neoprene coated glass fabric (Ventglas).

C. Access Door Hardware: Ventlok Series 100 latches, hinges, and gasketing to be used on doors less than four square feet in area; Series 200 on doors from four to eight square feet; Series 300 for larger doors or doors in medium pressure systems.

D. Dampers: Opposed blade type volume dampers shall be installed where called for on Drawings or otherwise necessary for proper balancing. Dampers shall have operating shaft extending horizontally to accept surface mounted duct hardware.

E. Damper Operator Hardware: Dampers with a shaft length of 12 inch or less shall be equipped with Ventlok No. 620, 1/4 inch dial regulators, with shaft lengths of 12 inch to 20 inch with Ventlok No. 635, 3/8 inch dial regulators and No. 607 end bearings. Larger dampers shall be controlled with Ventlok self-locking regulators No. 640 or 641 in 3/8 inch or 1/2 inch size, and shall be installed with No. 607 end bearings.

2.2 ROUND FLEXIBLE DUCTWORK (INSULATED)

A. Approved Manufacturers: Genflex, Thermaflex, Wiremold, Cleva-Flex, Porter Co., P.P.G. Co, Flexmaster.

B. Insulated low pressure flexible duct system shall be a factory fabricated assembly consisting of a zinc coated spring steel helix, wrapped with a nominal 1 inch thick by 1 lb. per cubic foot density fiberglass insulation. Assembly shall be sheathed in a vapor barrier jacket. Inner liner shall be of continuous non-perforated aluminum copolymer forming a positive inner air seal, such that if the outer vapor barrier is punctured, no air will be lost. The composite assembly, including insulation and vapor barrier, shall meet the Class I requirements of NFPA bulletin No. 90A, and be labeled by Underwriters'

Laboratories, Inc. with a flame spread rating of 25 or less, and a smoke developed rating of 50 or under.

C. Duct system shall include a Model CB coupling as an integral part of one end, factory installed for quick connection to an air outlet device. Opposite end shall have a "spin in" fitting with damper where "lift-out" ceilings occur.

D. Flexible ducts shall be installed in a fully extended condition, free of sags and kinks, using only the minimum length required to make the connection.

E. Where horizontal supports are required, flexible duct shall be suspended on 35 inch centers with a minimum 3/4 inch wide flat bending material. All joints and connections shall be made with 1/2 inch wide positive locking steel straps.

F. Insulated low pressure flexible duct system shall be equal to Flexmaster Type 5-insulated.

G. Where "lift-out" ceilings occur, flex ducts shall be installed with volume damper in flex duct at connection to main duct.

2.3 REGISTERS, GRILLES AND DIFFUSERS

A. Steel outlets to be supplied with prime coat finish, unless specified otherwise. Aluminum outlets to remain unpainted.

B. Steel grilles, registers, diffusers, to be installed on white ceilings to be furnished with white baked-enamel finish and in suspended acoustical ceilings to be furnished with off-white baked enamel finish to match suspension system finish.

C. Registers, grilles, and diffusers to be of size, capacity and performance complete with accessories as noted on schedule on Drawings.

D. Manufacturers: Titus, Anemostat, Krueger, Carnes, Metal Aire, Tuttle and Bailey Co., Barber-Coleman, Price.

2.4 LINEAR SLOT DIFFUSERS

A. Provide linear slot diffusers as shown in schedule on Drawings for type of ceilings shown on Architectural Drawings.

B. Casing shall be constructed of galvanized steel with inlet collar.

C. Casing shall be insulated with 1/2 inch thick dual density thermal and acoustical fiberglass insulation meeting NFPA 90A requirements.

D. Diffuser to be extruded aluminum with steel deflector to provide horizontal air throw. Exposed surfaces of diffuser to be finished with white enamel.

E. Manufacturers: Tempo (No Substitutions Allowed).

2.5 GRAVITY BACKDRAFT DAMPERS (Low Pressure) (< 2.0” w.c.)

A. Provide weighted gravity backdraft dampers where shown on Drawings.

B. Manufacturers: Arrow "Series 400", Ruskin.

PART 3 - EXECUTION

3.1 SHEET METAL WORK

A. Provide sheet metal duct systems, connections, dampers, duct turns, housings, hinged sheet metal doors and necessary removable access doors for the complete supply, return, and exhaust systems. Provide access doors in ductwork wherever required for observation and maintenance of dampers.

B. Duct Workmanship: Ductwork to be constructed and erected in a workmanlike manner. Ducts to be straight and smooth on the inside with neatly finished joints, airtight, and free from vibration under every condition of operation. The internal ends of slip joints to be made in the direction of the airflow. The ducts to be securely attached to the building construction in an acceptable manner. Changes in dimensions and shape of the ducts to be gradual (not more than 30 degrees included angle). Modified duct sizes required to avoid conflicts with structure, equipment, piping or conduit shall be hydraulically equivalent to the limiting dimensions indicated on the Drawings unless otherwise approved by the Engineer.

C. Duct Turns: 90 degree elbows up to 18 inches wide and 45 degree elbows consist of an inside radius of not less than 1/2 width of the duct or be furnished with single blade duct vanes with 2-1/4 inch blade spacing. 90 degree elbows larger than 18 inches to be equipped with single blade with trailing edge type duct vanes. Shop fabricated duct vanes shall conform to details of the Sheet Metal and Air Conditioning Contractors National Association Duct Construction manual. Do not use turning vanes on medium or high velocity ductwork unless specifically called out on Drawings. Duct turns on medium and high velocity ductwork shall be made using long radius elbows unless specifically modified and accepted by the Engineer.

D. Flexible Connections: Provide sound isolating flexible connections on the inlet and outlet of each fan to which duct connectors are made. At least one inch slack to be allowed in fabric connections to insure that no vibration is transmitted from fan to ductwork. The fabric can either be folded in with the metal or attached with metal collar frames at each end to prevent air leakage.

E. Dampers: Opposed blade type volume dampers to be installed where called for on the drawings or otherwise necessary for proper balancing.

F. Ducts to be sealed per SMACNA Standards: Seal Class A for over 2 inches static pressure and Seal Class B for less than 2 inches static pressure based on fan estimated static pressure shown on Drawings.

G. Conduct a complete duct leakage test as outlined in the SMACNA Leakage Test Manual.

H. Where joints are not accessible for proper sealing, hand holes should be cut in duct and the joints sealed from the inside. Take special care to seal duct corners.

I. Wherever exposed ducts pass through walls, floors, or ceilings, a 2 inch flanged sheet-metal collar fitting close around ducts to be slipped along duct until flange is tight against finished surface covering edges of openings and presenting a neat appearance. Lock collar to duct. Wherever ducts penetrate floors or fire walls, install safing insulation to maintain fire wall integrity.

3.2 FANS

A. Rotation Arrow: Rotation of the fan to be checked on start-up and if there is no rotation arrow supplied by the manufacturer, install a correct rotation arrow.

END OF SECTION 15880

SECTION 15990 - TESTING, ADJUSTING AND BALANCING

PART 1 - GENERAL

1.1 RELATED WORK

A. The General Conditions, Supplementary Conditions and Division 1, General Requirements apply to this Section, and Contractor shall review and adhere to all requirements of these Documents.

B. Related work specified in other Sections:

Section 15010 - Basic Mechanical Requirements
Section 15900 - Ductwork and Accessories

1.2 SYSTEM DESCRIPTION

A. The work includes, but is not limited to the following:

1. Upon completion of the installation of all the air systems, all necessary adjustments shall be made to provide capacities listed on the Drawings to properly balance these systems.
2. Submittals and written reports as specified.
3. Testing requirements as described in Specification Section 15010, paragraph 1.16.

1.3 QUALITY ASSURANCE

A. Work under this section shall be executed under the direct supervision of a Registered Professional Engineer having an established professional office in the State of Utah and having an experience record of not less than five (5) years in the mechanical contracting industry, engaged in testing, balancing and adjusting of air and hydronic mechanical systems for not less than two (2) years of that time, or, under the direct supervision of a qualified testing, adjusting and balancing supervisor, possessing certification from the National Environmental Balancing Bureau (NEBB) or from the Associated Air Balance Council (AABC).

B. Comply with the applicable procedures in the chapter on Testing, Adjusting and Balancing in the latest ASHRAE Edition of the NEBB, AABC, and SMACNA Test and Balance documents.

C. Calibration and maintenance of instruments shall be in accordance with manufacturer's standards and recommendations, and calibration histories for each instrument shall be available for examination.

D. Accuracy of measurements shall be in accordance with the applicable measurement means as listed in the latest edition of NEBB, AABC, and SMACNA Test and Balance documents.

E. Allowable Tolerances:

1. Tolerances of adjustment for air handling systems are plus or minus 5% for supply systems at air devices and plus or minus 10% for return and exhaust systems from figures shown on drawings.

F. Final Testing, Adjusting and Balancing of all hydronic and air systems shall be performed by an approved separate professional Testing, Adjusting and Balancing subcontractor meeting the above Quality Assurance requirements. Acceptable separate professional subcontractors meeting the above requirements are as follows:

1. BTC Services, Inc.
2. Certified Testing & Balancing, Inc.
3. Payson Sheet Metal
4. RS Analysis, Inc.
5. Intermountain Test & Balance

G. Subcontractors not listed above must submit for acceptance.

H. Within 30 days after execution of the Owner-Contractor Agreement, transmit to Architect/Engineer the name <and qualifications> of the organization proposed to perform the services.

1.4 SUBMITTALS

A. Procedure: Submit Qualifications, Documentation, Test Schedules and Reports in accordance with the General Conditions of the Contract:

B. Qualifications:

1. Submit three copies of documentation to confirm compliance with Quality Assurance provisions:

a. Organization supervisor and personnel training and qualifications.
b. Specimen copy of each of the report forms proposed for use.

C. Preliminary Report: At least fifteen days prior to starting field work, submit three copies of:

1. A set of report forms filled out as to the design flow values and the installed equipment pressure drops, and the required CFM for air terminals.

2. A complete list of instruments proposed to be used, organized in appropriate categories, with data-sheets for each. Show:

   a. Manufacturer and model number.
   b. Description and use when needed to further identify the instrument.
   c. Size of capacity range.
   d. Latest calibration date.

3. Architect/Engineer will review submittals for compliance with Contract Documents, and will return one set marked to indicate:

   a. Discrepancies noted between measured data and Contract Documents.
   b. Additional, or more accurate, instruments required.
   c. Requests for re-calibration of specific instruments.

D. Schedules:

1. Schedule tests to comply with project completion schedules.
2. Schedule testing and balancing of parts of the systems which are delayed due to seasonal, climatic, occupancy, or other conditions beyond control of the Contractor, as early as the proper conditions will allow, after consultation with Architect/Engineer.
3. Submit reports of delayed testing promptly after execution of those services.

E. Final Report: At least fifteen days prior to Contractor's request for final inspection, submit three copies of final reports, on applicable reporting forms, for review. Submit a fourth copy directly to the Engineer. Each individual final reporting form must bear the signature of the person who recorded data and that of the NEBBor AABC certified supervisor of the reporting organization. Identify instruments of all types which were used and last date of calibration of each. Report shall include:

1. A detailed letter to Engineer outlining all abnormal or notable conditions not covered in above data specifically identifying all locations where specified flow tolerances could not be met.
2. A set of reduced black and white or blueline prints with all air openings clearly marked to correspond with data sheets and with thermometer locations clearly marked.
3. Data sheets showing amount of air handled at each opening, instrument used, velocity readings, and manufacturer free area factor.
4. Data sheets giving log of room temperatures in rooms exhibiting objectionable temperatures during the heating season. Logs shall be taken when outside temperature is 30 deg.F or colder.
5. Data sheets giving log of room temperatures in rooms exhibiting objectionable temperatures during the cooling season. Logs shall be taken with full occupant load, full lighting, and maximum solar conditions.
6. Equipment data sheets giving make, size and model, of fans, starters and motors with rated amps and service factors, and drives.
7. Operating data including fan RPM, inlet and outlet pressures, pressure drop across filters, face and bypass dampers, and measured motor current and voltage, BHP and CFM (total).

8. Heating equipment operating data including air temperatures entering and leaving heating coils (maximum air temperature rise), together with corresponding air flow and air pressure drop, water temperature entering and leaving heating coil, water flow and pressure drop through heating coil.
9. Cooling equipment operating data including air temperatures entering and leaving cooling coils together with corresponding air flow and air pressure drop.
10. Equipment and operating data as required to show performance of heating, ventilating, and air conditioning units, cabinet heaters, unit heaters, fans and temperature control devices.
11. Sound pressure levels showing readings in all 8 octave bands and plotted on NC charts shall be submitted for the following:

    a. Lobbies, Toilets and Commercial Area.
    b. All spaces exhibiting abnormally high or annoying noise levels.

1.5 PROJECT CONDITIONS

A. The following job conditions must be verified before any testing, adjusting or balancing of the environmental systems begin:

1. Installation of the designated system is complete and in full operation.
2. Air systems shall be checked for dirty filters, filter leakage, equipment vibrations, damper operation, fan rotation, and other such conditions requiring correction.

PART 2 - PRODUCTS

- NOT USED –

PART 3 - EXECUTION

3.1 PROCEDURE

A. Confirm that project conditions have been verified and that necessary corrections have been made before proceeding with the Work.

B. The Test and Balance Contractor must proportion air/water flows in the system while introducing a minimum amount of resistance. All systems are to be proportionally balanced.

C. Air Systems:

1. The balancing firm shall adjust all dampers, diffusers, registers, belts and sheaves for the delivery and distribution of air quantities shown in the Contract Documents and shall mark each balancing device at final setting.
2. Adjust fan speeds and motor drives within drive limitations for required air volume, provide new sheaves as necessary, or adjustable bands on constant

volume plenum fans, and notify Division 16 Contractor of any thermal overloads that need to be changed/replaced.

3. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 1” w.c., equivalent to 50% loading of filters.
4. Exhaust and recirculation air systems shall be adjusted for air quantities shown on Drawings.
5. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
6. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
7. Measure building static pressure in both economizer mode and minimum outside air mode, and adjust supply, return and exhaust air systems to provide the required relationship between each to maintain approximately 0.05 inches water column positive static pressure at the Building Entries.
8. Distribution system shall be adjusted to obtain uniform space temperatures free from objectionable drafts and noise.
9. Where multiple air diffusers are shown on one terminal box, adjust dampers for the delivery and distribution of air quantities shown in the Contract Documents.
10. Report: After all adjustments are made, a detailed report shall be prepared by the balancing firm and submitted to the Architect for approval. Owner reserves the right to spot check the report prior to final acceptance.

END OF SECTION 15990

SECTION 16010 - BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this and the other sections of Division 16.

1.2 SUMMARY

A. This section includes general administrative and procedural requirements for electrical installations. The following administrative and procedural requirements are included in this Section to expand the requirements specified in Division 1:

Submittals.
Workmanship.
Coordination drawings.
Record documents.
Drawings and Specifications.
Maintenance manuals.
Rough-ins.
Electrical installations.
Cutting and patching.

B. Related Sections: The following sections contain requirements that relate to this section:

Division 15 Section "ELECTRICAL REQUIREMENTS FOR MECHANICAL EQUIPMENT," for factory-installed motors, controllers, accessories, and connections.

Division 16 Section "BASIC ELECTRICAL MATERIALS AND METHODS," for materials and methods common to the remainder of Division 16, plus general related specifications including:

1. Access to electrical installations.

Division 1 commissioning, coordinate as required.

1.3 SUBSTITUTIONS

A. The equipment specified carries brand names and catalog numbers and shall be interpreted as establishing a standard of quality. Substitutions will be considered if a duplicate written

application (2 copies) is at the office of the engineer as per general conditions of the specifications five working days prior to bid opening. The application shall include the following: 1) A statement declaring the equipment proposed is equal to that specified by having the same physical characteristics and dimensions, meet the drawings layout and structural conditions as well as load requirements; 2) The specified submittal catalog numbers of the equipments under consideration; 3) A pictorial and specification brochure; 4) Sample may be required at engineers discretion; 5) Additional information as may be noted on drawings.

B. Any conflict arising from the use of substituted equipment shall be the responsibility of the supplier, who shall bear all costs required to make the equipment comply with the intent of the plans and specifications.

C. At the option of the Architect/Prime Engineer, samples may be required for non-standard items before installation during construction.

D. No materials or apparatus shall be substituted after the bid opening except where the equipment manufacturer has been discontinued or delivery becomes a problem, then written approval of the Architect/Prime Engineer is required.

1.4 SUBMITTALS

A. General: Follow the procedures specified in Division 1 Section "SUBMITTALS."

B. Increase, by the quantity listed below, the number of electrical related shop drawings, product data, and samples submitted, to allow for required distribution plus two copies of each submittal required, which will be retained by the Electrical Consulting Engineer.

C. Additional copies may be required by individual sections of these Specifications.

1.5 WORKMANSHIP

A. All materials and equipment shall be installed in accordance with the recommendations of the manufacturer to conform with the contract documents. The installation shall be accomplished by workmen skilled and licensed by the State of Utah in the type of work involved.

B. The Electrical Contractor shall have a Utah state licensed Master Electrician assigned to direct the electrical work and to coordinate work with the General Contractor and other trades. Furthermore, a Utah state licensed master electrician shall be assigned to supervise the actual performance of all electrical work under Division 16. All installers must be Utah state licensed electrical journey man.

1. All workmen doing electrical work of any nature must at all times carry their electrician's license with them and show it upon request.

2. The Utah state licensed master journeyman assigned to supervise the performance of Division 16 electrical work, shall be required to be on the job site at all times, while Division 16 work is being performed.

C. The installation shall conform to the applicable rules of the current (2005) National Electrical Code and current (2005) National Electrical Safety Code except where more stringent requirements are noted in these specifications. Conflicts shall be brought to the attention of the Architect/Prime Engineer.

D. The Contractor and Sub-contractors shall comply with OSHA and EPA Standards while in the performance of this contract.

E. Installation of communication pathways shall comply with TIA/EIA current standards, conduit sizing specified by Owner. ¾” EMT shall be minimum size.

1.6 COORDINATION DRAWINGS

A. Prepare coordination drawings in accordance with Division 1 Section "PROJECT COORDINATION," to a scale of 1/4"=1'-0" or larger; detailing major elements, components, and systems of electrical equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:

1. Indicate the proposed locations of major raceway systems, equipment, and materials. Include the following:

   Clearances for servicing equipment, including space for equipment disassembly required for periodic maintenance.

   Exterior wall and foundation penetrations.

   Fire-rated wall and floor penetrations.

   Equipment connections and support details.

   Sizes and location of required concrete pads and bases.

1. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.

1.7 RECORD DOCUMENTS

A. Prepare record documents in accordance with the requirements in Division 1 Section "PROJECT CLOSEOUT." In addition to the requirements specified in Division 1, indicate installed conditions for:

1. Major raceway systems, size and location, for both exterior and interior; locations of control devices; distribution and branch electrical circuitry; and fuse and circuit breaker size and arrangements.

2. Equipment locations (exposed and concealed), dimensioned from prominent building lines.

1.8 DRAWINGS AND SPECIFICATIONS

A. Electrical drawings are diagrammatic, but shall be followed as closely as actual construction and work of other contractors will permit. Home runs shall be installed from outlets as shown on drawings **and indicated exact on “as builts”.**

B. The contract drawings indicate the extent and the general location and arrangement of equipment, conduit, and wiring. The Contractor shall study plans and details so that equipment will be properly located and readily accessible. If any conflicts occur necessitating departures from the contract drawings, details of departures and reasons therefore shall be submitted to the Engineer for his prior approval.

1.9 MAINTENANCE MANUALS

A. Prepare maintenance manuals in accordance with Division 1 Section "PROJECT CLOSEOUT." In addition to the requirements specified in Division 1, include the following information for equipment items:

B. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.

C. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.

A. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.

1.10 DELIVERY, STORAGE AND HANDLING

A. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 ROUGH-IN

A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

B. Refer to equipment specifications in Divisions 2 through 16 for rough-in requirements.

3.2 ELECTRICAL INSTALLATIONS

A. General: Sequence, coordinate, and integrate the various elements of electrical systems, materials, and equipment. Comply with the following requirements:

1. Coordinate electrical systems, equipment, and materials installation with other building components.

2. Verify all dimensions by field measurements.

3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for electrical installations.

4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.

5. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.

6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.

7. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic

form. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect/Prime Engineer.

8. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.

9. Install electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.

3.3 CUTTING AND PATCHING

A. General: Perform cutting and patching in accordance with Division 1 Section "CUTTING AND PATCHING." In addition to the requirements specified in Division 1, the following requirements apply:

1. Perform cutting, fitting, and patching of electrical equipment and materials required to:

2. Uncover Work to provide for installation of ill-timed Work.

3. Remove and replace defective Work.

4. Remove and replace Work not conforming to requirements of the Contract Documents.

5. Remove samples of installed Work as specified for testing.

6. Install equipment and materials in existing structures.

7. Upon written instructions from the Architect/Prime Engineer, uncover and restore Work to provide for Architect/Prime Engineer observation of concealed Work.

B. Cut, remove, and legally dispose of selected electrical equipment, components, and materials as indicated, including but not limited to removal of electrical items indicated to be removed and items made obsolete by the new Work.

C. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.

D. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.

E. Protection of Installed Work: During cutting and patching operations, protect adjacent installations. Cover as necessary.

F. Patch existing finished surfaces and building components using new materials matching existing materials and experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.

G. Refer to Division 1 Section "DEFINITIONS AND STANDARDS" for definition of experienced "Installer."

H. Patch finished surfaces and building components using new materials specified for the original installation and experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.

    A. Refer to Division 1 Section "DEFINITIONS AND STANDARDS" for definition of experienced "Installer."

END OF SECTION 16010

SECTION 16050 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Requirements specified in Division 16 Section "Basic Electrical Requirements" apply to this Section.

1.2 SUMMARY

A. This Section includes limited scope general construction materials and methods for application with electrical installations as follows:

Miscellaneous metals for support of electrical materials and equipment.

Joint sealers for sealing around electrical materials and equipment; and for sealing penetrations in fire and smoke barriers, floors, and foundation walls.

1.3 DEFINITIONS

A. The following definitions apply to excavation operations:

1. Additional Excavation: Where excavation has reached required subgrade elevations, if unsuitable bearing materials are encountered, continue excavation until suitable bearing materials are reached. The Contract Sum may be adjusted by an appropriate Contract Modification.

2. Subbase: as used in this Section refers to the compacted soil layer used in pavement systems between the subgrade and the pavement base course material.

3. Subgrade: as used in this Section refers to the compacted soil immediately below the slab or pavement system.

4. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction from the Architect.

5. Schedules indicating proposed methods and sequence of operations for selective demolition prior to commencement of Work. Include coordination for shut-off of electrical service, and details for dust and noise control. Method of procedure will be required for any work, any power rooms and power outages.

6. Coordinate sequencing with construction phasing and Owner occupancy specified in Division 1 Section "Summary of Work."

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer for the installation and application of joint sealers.

B. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code - Steel."

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

A. Provide UL Label on each fire-rated access door.

B. Conditions Affecting Excavations: The following project conditions apply:

1. Maintain and protect existing building services which transit the area affected by selective demolition.

2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by excavation operations.

E. Site Information: Subsurface conditions were investigated during the design of the Project. Reports of these investigations are available for information only; data in the reports are not intended as representations or warranties of accuracy or continuity of conditions. The Owner will not be responsible for interpretations or conclusions drawn from this information, but rather at the contractor’s expense.

F. Existing Utilities: Locate existing underground utilities in excavation areas. If utilities are indicated to remain, support and protect services during excavation operations. Any damage done to existing utility line during excavation will be contractor’s responsibility. Costs of repair will also be the contractor’s responsibility.

G. Use of explosives is not permitted.

H. Notify the Architect at least 5 days prior to commencing demolition operations.

I. Perform demolition in phases as indicated.

PART 2 - PRODUCTS

2.1 JOINT SEALERS

A. General: Joint sealers, joint fillers, and other related materials compatible with each other and with joint substrates under conditions of service and application.

B. Available Products: subject to compliance with requirements, provide joint sealers of one of the following:

"3M" CP 25WB Caulk

PART 3 - EXECUTION

3.1 PREPARATION FOR JOINT SEALERS

A. Surface Cleaning for Joint Sealers: Clean surfaces of joints immediately before applying joint sealers to comply with recommendations of joint sealer manufacturer.

3.2 EXCAVATION

A. Slope sides of excavations to comply with local codes and ordinances. Shore and brace as required for stability of excavation.

B. Shoring and Bracing: Establish requirements for trench shoring and bracing to comply with local codes and authorities. Maintain shoring and bracing in excavations regardless of time period excavations will be open.

C. Remove shoring and bracing when no longer required. Where sheeting is allowed to remain, cut top of sheeting at an elevation of 30 inches below finished grade elevation.

D. Install sediment and erosion control measures in accordance with local codes and ordinances.

E. Dewatering: Prevent surface water and subsurface or groundwater from flowing into excavations and from flooding project site and surrounding area.

F. Do not allow water to accumulate in excavations. Remove water to prevent softening of bearing materials. Provide and maintain dewatering system components necessary to convey water away from excavations.

G. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey surface water to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches.

H. Material Storage: Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade, and shape stockpiles for proper drainage.

I. Locate and retain soil materials away from edge of excavations. Do not store within drip-line of trees indicated to remain.

J. Remove and legally dispose of excess excavated materials and materials not acceptable for use as backfill or fill.

K. Trenching: Excavate trenches for electrical installations as follows:

1. Excavate trenches to the uniform width, sufficiently wide to provide ample working room and a minimum of 6 to 9 inches clearance on both sides of raceways and equipment.

2. Excavate trenches to depth indicated or required.

3. Limit the length of open trench to that in which installations can be made and the trench backfilled within the same day.

4. Where rock is encountered, carry excavation below required elevation and backfill with a layer of crushed stone or gravel prior to installation of raceways and equipment. Provide a minimum of 6 inches of stone or gravel cushion between rock bearing surface and electrical installations.

5. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35 deg F (1 deg 2 C).

6. Backfilling and Filling: Place soil materials in layers to required subgrade elevations for each area classification listed below, using materials specified in Part 2 of this Section.

   Under walks and pavements, use a combination of subbase materials and excavated or borrowed materials.

   Under building slabs, use drainage fill materials.

   Under piping and equipment, use subbase materials where required over rock bearing surface and for correction of unauthorized excavation.

7. Backfill excavations as promptly as work permits, but not until completion of the following:

   Inspection, testing, approval, and locations of underground utilities have been recorded.

   Removal of concrete formwork.

   Removal of shoring and bracing, and backfilling of voids.

   Removal of trash and debris.

L. Placement and Compaction: Place backfill and fill materials in layers of not more than 8 inches in loose depth for material compacted by heavy equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

M. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification specified below. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

N. Place backfill and fill materials evenly adjacent to structures, piping, and equipment to required elevations. Prevent displacement of raceways and equipment by carrying material uniformly around them to approximately same elevation in each lift.

O. Compaction: Control soil compaction during construction, providing minimum percentage of density specified for each area classification indicated below.

P. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density for soils which exhibit a well-defined moisture-density relationship (cohesive soils), determined in accordance with ASTM D 1557 and not less than the following percentages of relative density, determined in accordance with ASTM D 2049, for soils which will not exhibit a well-defined moisture-density relationship (cohesionless soils).

Q. Areas Under Structures, Building Slabs and Steps, Pavements: Compact top 12 inches of subgrade and each layer of backfill or fill material to 90 percent maximum density for cohesive material, or 95 percent relative density for cohesionless material.

R. Areas Under Walkways: Compact top 6 inches of subgrade and each layer of backfill or fill material to 90 percent maximum density for cohesive material, or 95 percent relative density for cohesionless material.

S. Other Areas: Compact top 6 inches of subgrade and each layer of backfill or fill material to 85 percent maximum density for cohesive soils, and 90 percent relative density for cohesionless soils.

T. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water. Apply water in minimum quantity necessary to achieve required moisture content and to prevent water appearing on surface during, or subsequent to, compaction operations.

U. Subsidence: Where subsidence occurs at electrical installation excavations during the period 12 months after Substantial Completion, remove surface treatment (i.e., pavement, lawn, or other finish), add backfill material, compact to specified conditions, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent areas.

3.3 ERECTION OF METAL SUPPORTS AND ANCHORAGE

A. Cut, fit, and place miscellaneous metal fabrications accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

A. Field Welding: Comply with AWS "Structural Welding Code."

3.4 ERECTION OF WOOD SUPPORTS AND ANCHORAGE

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorage accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

B. Select fastener sizes that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.5 APPLICATION OF JOINT SEALERS

A. General: Comply with joint sealer manufacturers' printed application instructions applicable to products and applications indicated, except where more stringent requirements apply.

B. Installation of Fire-Stopping Sealant: Install sealant, including forming, packing, and other accessory materials, to fill openings around electrical services penetrating floors and walls, to provide fire-stops with fire-resistance ratings indicated for floor or wall assembly in which penetration occurs. Comply with installation requirements established by testing and inspecting agency.

END OF SECTION 16050

SECTION 16110 - RACEWAYS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Requirements of the following Division 16 Sections apply to this Section:

"Basic Electrical Requirements."
"Basic Electrical Materials and Methods."

1.2 SUMMARY

A. This Section includes raceways for electrical wiring. Types of raceways in this section include the following:

Electrical metallic tubing (EMT).
Underground plastic utilities duct.
Rigid metal conduit.
Rigid nonmetallic conduit.
Surface raceways.

A. Related Sections: The following Division 16 Sections contain requirements that relate to this Section:

"Wires and Cables" for other wiring methods.
"Supporting Devices" for raceway supports.
"Electrical Boxes and Fittings" for boxes used with conduit and tubing systems.

1.3 QUALITY ASSURANCE

A. Electrical Component Standard: Components and installation shall comply with NFPA 70 "National Electrical Code" and NFPA 76 2002.

B. NEMA Compliance: Comply with applicable requirements of NEMA standards pertaining to raceways.

C. UL Compliance and Labeling: Comply with applicable requirements of UL standards pertaining to electrical
raceway systems. Provide raceway products and components listed and labeled by UL, ETL, or CSA.

1.4 SEQUENCING AND SCHEDULING

A. Coordinate with other Work, including metal and concrete deck installation, as necessary to interface installation of electrical raceways and components with other Work.

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:

Conduit Bodies:

Adalet-PLM
American Electric
Appleton Electric Co.
Carlon
Crouse-Hinds Division, Cooper Industries, Inc.
Delta Industrial Products
Killark Electric Mfg. Co.
Kraloy Products Co.
O-Z/Gedney
Spring City Electrical Mfg. Co.

Surface Metal Raceway:

Alrey-Thompson Co., Inc.
Allied Tube & Conduit
American Electric
B-Line Systems, Inc.
Butler Mfg. Co.
Erickson Electrical Equipment Co.
GS Metals Corp.
Haydon Corp.
Hoffman Engineering Co.
Isoduct Energy Systems
Isotrol Systems

Keystone/Rees, Inc.
SL Industries, Inc.
Square D Co.
The Wiremold Co.

2.2 METAL CONDUIT AND TUBING

A. Rigid Steel Conduit: ANSI C80.1.

B. Intermediate Steel Conduit: UL 1242 and NEMA RN 1.

C. Electrical Metallic Tubing and Fittings: ANSI C80.3.

D. Flexible Metal Conduit: UL 1, zinc-coated steel.

E. Liquidtight Flexible Metal Conduit and Fittings: UL 360. Fittings shall be specifically approved for use with this raceway.

2.3 NONMETALLIC CONDUIT AND DUCTS

A. Rigid Nonmetallic Conduit (RNC): NEMA TC 2 and UL 651, Schedule 40 or 80 PVC.

B. PVC Conduit and Tubing Fittings: NEMA TC 3; match to conduit or conduit/tubing type and material.

C. Conduit, Tubing, and Duct Accessories: Types, sizes, and materials complying with manufacturer's published product information. Mate and match accessories with raceway.

2.4 CONDUIT BODIES

A. General: Types, shapes, and sizes as required to suit individual applications and NEC requirements. Provide matching gasketed covers secured with corrosion-resistant screws.

B. Metallic Conduit and Tubing: Use metallic conduit bodies. Use bodies with threaded hubs for threaded raceways.

C. Conduit Bodies 1 Inch and Smaller: Use bodies with screw-type EMT connectors.

D. Nonmetallic Conduit and Tubing: Use nonmetallic conduit bodies conforming to UL 514 B.

2.5 SURFACE RACEWAYS

A. General: Sizes and channels as indicated. Provide fittings that match and mate with raceway.

B. Surface Metal Raceway: Construct of galvanized steel with snap-on covers, with 1/8-inch mounting screw knockouts in base approximately 8 inches o.c. Finish with manufacturer's standard prime coating suitable for painting. Provide raceways of types suitable for each application required.

C. Conduit Sizes: All conduit shall be a minimum of 3/4" unless inidcated on the drawings otherwise.

PART 3 - EXECUTION

3.1 WIRING METHOD

A. Outdoors and in the Mechanical Rooms: Use the following wiring methods:

Connection to Vibrating Equipment: Including motor-driven equipment: liquidtight flexible metal conduit.

Buried: PVC schedules 40 conduit. Conduit bends over 22? must be rigid steel.

B. Indoors: Use the following wiring methods:

Connection to Vibrating Equipment: Including motor-operated equipment: flexible metal conduit.

Exposed: electrical metallic tubing.

Concealed: electrical metallic tubing.

3.2 INSTALLATION

A. General: Install electrical raceways in accordance with manufacturer's written installation instructions, applicable requirements of NEC, and as follows:

Conceal Conduit and EMT, unless indicated otherwise, within finished walls, ceilings, and floors. Keep raceways at least 12 inches away from parallel runs of flues and steam or hot water pipes. Install raceways level and square and at proper elevations.

B. Elevation of Raceway: Where possible, install horizontal raceway runs above water and steam piping.

Complete installation of electrical raceways before starting installation of conductors within raceways.

Provide supports for raceways as specified elsewhere in Division 16.

Prevent foreign matter from entering raceways by using temporary closure protection.

Protect stub-ups from damage where conduits rise from floor slabs. Arrange so curved portion of bends is not visible above the finished slab.

Make bends and offsets so the inside diameter is not effectively reduced. Unless otherwise indicated, keep the legs of a bend in the same plane and the straight legs of offsets parallel. For all bends under the ground, use rigid galvanized steel conduit.

Use raceway fittings that are of types compatible with the associated raceway and suitable for the use and location. For electrical metallic tubing (EMT), use rigid steel set screw type fittings (screw must have a full set) except as otherwise indicated. Die-cast fittings shall not be used. Box connectors 1" and larger shall be insulated, throat type or equal type plastic bushing. The use of the indenter-type fittings shall be prohibited. Fittings in the concrete shall be compression type and taped or approved for such use.

Run concealed raceways with a minimum of bends in the shortest practical distance considering the type of building construction and obstructions except as otherwise indicated. This does not apply to conduits in crawl spaces.

C. Raceways embedded in slabs: Install in middle third of the slab thickness where practical and leave at least 1 inch concrete cover. Tie raceways to reinforcing rods or otherwise secure them to prevent sagging or shifting during concrete placement. This must be inspected before the concrete is poured. Space raceways laterally to prevent voids in the concrete. Run conduit larger than 1-inch trade size, parallel with or at right angles to the main reinforcement; where at right angles to the reinforcement, the conduit shall be close to one of the supports of the slab. Where nonmetallic conduit is used, raceways must be converted to rigid steel conduit before rising above floor. No PVC allowed above grade nor penetrating structural elements. Conduits through the floor, concrete and/or earth shall be wrapped with PVC tape (minimum of 10 mil.) And supported to maintain vertical plumb.

D. Install exposed raceways parallel and perpendicular to nearby surfaces or structural members and follow the surface contours as much as practical.

E. Run exposed, parallel, or banked raceways together. Make bends in parallel or banked runs from the same center line so that the bends are parallel. Factory long sweep on medium voltage elbows may be used in banked runs only where they can be installed parallel. This requires that there be a change in the plane of the run such as from wall to ceiling and that the raceways be of the same size. In other cases provide field bends for parallel raceways.

F. Join raceways with fittings designed and approved for the purpose and make joints tight. Where joints cannot be made tight, shall use bonding jumpers to provide electrical continuity of the raceway system. Make raceway terminations tight. Where terminations are subject to

vibration, use bonding bushings to assure electrical continuity. Where subject to vibration or dampness, use insulating bushings to protect conductors.

Tighten set screws of threadless fittings with suitable tool (not pliers).

G. Terminations: Double locknuts and plastic bushing shall be used with all IMC and rigid conduits.

H. Where terminating in threaded hubs, screw the raceway or fitting tight into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align the raceway so the coupling is square to the box, and tighten the chase nipple so no threads are exposed.

I. Raceway Expansion Fittings, shall be installed on all raceway runs that cross a building expansion joint. The fittings shall be OZ type "AX" or approved equal, sized to raceway. Conduits 1" and larger install OZ type "B" connectors.

J. Install pull wires in empty raceways. Use monofilament plastic line having not less than 200-lb tensile strength. Leave not less than 12 inches of slack at each end of the pull wire.

K. Telephone and Signal System Raceways 2 each 1-Inch Trade Size: In addition to the above requirements, install raceways 2 each 1-inch trade size in maximum lengths at 100 feet and with a maximum of two, 90-deg bends or equivalent. Install pull or junction boxes where necessary to comply with these requirements. Follow the ANSI/TIA/EIA-569-B standards. Conduits to end within 12” of cable tray with a bend toward IDF room.

L. Install raceway sealing fittings in accordance with the manufacturer's written instructions. Locate fittings at suitable, approved, 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 and elsewhere as indicated:

Where conduits pass from warm locations to cold locations, such as the boundaries of refrigerated spaces and air-conditioned spaces.

Where required by the NEC.

M. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment with an adjustable top or coupling threaded inside for plugs and set flush with the finished floor. Extend conductors to equipment with rigid steel conduit; flexible steel conduit may be used 6 inches above the floor with no more than 36" in length. Where equipment connections are not made under this contract, install screwdriver-operated threaded flush plugs flush with floor.

N. Flexible Connections: Use short length (maximum of 6 ft.) of flexible steel conduit for recessed and semirecessed lighting fixtures, for equipment subject to vibration, noise transmission, or

movement; and for all motors. Install separate ground conductor across flexible connections. Aluminum flexible conduits shall not be used. Use #14 THHN str. Wire with flex whip unit. No MC cable to be used for this purpose.

O. All Metal Raceways: Install a separate green ground conductor in raceway from the junction box supplying the raceway to receptacle or fixture ground terminals.

P. Select each surface metal raceway outlet box to which a lighting fixture is attached to be of sufficient diameter to provide a seat for the fixture canopy.

Q. Install Accessible Junction Boxes: or conduits in conduits runs as required at 100 ft. intervals on long runs. Each junction box shall be supported independent of the conduit. Mark all J-boxes with circuit and panel indentification.

R. Install From Each Recessed Branch Panel, five spare 3/4" conduits (capped) into the ceiling and floor space, when the floor space is not accessible, run six into the ceiling.

3.3 ADJUSTING AND CLEANING

A. Upon completion of installation of raceways, inspect interiors of raceways; clear all blockages and remove burrs, dirt, and construction debris.

END OF SECTION 16110

SECTION 16120 - WIRES AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Requirements of the following Division 16 Sections apply to this section:

Basic Electrical Requirements.

1.2 SUMMARY

A. This Section includes wires, cables, and connectors for power, lighting, control and related systems rated 600 volts and less.

B. Related Sections: The following Sections contain requirements that relate to this section:

Division 16 Section "Electrical Boxes and Fittings" for connectors for Terminating Cables in boxes and other electrical enclosures.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with provisions of the following code:

NFPA 70 "National Electrical Code."
NFPA 76

B. Conform to applicable codes and regulations regarding toxicity of combustion products of insulating materials.

C. UL Compliance: Provide components which are listed and labeled by UL under the following standards.

UL Std. 83	Thermoplastic-Insulated Wires and Cables.
UL Std. 486A	Wire Connectors and Soldering Lugs for Use with Copper Conductors.
UL Std. 854	Service Entrance Cable.

D. NEMA/ICEA Compliance: Provide components which comply with the following standards:

WC-5 Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

E. IEEE Compliance: Provide components which comply with the following standard.

Std. 82 Test procedures for Impulse Voltage Tests on Insulated Conductors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Wire and Cable:

American Insulated Wire Corp.
Brintec Corp.
Carol Cable Co. Inc.
Senator Wire and Cable Co.
Southwire Company.

A. Connectors for Wires and Cable Conductors:

AMP
3M Company
O-Z/Gedney Co.
Square D Company.

2.2 WIRES AND CABLES

A. General: Provide wire and cable suitable for the temperature, conditions and location where installed.

B. Conductors: Provide solid conductors for power and lighting circuits no. 10 AWG and smaller. Provide stranded conductors for sizes no. 8 AWG and larger. All control onductors shall be THHN/THWN stranded in raceway. Motor loads shall be standard copper.

C. Conductor Material: copper for all wires and cables.

D. Insulation: Provide THHN/THWN insulation for all conductors sizes.

E. Color Coding for phase identification in accordance with Table 1 in Part 3 below.

F. Jackets: Factory-applied nylon or PVC external jacketed wires and cables for pulls in raceways over 100-feet in length, for pulls in raceways with more than three equivalent 90 deg. bends, for pulls in conduits underground or under slabs on grade, and where indicated.

2.3 CONNECTORS FOR CONDUCTORS

A. Provide UL-listed factory-fabricated, solderless metal connectors of sizes, ampacity ratings, materials, types and classes for applications and for services indicated. Use connectors with temperature ratings equal to or greater than those of the wires upon which used.

PART 3 - EXECUTION

3.1 WIRING METHOD

A. Use the following wiring methods as indicated:

Wire: install all wire in raceway.

3.2 INSTALLATION OF WIRES AND CABLES

A. General: Install electrical cables, wires, and connectors in compliance with NEC.

B. Coordinate cable installation with other Work.

C. Pull conductors simultaneously where more than one is being installed in same raceway. Use UL listedpulling compound or lubricant, where necessary.

D. Use pulling means including, fish tape, cable, rope, and basket weave wire/cable grips which will not damage cables or raceways. Do not use rope hitches for pulling attachment to wire or cable.

E. Conceal all cable in finished spaces.

F. Install exposed cable parallel and perpendicular to surfaces or exposed structural members, and follow surface contours, where possible.

G. Keep conductor splices to minimum.

H. Install splice and tap connectors which possess equivalent or better mechanical strength and insulation rating than conductors being spliced.

I. Use splice and tap connectors which are compatible with conductor material.

J. Provide adequate length of conductors within electrical enclosures and train the conductors to terminal points with no excess. Bundle multiple conductors, with conductors larger than no 10 AWG cabled in individual circuits. Make terminations so there is no bare conductor at the terminal.

K. Tighten electrical connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL 486A and UL 486B.

L. Mark all the lugs after torquing with a permenant marker or a term color marking tool.

M. Provide insulated green ground wire in all conduits and sized proper to meet code.

3.3 FIELD QUALITY CONTROL

A. Prior to energizing, check installed wires and cables with megohm meter to determine insulation resistance levels to assure requirements are fulfilled.

B. Prior to energizing, test wires and cables for electrical continuity and for short-circuits.

C. Subsequent to wire and cable hook-ups, energize control circuits and demonstrate proper functioning. Correct malfunctioning units, and retest to demonstrate compliance.

D. Provide written documents for all Megger testing.

E. Refer to section 17000 for project commissioning requirements.

TABLE 1: Color Coding for Phase Identification:

Color code secondary service, feeder, and branch circuit conductors with factory applied color as follows:

208/120 Volts	Phase	480/277 Volts
Black	A	Brown
Red	B	Orange
Blue	C	Yellow
White	Neutral	Gray
Green	Ground	Green
White & Green	Isolated Ground	White & Green

Conductors in sizes #6 and below shall be color coded with the colored insulation. Larger sizes may be identified with colored tape. Colored tape (3" minimum) where used shall be applied at all terminations, junction boxes and pull boxes.

END OF SECTION 16120

SECTION 16135 - ELECTRICAL BOXES AND FITTINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. This section is a Division-16 Basic Electrical Materials and Methods section, and is a part of each Division-16 section making reference to electrical wiring boxes and fittings specified herein.

1.2 DESCRIPTION OF WORK:

A. Extent of electrical box and associated fitting work is indicated by drawings and schedules.

B. Types of electrical boxes and fittings specified in this section include the following:

Outlet boxes.
Junction boxes.
Pull boxes.
Floor boxes.
Bushings.
Locknuts.
Knockout closures.

1.3 QUALITY ASSURANCE:

A. Manufacturers: Firms regularly engaged in manufacture of electrical boxes and fittings, of types, sizes, and capacities required, whose products have been in satisfactory use in similar service for not less than 3 years.

B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects utilizing electrical boxes and fittings similar to those required for this project.

C. NEC Compliance: Comply with NEC as applicable to construction and installation of electrical wiring boxes and fittings.

D. UL Compliance: Comply with applicable requirements of UL 50, UL 514-Series, and UL 886 pertaining to electrical boxes and fittings. Provide electrical boxes and fittings which are UL-listed and labeled.

E. NEMA Compliance: Comply with applicable requirements of NEMA Stds/ Pub No.'s OS1, OS2 and Pub 250 pertaining to outlet and device boxes, covers and box supports.

PART 2 - PRODUCTS

2.1 FABRICATED MATERIALS:

A. Outlet Boxes: Provide galvanized flat rolled sheet-steel type of the class required to satisfy the conditions at each outlet, unless indicated. Construct outlet boxes with mounting holes, and with cable and conduit-size knockout openings in bottom and sides. Provide boxes with threaded screw holes, with corrosion- resistant cover and grounding screws for fastening surface and device type box covers, and for equipment type grounding.

B. Study the building conditions and materials surrounding each outlet prior to installing such boxes to prevent interference with work of other trades. Switch, telephone and receptacle outlet boxes: Not less than 4'x4" x 2 1/8" with adapting tile or plaster covers where necessary to set FLUSH with the finished surfaces. A gang box shall be used where more than one switch or device is located at one point. Sectional boxes are not acceptable. In masonry wall where a tile or plaster ring cannot be used, install a single gang 3 1/2" deep box minimum, unless otherwise noted.

C. Install boxes with rigid supports using metal bar hangers between studs with screws. Welding boxes directly to metal joist and studs is NOT acceptable. Boxes set opposite in wall shall have at least 10" of conduit between them.

D. Ceiling fixture outlet boxes shall be 4-inch minimum. Each box shall be supported independently of the conduit to carry 200 lbs. Where three or more raceway entrances are made, use minimum box depth of 2 1/8". Where fixtures are to be installed, provide with standard 3/8" stud.

E. Outlet Box Accessories: Provide outlet box accessories as required for each installation, including box supports, mounting ears and brackets, wallboard hangers, box extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes, which are compatible with outlet boxes being used to fulfill installation requirements for individual wiring situations. Choice of accessories is Installer's code- compliance option.

F. Device Boxes: Provide galvanized coated flat rolled sheet-steel non-gangable device boxes, suitable for installation at respective locations. Construct device boxes for flush mounting with mounting holes, and with cable-size knockout openings in bottom and ends, and with threaded screw holes in end plates for fastening devices. Provide cable clamps and corrosion-resistant screws for fastening cable clamps, and for equipment type grounding.

G. Junction boxes shall be not less than 4 - 0, with plaster ring and flush with finished surface; 4-S or 4-0 boxes shall be used for all devices, single or double gang, with proper plaster ring and covers. Industrial, raised covers shall be used for switch and outlets run on surface. Boxes shall be securely fastened to the surface with approved anchoring means; wooden plugs shall not be allowed. J-boxes with 4 or more conduits shall be minimum size of 4 11/16".

H. Device Box Accessories: Provide device box accessories as required for each installation, including mounting brackets, device box extensions, switch box supports, plaster ears, and plaster board expandable grip fasteners, which are compatible with device boxes being utilized to fulfill installation requirements for individual wiring situations.

I. Manufacturers: Subject to compliance with requirements, provide interior outlet boxes of one of the following:

Bowers
Appleton Electric; Emerson Electric Co.
Midland-Ross Corp.
Pass and Seymour, Inc.
RACO Div; Harvey Hubbell Inc.
Thomas & Betts Co.

J. Raintight Outlet Boxes: Provide corrosion-resistant cast-metal raintight outlet wiring boxes, of types, shapes and sizes, including depth of boxes, with threaded conduit holes for fastening electrical conduit, cast-metal face plates with spring-hinged watertight caps suitably configured for each application, including face plate gaskets and corrosion-resistant plugs and fasteners.

K. Manufacturers: Subject to compliance with requirements, provide raintight outlet boxes of one of the following:

Appleton Electric; Emerson Electric Co.
Arrow-Hart Div; Crouse-Hinds Co.
Bell Electric; Square D Company.
Harvey Hubbell, Inc./RACO
OZ/Gedney; General Signal Co.
Pass and Seymour, Inc.

L. Junction and Pull Boxes: Provide galvanized code-gage sheet steel junction and pull boxes, with screw-on covers; of types, shapes and sizes, to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws and washers.

M. Manufacturers: Subject to compliance with requirements, provide junction and pull boxes of one of the following:

Adalet-PLM Div, Scott Fetzer Co.
Appleton Electric; Emerson Electric Co.

Arrow-Hart Div; Crouse-Hinds Co.
Bell Electric; Square D Company.
GTE Corporation.
Keystone Columbia, Inc,
OZ/Gedney Co.; General Signal Co.
Spring City Electrical Mfg Co.

N. Floor Boxes: Provide adjustable floor boxes as indicated on the drawings, with threaded-conduit-entrance ends, and vertical adjusting rings.

O. Bushings, Knockout Closures and Locknuts: Provide corrosion- resistant box knockout closures, conduit locknuts and malleable iron conduit bushings, offset connectors, of types and sizes, to suit respective installation requirements and applications.

P. Manufacturers: Subject to compliance with requirements, provide bushings, knockout closures, locknuts and connectors of one of the following:

Adalet-PLM Div; Scott Fetzer Co.
AMP, Inc.
Arrow-Hart Div; Crouse-Hinds Co.
Appleton Electric Co.; Emerson Electric Co.
Bell Electric; Square D Co.
Bowers
Midland-Ross Corp.
Midwest Electric; Cooper Industries Inc.
OZ/Gedney Co.; General Signal Co.
RACO Div; Harvey Hubbell Inc.
Thomas & Betts Co., Inc.

PART 3 - EXECUTION

3.1 INSTALLATION OF ELECTRICAL BOXES AND FITTINGS:

A. General: Install electrical boxes and fittings as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in accordance with recognized industry practices to fulfill project requirements.

B. Coordinate installation of electrical boxes and fittings with wire/ cable, wiring devices, and raceway installation work.

C. Provide weathertight outlets for interior and exterior locations exposed to weather or moisture with proper cover.

D. Provide knockout closures to cap unused knockout holes where blanks have been removed.

E. Install electrical boxes in those locations which ensure ready accessibility to enclosed electrical wiring.

F. Avoid installing boxes back-to-back in walls. Provide not less than 6" (150 mm) separation.

G. Position recessed outlet boxes accurately to allow for surface finish thickness.

H. Set floor boxes level and flush with finish flooring material.

I. Avoid using round boxes where conduit must enter box through side of box, which would result in difficult and insecure connections when fastened with locknut or bushing on rounded surfaces.

J. Fasten electrical boxes firmly and rigidly to substrates, or structural surfaces to which attached, or solidly embed electrical boxes in concrete or masonry.

K. Provide electrical connections for installed boxes.

L. Subsequent to installation of boxes, protect boxes from construction debris and damage.

3.2 GROUNDING:

A. Upon completion of installation work, properly ground electrical boxes and demonstrate compliance with 2005 NEC Article 250 requirements with Bonding Pigtail for device boxes.

2005 NEC ART 250

END OF SECTION 16135

SECTION 16143 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Requirements of the following Division 16 Sections apply to this section:

Basic Electrical Requirements.

1.2 SUMMARY

A. This Section includes the following:

Receptacles
Ground Fault Circuit Interrupter Receptacles
Snap Switches
Wall Plates
Floor Service Outlets

B. Related Sections: The following sections contain requirements that relate to this section:

Division 16 Section "Circuit and Motor Disconnects" for devices other than snap switches and plug/receptacle sets used as disconnects for motors.

1.3 SUBMITTALS

A. Product data for each type of product specified.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with provisions of the following codes.

NFPA 70 "National Electrical Code".

UL and NEMA Compliance: Provide wiring devices which are listed and labeled by UL and comply with applicable UL and NEMA standards.

1.5 SEQUENCING AND SCHEDULING

A. Schedule installation of finish plates after the surface upon which they are installed has received final finish.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

	Receptacles Cat.#	Switches Cat. #
Hubbell Inc.	2162	2121
Pass and Seymour Inc.	26362	26021
Leviton	16362	5621

2.2 WIRING DEVICES:

A. General: Provide wiring devices, in types, characteristics, grades, colors, and electrical ratings for applications indicated which are UL listed and which comply with NEMA WD 1 and other applicable UL and NEMA standards. Provide white color devices except as otherwise indicated. Verify color selections with Architect.

B. Receptacles: All receptacles shall be decorator style specification grade. As scheduled in Table 1 in Part 3 below. Comply with UL 498 and NEMA WD 1.

C. Receptacles, Industrial Heavy Duty: Receptacles are to have the following features:

a) Heavy-duty nylon face to resist cracking and chipping.

b) Heavy-duty wraparound mounting strap locked into body for abuse-resistant installation. Heavy-gauge brass ground contacts riveted to strap with solid brass rivets and pretensioned for reliable, abuse-resistant grounding path.

c) Thick-walled, reinforced thermoplastic polyester heat-resistant base for superior thermal and electrical properties.

d) Automatic self-grounding spring assures ground continuity between mounting strap and metal wall box, as allowed by NEC Article 250-74, Exception 2, for equipment bonding.

A. Ground-Fault Interrupter (GFI) Receptacles: as indicated in Table 1 in Part 3 below; provide "feed-thru" type ground-fault circuit interrupter, with integral heavy-duty decorator style specification grade receptacles arranged to protect connected downstream receptacles on same circuit and field of view. Provide unit designed for installation in a 2-3/4 inch deep outlet box without adapter, grounding type, Class A, Group 1, per UL Standard 94.3.

B. Rocker Switches: All rocker switches shall be decorator style, quiet type AC switches as indicated in Table 2 in Part 3 below. Comply with UL 20 and NEMA WD1. Rocker switches are to have the following features:

a) Low profile thermoset rocker switch.

b) Polycarbonate bezel to ensure proper fit with wall plate and prevent rocker binding.

c) Thermoset housing with red base for 20 Amp devices.

d) Thermoset housing also includes provision for back and side-wiring and a retaining slot that prevents wire movement or slippage.

e) External termination clamp as a visual aid for proper wiring. Over size screw heads with cut slots accept both solid and stranded #12 to #10 AWG wires to aid in the application versatility.

f) Provision for two wires per terminal.

g) One-piece bridge with integral ground to satisfy all local code requirements.

h) For applications requiring 20 Amps, 100% copper contact arm assures low heat rise and 20% more silver in the contacts provides for longer life.

i) Switch mechanism with positive action and mechanical break for positive circuit interruption.

A. Color: Color of all devices will be selected by Architect.

2.3 WIRING DEVICE ACCESSORIES

A. Wall plates: single and combination, of types, sizes, and with ganging and cutouts as indicated. Provide metal screws for securing plates to devices with screw heads colored to match finish of plates.

Material and Finish: brushed stainless steel or color by architect.

PART 3 - EXECUTION

3.1 INSTALLATION OF WIRING DEVICES AND ACCESSORIES:

A. Install wiring devices and accessories as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC and in accordance with recognized industry practices to fulfill project requirements.

B. Coordinate with other Work, including painting, electrical boxes and wiring installations, as necessary to interface installation of wiring devices with other Work.

C. Install wiring devices only in electrical boxes which are clean; free from building materials, dirt, and debris.

D. Install wiring devices after wiring work is completed.

E. Install wall plates after painting work is completed.

F. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for wiring devices. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standard 486A. Use properly scaled torque indicating hand tool.

3.2 PROTECTION

A. Protect installed components from damage. Replace damaged items prior to final acceptance.

3.3 FIELD QUALITY CONTROL

A. Testing: Prior to energizing circuits, test wiring for electrical continuity, and for short-circuits. Ensure proper polarity of connections is maintained. Subsequent to energizing, test wiring devices and demonstrate compliance with requirements, operating each operable device at least six times.

A. Test ground fault interrupter operation with both local and remote fault simulations in accordance with manufacturer recommendations.

TABLE 1 (See Evaluations, Ref 3)

RECEPTACLES

DESIG-NATION	CURRENT RATING (1) AMPS	VOLTAGE RATING	SINGLE/ DUPLEX	NEMA CONFIG-URATION	UL GRADE	NOTES
-	20	125	DUPLEX	5-20R	HEAVY DUTY	
WP	20	125	DUPLEX	5-20R	HEAVY DUTY	WEATHERPROOF
WP	20	125	DUPLEX	5-20R	HEAVY DUTY	INTEGRAL GFI (2)

NOTES

(1) Letter designations are used where symbols alone do not clearly designate on plans locations where specific receptacle types are used.

(2) Protects downstream receptacles on same circuit and field of view.

DESIG-NATION (1)	TYPICAL APPLICATION (AC)	LOAD RATING	VOLTAGE RATING	POLES	UL GRADE	NOTES
S	CONTROL LIGHTS	20A	120/277	1	HEAVY DUTY	-
S_3	CONTROL LIGHTS	20A	120/277	3-way	HEAVY DUTY	-
S	DISCONN. MOTOR	1HP	120/277	1	HEAVY DUTY	(2)

NOTES

(1) For rocker switches, designation is the same as the symbol used on plans for the device. Type of switch is determined from plan context including type of device or circuit being controlled.

(2) Overload element in toggle switch.

(3) Pilot light "on" when switch is "on".

END OF SECTION 16143

SECTION 16170 - CIRCUIT AND MOTOR DISCONNECTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Requirements of the following Division 16 Sections apply to this section:

Basic Electrical Requirements
Fuses

1.2 SUMMARY

A. This Section includes circuit and motor disconnects.

B. Related Sections: The following sections contain requirements that relate to this section:

Division 16 Section "Wiring Devices" for snap switches used as motor disconnects.

1.3 SUBMITTALS

A. Product data for each type of product specified.

B. Maintenance data for circuit and motor disconnects, for inclusion in Operation and Maintenance Manual specified in Division 1 and Division 16 Section "Basic Electrical Requirements."

1.4 QUALITY ASSURANCE

A. Electrical Component Standards: Provide components complying with NFPA 70 "National Electrical Code" and which are listed and labeled by UL. Comply with UL Standard 98 and NEMA Standard KS 1.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Square D Company.
General Electric
Siemens

2.2 CIRCUIT AND MOTOR DISCONNECT SWITCHES

A. General: Provide circuit and motor disconnect switches in types, sizes, duties, features ratings, and enclosures as indicated. Provide NEMA 1 enclosure except for outdoor switches, and other indicated locations provide NEMA 3R enclosures with raintight hubs. For motor and motor starter disconnects, provide units with horsepower ratings suitable to the loads.

B. Fusible Switches: heavy duty switches, with fuses of classes and current ratings indicated. See Section "FUSES" for specifications. Where current limiting fuses are indicated, provide switches with non-interchangeable feature suitable only for current limiting type fuses.

C. Non-fusible Disconnects: heavy duty switches of classes and current ratings as indicated.

PART 3 - EXECUTION

3.1 INSTALLATION OF CIRCUIT AND MOTOR DISCONNECTS

A. General: Provide circuit and motor disconnect switches as indicated and where required by the above Code. Comply with switch manufacturers' printed installation instructions.

3.2 FIELD QUALITY CONTROL

A. Testing: Subsequent to completion of installation of electrical disconnect switches, energize circuits and demonstrate capability and compliance with requirements. Except as otherwise indicated, do not test switches by operating them under load. However, demonstrate switch operation through six opening/closing cycles with circuit unloaded. Open each switch enclosure for inspection of interior, mechanical and electrical connections, fuse installation, and for verification of type and rating of fuses installed. Correct deficiencies then retest to demonstrate compliance. Remove and replace defective units with new units and retest.

B. Refer to specification section 17000 for project commissioning requirements.

C. Provide engraved nametag for all dissconnects.

END OF SECTION 16170

SECTION 16190 - SUPPORTING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Requirements of the following Division 16 Sections apply to this section:

"Basic Electrical Requirements."
"Basic Electrical Materials and Methods."

1.2 SUMMARY

A. This Section includes secure support from the building structure for electrical items by means of hangers, supports, anchors, sleeves, inserts, seals, and associated fastenings.

B. Related Sections: The following Sections contains requirements that relate to this Section:

C. Division 3 Section "Concrete Accessories" for inserts, anchors, and sleeves to be installed in concrete for use with supporting devices.

D. Division 5 Section "Metal Fabrications" for requirements for miscellaneous metal items involved in supports and fastenings.

E. Division 7 Section "Joint Sealers" for requirements for firestopping at sleeves through walls and floors that are fire barriers.

F. Refer to other Division 16 sections for additional specific support requirements that may be applicable to specific items.

1.3 QUALITY ASSURANCE

A. Electrical Component Standard: Components and installation shall comply with NFPA 70 "National Electrical Code."

B. Electrical components shall be listed and labeled by UL, ETL, CSA, or other approved, nationally recognized testing and listing agency that provides third-party certification follow-up services.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

Slotted Metal Angle and U-Channel Systems:

Allied Tube & Conduit
American Electric
B-Line Systems, Inc.
Cinch Clamp Co., Inc.
GS Metals Corp.
Haydon Corp.
Kin-Line, Inc.
Unistrut Diversified Products

Conduit Sealing Bushings:

Bridgeport Fittings, Inc.
Cooper Industries, Inc.
Elliott Electric Mfg. Corp.
GS Metals Corp.
Killark Electric Mfg. Co.
Madison Equipment Co.
L.E. Mason Co.
O-Z/Gedney
Product Electric Corp.
Raco, Inc.
Red Seal Electric Corp.
Spring City Electrical Mgf. Co.
Thomas & Betts Corp.

2.2 COATINGS

A. Coating: Supports, support hardware, and fasteners shall be protected with zinc coating or with treatment of equivalent corrosion resistance using approved alternative treatment, finish, or inherent material characteristic. Products for use outdoors shall be hot-dip galvanized.

2.3 MANUFACTURED SUPPORTING DEVICES

A. Raceway Supports: Clevis hangers, riser clamps, conduit straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring steel clamps.

B. Fasteners: Types, materials, and construction features as follows:

No pin driven anchors are acceptable – all must be removable. If necessary threaded screw anchors accepted.

C. Expansion Anchors: Carbon steel wedge or sleeve type.

D. Toggle Bolts: All steel springhead type.

E. Powder-Driven Threaded Studs: Heat-treated steel, designed specifically for the intended service.

F. Conduit Sealing Bushings: Factory-fabricated watertight conduit sealing bushing assemblies suitable for sealing around conduit, or tubing passing through concrete floors and walls. Construct seals with steel sleeve, malleable iron body, neoprene sealing grommets or rings, metal pressure rings, pressure clamps, and cap screws.

G. U-Channel Systems: 16-gage steel channels, with 9/16-inch-diameter holes, at a minimum of 8 inches on center, in top surface. Provide fittings and accessories that mate and match with U-channel and are of the same manufacture. No wire type conduit straps shall be used.

2.4 FABRICATED SUPPORTING DEVICES

A. General: Shop- or field-fabricated supports or manufactured supports assembled from U-channel components.

B. Steel Brackets: Fabricated of angles, channels, and other standard structural shapes. Connect with welds and machine bolts to form rigid supports.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install supporting devices to fasten electrical components securely and permanently in accordance with NEC requirements.

B. Coordinate with the building structural system and with other electrical installation.

C. Raceway Supports: Comply with the NEC, according to seismic zone 3 and the following requirements:

D. Conform to manufacturer's recommendations for selection and installation of supports.

E. Strength of each support shall be adequate to carry present and future load multiplied by a safety factor of at least four. Where this determination results in a safety allowance of less than 200 lbs, provide additional strength until there is a minimum of 200 lbs safety allowance in the strength of each support.

F. Install individual and multiple (trapeze) raceway hangers and riser clamps as necessary to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.

G. Support parallel runs of horizontal raceways together on trapeze-type hangers. Minimum 3/8" thread rods.

H. Support individual horizontal raceways by separate pipe hangers. Spring steel fasteners may be used in lieu of hangers only for 3/4-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings only. For hanger rods with spring steel fasteners, use 3/8-inch-diameter or larger threaded steel. Use spring steel fasteners that are specifically designed for supporting single conduits or tubing according to seismic zone 3.

I. Space supports for raceways in accordance with Table I of this section. Space supports for raceway types not covered by the above in accordance with NEC.

J. Support raceways to the structure at intervals not to exceed eighth foot centers and within twelve inches of each junction outlet, device box, fittings or 90? elbows, minimum of two straps per ten foot run.

K. In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports with no weight load on raceway terminals.

L. Miscellaneous Supports: Support miscellaneous electrical components as required to produce the same structural safety factors as specified for raceway supports and according to seismic zone 3. Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, switchgears, generators, 2" conduit runs and larger, and other devices.

M. In open overhead spaces, cast boxes threaded to raceways need not be supported separately except where used for fixture support; support sheet metal boxes directly from the building structure or by bar hangers. Where bar hangers are used, attach the bar to raceways on opposite sides of the box and support the raceway with an approved type of fastener not more than 24 inches from the box.

N. Sleeves: Install in concrete slabs and walls and all other fire- rated floors and walls for raceways and cable installations. For sleeves through fire rated-wall or floor construction, apply UL- listed firestopping sealant in gaps between sleeves and enclosed conduits and cables in accordance with "Fire Resistant Joint Sealers" requirement of Division 7 Section "Joint Sealers."

O. Conduit Seals: Install seals for conduit penetrations of slabs on grade and exterior walls below grade and where indicated. Tighten sleeve seal screws until sealing grommets have expanded to form watertight seal.

P. Fastening: Unless otherwise indicated, fasten electrical items and their supporting hardware securely to the building structure, including but not limited to conduits, raceways, panelboards, boxes, disconnect switches, and control components in accordance with the following:

Q. Fasten by means of wood screws, toggle bolts on hollow masonry units, concrete inserts or expansion bolts on concrete or solid masonry, and machine screws, welded threaded studs, or spring-tension clamps on steel. Threaded studs driven by a powder charge and provided with lock washers and nuts may be used instead of expansion bolts and machine or wood screws in steel beams only, not concrete. Do not weld conduit, pipe straps, or items other than threaded studs to steel structures. In partitions of light steel construction, use sheet metal screws.

R. Holes cut to depth of more than 1-1/2 inches in reinforced concrete beams or to depth of more than 3/4 inch in concrete shall not cut the main reinforcing bars. Fill holes that are not used.

S. Ensure that the load applied to any fastener does not exceed 25 percent of the proof test load. Use vibration- and shock- resistant fasteners for attachments to concrete slabs.

TABLE I: SPACING FOR RACEWAY SUPPORTS

Raceway Size (Inches)	No. of Conductors in Run	Maximum Spacing of Supports (Feet) Location	RMC&IMC*	EMT	RNC
		HORIZONTAL RUNS			
3/4	1 or 2	Flat ceiling or wall.	5	5	3
3/4	1 or 2	Where it is difficult to provide supports except at intervals fixed by the building construction.	7	7	...
3/4	3 or more	Any location.	7	7	...
1	3 or more	Any location.			
1 & larger	1 or 2	Flat ceiling or wall.	6	6	...
1 & larger	1 or 2	Where it is difficult to provide supports except at intervals fixed by the building construction.	8	8	...
1 & larger	3 or more	Any location.	8	8	...
Any	....	Concealed.	8	8	...
		VERTICAL RUNS			
3/4	....	Exposed.	7	7	...
1,1-1/4	....	Exposed.	8	8	...
1-1/2 and larger	....	Exposed.	8	8	...
Up to 2	....	Shaftway.	8	8	...
2-1/2	....	Shaftway.	8	8	...
3 & larger	....	Shaftway.	8	8	...
Any	....	Concealed.	8	8	...

* Maximum spacings for IMC above apply to straight runs only. Otherwise the maximums for EMT apply.

Abbreviations:		
	EMT	Electrical metallic tubing.
	IMC	Intermediate metallic conduit.
	RMC	Rigid metallic conduit.
	RNC	Rigid nonmetallic conduit.

END OF SECTION 16190

SECTION 16195 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Requirements of the following Division 16 Sections apply to this section:

"Basic Electrical Requirements."
"Basic Electrical Materials and Methods."

1.2 SUMMARY

A. This Section includes identification of electrical materials, equipment, and installations. It includes requirements for electrical identification components including but not limited to the following:

Buried electrical line warnings.

Identification labeling for raceways, cables, and conductors.

Operational instruction signs.

Warning and caution signs.

Equipment labels and signs.

B. Related Sections: The following Sections contain requirements that relate to this Section:

Division 9 Section "Painting" for related identification requirements.

Division 16 Section "Wires and Cables" for requirements for color coding of conductors for phase identification.

Refer to other Division 16 sections for additional specific electrical identification associated with specific items.

1.3 QUALITY ASSURANCE

A. Electrical Component Standard: Components and installation shall comply with NFPA 70 "National Electrical Code."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

American Labelmark Co.
Calpico, Inc.
Cole-Flex Corp.
Emed Co., Inc.
George-Ingraham Corp.
Ideal Industries, Inc.
Kraftbilt
LEM Products, Inc.
Markal Corp.
National Band and Tag Co.
Panduit Corp.
Radar Engineers Div., EPIC Corp.
Seton Name Plate Co.
Standard Signs, Inc.
W.H.Brady, Co.

2.2 ELECTRICAL IDENTIFICATION PRODUCTS

A. Underground Line Marking Tape: Permanent, bright-colored, continuous-printed, magnetic tracking colored PVC type for direct-burial service not less than 6 inches wide by 4 mils thick. Printed legend indicative of general type of underground line below.

B. Wire/Cable designation Tape Markers: Vinyl or vinyl-cloth, self- adhesive, wraparound, cable/conductor markers with preprinted numbers and letter.

C. Aluminum, Wraparound, Cable Marker Bands: Bands cut from 0.014- inch thick, aluminum sheet, fitted with slots or ears for securing permanently around wire or cable jacket or around groups of conductors. Provide for legend application with stamped letters or numbers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install identification devices in accordance with manufacturer's written instructions and requirements of NEC.

B. Sequence of Work: Where identification is to be applied to surfaces that require finish, install identification after completion of finish work.

C. Conduit Identification:

1. Underground Electrical Line Identification: During trench backfilling, for exterior underground power and signal lines, install continuous underground plastic line marker, located directly above line at 6 to 8 inches below finished grade. Where multiple lines installed in a common trench or concrete envelope, do not exceed an overall width of 16 inches; install a single line marker.

2. Install line marker for underground wiring, both direct-buried and in raceway.

D. Conductor Color Coding: Provide color coding for secondary service, feeder, and branch circuit conductors throughout the project secondary electrical system as follows:

1.

208/120 Volts	Phase	480/277 Volts
Black	A	Brown
Red	B	Purple
Blue	C	Yellow
White	Neutral	White
Green	Ground	Green
Green & White	Isolated Ground	Green & White
Control		Violet

2. Apply the following colors to the systems listed below:

a. Fire-Alarm System: Red.
b. Fire-Suppression Supervisory and Control System: Red and yellow.
c. Combined Fire-Alarm and Security System: Red and blue.
d. Security System: Purple.
e. Mechanical and Electrical Supervisory System: Green and blue.
f. Telecommunications System: Blue.
g. Emergency power system: Yellow.
h. 277/480 Volts System: Brown.
i. 120/208 Volts System: Black.
j. Clocks & Bells: Orange.
k. Sound System: Green.
l. Traveler (switch to light or switch to switch) 120Volts: Pink.
m. Traveler (switch to light or switch to switch) 277 Volts: Purple.

A. Use conductors with color factory-applied the entire length of the conductors except as follows:

1. The following field-applied color-coding methods may be used in lieu of factory-coded wire for sizes larger than No. 6 AWG.

E. Apply colored, pressure-sensitive plastic tape in half- lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply the last two laps of tape with no tension to prevent possible unwinding. Use 1-inch-wide tape in colors as specified. Do not obliterate cable identification markings by taping. Tape locations may be adjusted slightly to prevent such obliteration.

F. In lieu of pressure-sensitive tape, colored cable ties may be used for color identification. Apply three ties of specified color to each wire at each terminal or splice point starting 3 inches from the terminal and spaced 3 inches apart. Apply with a special tool or pliers, tighten for snug fit, and cut off excess length.

G. Tag or label conductors as follows:

1. Future Connections: Conductors indicated to be for future connection or connection under another contract with identification indicating source and circuit numbers.

H. Apply warning, caution, and instruction signs and stencils as follows:

Install warning, caution, or instruction signs where required by NEC, where indicated, or where reasonably required to assure safe operation and maintenance of electrical systems and of the items to which they connect. Install engraved plastic- laminated instruction signs with approved legend where instructions or explanations are needed for system or equipment operation. Install butyrate signs with metal backing for outdoor items.

J. Install equipment/system circuit/device identification as follows:

Apply equipment identification labels of engraved plastic- laminate on each major unit of electrical equipment in building, including central or master unit of each electrical system. This includes communication/signal/alarm systems, unless unit is specified with its own self-explanatory identification. Except as otherwise indicated, provide single line of text, with 1/2-inch-high lettering on 1-1/2-inch-high label (2-inch-high where two lines are required), white lettering in black field. Text shall match terminology and numbering of the Contract Documents and shop drawings. Apply labels for each unit of the following categories of electrical equipment.

Panelboards.
Electrical switchboards.
Motor starters.

All sub-panelboards are to be labeled to identify the main from which their power is obtained as well as the location of the main panel, using Weber State University room number.

A. Apply circuit/control/item designation labels of engraved plastic laminate for disconnect switches, breakers, pushbuttons, pilot lights, motor control centers, and similar items for power distribution and control components above, except panelboards and alarm/signal components, where labeling is specified elsewhere. For panelboards, provide framed, typed circuit schedules with explicit description and identification of items controlled by each individual breaker.

B. Install labels at locations indicated and at locations for best convenience of viewing without interference with operation and maintenance of equipment.

END OF SECTION 16195

SECTION 16289 - TRANSIENT VOLTAGE SUPPRESSION

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 transient voltage surge suppressors for low-voltage power, control, and communication equipment.

B. Related Sections include the following:

1. Division 16 Section "Wiring Devices" for devices with integral transient voltage surge suppressors.
2. Division 16 Section "Panelboards" for factory-installed transient voltage surge suppressors.
3. Division 16 Section "Switchboards" for factory-installed transient voltage surge suppressors.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.

B. Product Certificates: Signed by manufacturers of transient voltage suppression devices, certifying that products furnished comply with the following testing and labeling requirements:

1. UL 1283 certification.
2. UL 1449 listing and classification.

C. Field Test Reports: Written reports of tests specified in Part 3 of this Section. Include the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Failed test results and corrective action taken to achieve requirements.

D. Maintenance Data: For transient voltage suppression devices to include in maintenance manuals specified in Division 1.

E. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain suppression devices and accessories through one source from a single manufacturer.

B. Product Options: Drawings indicate size, dimensional requirements, and electrical performance of suppressors and are based on the specific system 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 a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. IEEE Compliance: Comply with IEEE C62.41, "IEEE Guide for Surge Voltages in Low Voltage AC Power Circuits," and test devices according to IEEE C62.45, "IEEE Guide for Surge Suppressor Testing."

E. NEMA Compliance: Comply with NEMA LS 1, "Low Voltage Surge Protective Devices."

F. UL Compliance: Comply with UL 1283, "Electromagnetic Interference Filters," and UL 1449, "Transient Voltage Surge Suppressors."

1.5 PROJECT CONDITIONS

A. Placing into Service: Do not energize or connect service entrance equipment panelboards to their sources until the surge protective devices are installed and connected.

B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

C. Service Conditions: Rate surge protective devices for continuous operation under the following conditions, unless otherwise indicated:

1. Maximum Continuous Operating Voltage: Not less than 115 percent of nominal system operating voltage.
2. Operating Temperature: 30 to 120 deg F.

3. Humidity: 0 to 85 percent, noncondensing.
4. Altitude: 4000 feet above sea level.

1.6 COORDINATION

A. Coordinate location of field-mounted surge suppressors to allow adequate clearances for maintenance.

B. Coordinate surge protective devices with Division 16 Section "Electrical Power Monitoring and Control."

1.7 WARRANTY

A. General Warranty: Special warranties 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 Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of surge suppressors that fail in materials or workmanship within five years from date of Substantial Completion.

C. Special Warranty for Plug-in Cord-Connected Surge Suppressors: Written warranty, executed by manufacturer agreeing to repair or replace electronic equipment connected to circuits protected by surge suppressors.

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. Replaceable Protection Modules: One of each size and type installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Manufacturers of a Broad Line of Suppressors:
   a. Current Technology, Inc.

b. Liebert Corp.
c. United Power, Inc.
d. LEA International.

2.2 SERVICE ENTRANCE SUPPRESSORS

A. Surge Protective Device Description: Non-modular type with the following features and accessories:

1. LED indicator lights for power and protection status.
2. Audible alarm, with silencing switch, to indicate when protection has failed.
3. One set of dry contacts rated at 5 a, 250-V ac, for remote monitoring of protection status.

B. Surge Protective Device Description: Modular design with field-replaceable modules and the following features and accessories:

1. Fuses, rated at 200-kA interrupting capacity.
2. Fabrication using bolted compression lugs for internal wiring.
3. Integral disconnect switch.
4. Redundant suppression circuits.
5. Redundant replaceable modules.
6. Arrangement with copper busbars and for bolted connections to phase buses, neutral bus, and ground bus.
7. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
8. Red and green LED indicator lights for power and protection status.
9. Audible alarm, with silencing switch, to indicate when protection has failed.
10. One set of dry contacts rated at 5 a and 250-V ac, for remote monitoring of protection status. Coordinate with building power monitoring and control system.
11. Surge-event operations counter.

C. Peak Single-Impulse Surge Current Rating: 320 kA per phase.

D. Connection Means: Permanently wired.

E. Protection modes and UL 1449 clamping voltage for grounded wye circuits with voltages of 480Y/277 and 208Y/120; 3-phase, 4-wire circuits, shall be as follows:

1. Line to Neutral: 800 V for 480Y/277 400 V for 208Y/120.
2. Line to Ground: 800 V for 480Y/277 400 V for 208Y/120.
3. Neutral to Ground: 800 V for 480Y/277 400 V for 208Y/120.

F. Protection modes and UL 1449 clamping voltage for 208/120 V, single-phase, 3-wire circuits, shall be as follows:

1. Line to Neutral: 400 V.
2. Line to Ground: 400 V.

3. Neutral to Ground: 400 V.

2.3 ENCLOSURES

A. NEMA 250, with type matching the enclosure of panel or device being protected.

PART 3 - EXECUTION

3.1 INSTALLATION OF SURGE PROTECTIVE DEVICES

A. Install devices at service entrance on load side, with ground lead bonded to service entrance ground.

B. Install devices for panelboard and auxiliary panels with conductors between suppressor and points of attachment as short and straight as possible. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.

1. Provide multipole, 40 A circuit breaker as a dedicated disconnect for the suppressor, unless otherwise indicated.

3.2 CONNECTIONS

A. 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. Testing: Perform the following field quality-control testing:

1. After installing surge protective devices, but before electrical circuitry has been energized, test for compliance with requirements.
2. Complete startup checks according to manufacturer's written instructions.
3. Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.19. Certify compliance with test parameters.

B. Repair or replace malfunctioning units. Retest after repairs or replacements are made.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including piping and electrical connections. Report results in writing.

1. Verify that electrical wiring installation complies with manufacturer's installation requirements.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain surge protective devices.

1. Train Owner's maintenance personnel on procedures and schedules for maintaining suppressors.
2. Review data in maintenance manuals. Refer to Division 1 Section "Contract Closeout."
3. Review data in maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."
4. Schedule training with Owner, through Architect, with at least seven days' advance notice.

B. Refer to specification section 17000 to project commissioning requirements.

END OF SECTION 16289

SECTION 16425 - SWITCHBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

1. 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 service and distribution switchboards rated 600 V and less.

2. Related Sections include the following:

a. Division 16 Section "Basic Electrical Materials and Methods" for general and installation materials and methods.
b. Division 16 Section "Electrical Identification" for identification materials.
c. Division 16 Section "Fuses."

1.3 SUBMITTALS

A. Product Data: For each product and component specified.

B. Shop Drawings: For each switchboard. Show dimensioned plans and elevations, including required clearances and service space, component and device lists, and a single-line diagram showing main- and branch-bus current ratings and short-circuit ratings of switchboard. Include the following:

a. Descriptive documentation of optional barriers specified for electrical insulation and isolation.
b. Details of spare-fuse cabinet showing material, dimensions, and features, including storage provisions for fuse cartons.
c. Schedule of features, characteristics, ratings, and factory settings of individual protective devices.
d. Wiring Diagrams: Details of wiring for power and control and differentiating between manufacturer-installed and field-installed wiring.

C. Maintenance Data: For switchboards to include in the maintenance manuals specified in Division 1. Include detailed manufacturer's written instructions on adjusting overcurrent protective devices.

D. Switchboard manufacturer must provide training to properly set the adjustable overcurrent protection setting.

1.4 QUALITY ASSURANCE

A. Listing and Labeling: Provide switchboard assemblies 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" as defined in OSHA Regulation 1910.7.

B. Comply with NFPA 70.

C. Comply with NEMA PB 2.

D. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchboard equipment, including clearances between switchboard and adjacent surfaces and items. Switchboards having equal performance characteristics and complying with indicated maximum dimensions may be considered.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver in shipping splits of lengths that can be moved past obstructions in delivery path.

B. Store so condensation will not occur on or in switchboards. Provide temporary heaters as required to avoid condensation.

C. Handle switchboards according to NEMA PB 2.1. Use only factory-installed lifting provisions.

1.6 PROJECT CONDITIONS

A. Verify dimensions by field measurements.

B. Determine suitable path for moving switchboard into place considering Project conditions.

C. Verify clearance requirements. Locate switchboard to meet installation tolerances.

D. Revise locations and elevations from those indicated as required to suit Project conditions.

1.7 EXTRA MATERIALS

A. Spare Fuses: 3 spares of each type and rating of fuse and fusible devices used.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. General Electric Co.; Electrical Distribution and Control Division.
2. Square D Co.
1. Siemens

2.2 MANUFACTURED UNITS

A. Front-Connected, Front-Accessible Switchboard: Fixed, individually mounted main device, panel-mounted branches, and sections rear aligned.

1. Ratings: Provide nominal system voltage, continuous main-bus amperage, and short-circuit current ratings as indicated.

2.3 FABRICATION AND FEATURES

A. Barriers: Between adjacent switchboard sections

B. Insulation and isolation for main and vertical buses of feeder sections.

C. Insulation and isolation for main bus of main section and main and vertical buses of feeder sections.

A. Bus Transition and Incoming Line Pull Sections: Matched and aligned with basic switchboard.

A. Pull Box on Top of Switchboard: Include the following features:

1. Adequate ventilation to maintain air temperature in pull box within same limits as switchboard.
2. Set back from front to clear circuit-breaker removal mechanism.
3. Removable covers forming top, front, and sides. Top covers at rear are easily removable for drilling and cutting.
4. Bottom of insulating, fire-resistant material with separate holes for cable drops into switchboards.
5. Cable supports arranged to facilitate cabling and adequate to support cables indicated, including those for future installation.

B. Buses and Connections: 3 phase, 4 wire, except as otherwise indicated. Features as follows:

1. Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent conductivity with feeder circuit-breaker line connections.

2. Load Terminals: Silver-plated copper bus extensions equipped with pressure connectors for outgoing circuit conductors.

3. Ground Bus: 1/4-by-2-inch minimum size, drawn-temper copper of 98 percent conductivity; equipped with pressure connectors for feeder- and branch-circuit ground conductors. For busway feeders, extend insulated equipment grounding cable to busway ground connection and support cable at intervals in vertical run.

4. Contact Surfaces of Buses: Silver plated.

5. Main Phase Buses, Neutral Buses, and Equipment Ground Buses: Uniform capacity the entire length of the switchboard main and distribution sections. Provide for future extensions from both ends.

6. Isolation Barrier Access Provisions: Permit checking bus bolt tightness.

7. Neutral Buses: 100 percent of the ampacity of the phase buses, except as indicated, and equipped with approved pressure connectors for outgoing circuit neutral cables. A bus extension for busway feeder neutral bus is braced.

2.4 ACCESSORY COMPONENTS AND FEATURES

A. Fungus Proofing: Permanent fungicidal treatment for switchboard interior, including instruments and instrument transformers.

2.5 IDENTIFICATION

A. Nameplates and label products are specified in Division 16 Section "Electrical Identification."

1. Compartment Nameplates: Engraved laminated-plastic or metal nameplate for each compartment, mounted with corrosion-resistant screws.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive switchboard for compliance with installation tolerances and other conditions affecting performance of switchboards.

1. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install switchboards level and plumb as indicated, according to manufacturer's written instructions and NEMA PB 2.1.

A. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from switchboard units and components.

3.3 CONNECTIONS

A. Connect switchboards and components to wiring systems and to ground as indicated and instructed by manufacturer.

1. Tighten electrical connectors and terminals, including screws and bolts, according to manufacturer's published torque tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 IDENTIFICATION

A. Identify field-installed wiring and components and provide warning signs as specified in Division 16 Section "Basic Electrical Materials and Methods."

B. Identify field-installed wiring and components and provide warning signs as specified in Division 16 Section "Electrical Identification."

C. Install compartment nameplates.

3.5 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Make insulation-resistance tests of each switchboard bus, component, and connecting supply, feeder, and control circuits.

2. Make continuity tests of each circuit.

B. Acceptance Testing: After installing switchboards and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units, and retest.

C. Infrared Scanning: After Substantial Completion of each phase, but not more than 6 months after Final Acceptance, perform an infrared scan of each switchboard. Remove fronts to make joints and connections accessible to a portable scanner. Infrared scanning must be done by independent third party. This needs to be recorded with prints and DVD copy for owner.

1. Follow-up Infrared Scanning: Perform 1 additional follow-up infrared scan of each switchboard 11 months after date of Substantial Completion.
2. Instrument: Use an approved infrared scanning device designed to measure temperature or detect significant deviations from normal values. Provide calibration record for device used.
3. Record of Infrared Scanning: Prepare a certified report identifying switchboards checked and describing results of scanning. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

D. Refer to specification section 17000 for project commissioning requirements.

3.6 CLEANING

A. Upon completion of installation, inspect interior and exterior of switchboards. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish.

END OF SECTION 16425

SECTION 16452 - GROUNDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Division-16 Basic Materials and Methods sections apply to work of this section.

C. Requirements of this section apply to electrical grounding and bonding work specified elsewhere in these specifications.

1.2 SUMMARY:

A. Extent of electrical grounding and bonding work is indicated by drawings and schedules and as specified herein. Grounding and bonding work is defined to encompass systems, circuits, and equipment.

B. Type of electrical grounding and bonding work specified in this section includes the following:

Solidly grounded.

C. Applications of electrical grounding and bonding work in this section includes the following:

Electrical power systems.
Raceways.
Service equipment.
Enclosures.
Equipment.
Lighting standards.

D. Refer to other Division-16 sections for wires/cables, electrical raceways, boxes and fittings, and wiring devices which are required in conjunction with electrical grounding and bonding work; not work of this section.

1.3 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of grounding and bonding products, of types, and ratings required, and ancillary grounding materials, including

stranded cable, grounding electrodes and plate electrodes, and bonding jumpers whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with electrical grounding work similar to that required for project.

C. Codes and Standards:

1. Electrical Code Compliance: Comply with applicable local electrical code requirements of the authority having jurisdiction, and 2005 NEC as applicable to electrical grounding and bonding, pertaining to systems, circuits and equipment.

2. UL Compliance: Comply with applicable requirements of UL Standards No.'s 467, "Electrical Grounding and Bonding Equipment", and 869 "Electrical Service Equipment", pertaining to grounding and bonding of systems, circuits and equipment. In addition, comply with UL Std 486A, "Wire Connectors and soldering Lugs for Use with Copper Conductors." Provide grounding and bonding products which are UL-listed and labeled for their intended usage.

3. IEEE Compliance: Comply with applicable requirements and recommended installation practices of IEEE Standards 80, 81, 141 and 142 pertaining to grounding and bonding of systems, circuits and equipment. NFPA 780, ANSI J-STD-607-A.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Manufacturers: Subject to compliance with requirements, provide grounding and bonding products of one of the following (for each type of product):

Burndy Corporation.
Cadweld Div; Erico Products Inc.
Joslyn Corporation.
Okonite Company.
OZ Gedney Div; General Signal Corp.
Thomas and Betts Corp.

2.2 GROUNDING AND BONDING:

A. Materials and Components:

1. General: Except as otherwise indicated, provide electrical grounding and bonding systems indicated; with assembly of materials, including, but not limited to, cables/wires, connectors, solderless lug terminals, grounding electrodes and plate electrodes, bonding

jumper braid, surge arresters, and additional accessories needed for a complete installation. Where more than one type component product meets indicated requirements, selection is Installer's option. Where materials or components are not indicated, provide products which comply with NEC, UL, and IEEE requirements and with established industry standards for those applications indicated.

B. Conductors: Unless otherwise indicated, provide electrical grounding conductors for grounding system connections that match power supply wiring materials and are sized according to NEC.

C. Provide stainless steel ground rods. Cadweld connections.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine areas and conditions under which electrical grounding and bonding connections are to be made and notify Contractor in writing of conditions detrimental to proper completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION OF ELECTRICAL GROUNDING AND BONDING SYSTEMS:

A. General: Install electrical grounding and bonding systems as indicated, in accordance with manufacturer's instructions and applicable portions of NEC, NECA's "Standard of Installation", and in accordance with recognized industry practices to ensure that products comply with requirements.

B. Coordinate with other electrical work as necessary to interface installation of electrical grounding and bonding system work with other work.

C. Ground electrical service system neutral at service entrance equipment to existing grounding electrodes.

D. Ground each separately-derived system neutral to:

1. Effectively grounded metallic water pipe.

2. Separate grounding electrode.

E. Connect together system neutral, service equipment enclosures, exposed noncurrent carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors, and plumbing systems.

F. Terminate feeder and branch circuit insulated equipment grounding conductors with grounding lug, bus, or bushing.

G. Tighten grounding and bonding connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values for connectors and bolts. Where manufacturer's torquing requirements are not indicated, tighten connections to comply with tightening torque values specified in UL 486A to assure permanent and effective grounding.

H. Install braided type bonding jumpers with code-sized ground clamps on water meter piping to electrically bypass water meters.

I. Route grounding connections and conductors to ground and protective devices in shortest and straightest paths as possible to minimize transient voltage rises.

J. Apply corrosion-resistant finish to field-connections, buried metallic grounding and bonding products, and places where factory applied protective coatings have been destroyed, which are subjected to corrosive action.

K. Install clamp-on connectors on clean metal contact surfaces, to ensure electrical conductivity and circuit integrity.

3.3 FIELD QUALITY CONTROL:

A. Upon completion of installation of electrical grounding and bonding systems, test ground resistance with ground resistance tester. Where tests show resistance-to-ground is over 10 ohms, take appropriate action to reduce resistance to 10 ohms, or less, by driving additional ground rods; then retest to demonstrate compliance. Provide written report for ground testing.

Owner will test the grounding resistance independently.

END OF SECTION 16452

SECTION 16470 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Division-16 Basic Electrical Materials and Methods sections apply to work specified in this section.

1.2 SUMMARY:

A. Extent of panelboard, load-center and enclosure work, including cabinets and cutout boxes, is indicated by drawings and schedules, and as specified herein.

B. Types of panelboards and enclosures required for the project include the following:

Power-distribution panelboards.
Lighting and appliance panelboards.

C. Fuses required in connection with installation of panelboards and enclosures are specified in another Division-16 section.

D. Refer to other Division-16 sections for wires/cables, electrical boxes and fittings, and raceway work required in conjunction with installation of panelboards and enclosures.

E. Wires/cables, electrical boxes and fittings, and raceways required in conjunction with the installation of panelboards and enclosures are specified in other Division-16 sections.

1.3 SUBMITTALS:

A. Product Data: Submit manufacturer's data on panelboards and enclosures.

A. Wiring Diagrams: Submit wiring diagrams for panelboards showing connections to electrical power feeders and distribution branches.

1.4 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of panelboards and enclosures, of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.
B. Installer's Qualifications: A firm with at least 3 years of successful installation experience on projects utilizing panelboards similar to those required for this project.

C. Codes and Standards:

1. Electrical Code Compliance: Comply with applicable local code requirements of the authority having jurisdiction and NEC Article 384 as applicable to installation, and construction of electrical panelboards and enclosures.

2. UL Compliance: Comply with applicable requirements of UL 67, "Electric Panelboards," and UL's 50, 869, 486A, 486B, and 1053 pertaining to panelboards, accessories and enclosures. Provide panelboard units which are UL-listed and labeled.

3. NEMA Compliance: Comply with NEMA Stds Pub/No. 250, "Enclosures for Electrical Equipment (1000 Volts Maximum)," Pub/No. PB 1, "Panelboards," and Pub/No. PB 1.1, "Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less."

1.5 SEQUENCING AND SCHEDULING:

A. Coordinate installation of panelboards and enclosures with installation of wires/cables, electrical boxes and fittings, and raceway work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Manufacturers: Subject to compliance with requirements, provide panelboard products of one of the following (for each type and rating of panelboard and enclosure):

Square D Company.
General Electric.
Siemens.

2.2 PANELBOARDS:

A. General: Except as otherwise indicated, provide panelboards, enclosures and ancillary components, of types, sizes, and ratings indicated, which comply with manufacturer's standard materials; with the design and construction in accordance with published product information; equip with proper

number of unit panelboard devices as required for complete installation. Where types, sizes, or ratings are not indicated, comply with NEC, UL and established industry standards for those applications indicated.

B. Power Distribution Panelboards: Provide dead-front safety type power distribution panelboards as indicated, with panelboard switching and protective devices in quantities, ratings, types, and with arrangement shown; with anti-turn solderless pressure type main lug connectors approved for use with copper conductors. Select unit with feeders connecting at top of panel. Equip with copper bus bars with not less than 98-percent conductivity, and with full-sized neutral bus; provide suitable lugs on neutral bus for outgoing feeders requiring neutral connections. Provide molded-case main and branch circuit-breaker types for each circuit, with toggle handles that indicate when tripped. Where multiple-pole breakers are indicated, provide with common trip so overload on one pole will trip all poles simultaneously. Provide panelboards with bare uninsulated grounding bars suitable for bolting to enclosures. Select enclosures fabricated by same manufacturer as panelboards, which mate and match properly with panelboards.

C. Lighting and Appliance Panelboards: Provide dead-front safety type lighting and appliance panelboards as indicated, with switching and protective devices in quantities, ratings, types and arrangements shown; with anti-burn solderless pressure type lug connectors approved for use with copper conductors; construct unit for connecting feeders at top of panel; equip with copper bus bars, full-sized neutral bar, with bolt-in type heavy-duty, quick-make, quick-break, single-pole circuit-breakers, with toggle handles that indicate when tripped. Provide suitable lugs on neutral bus for each outgoing feeder required; and provide bare uninsulated grounding bars suitable for bolting to enclosures. Select enclosures fabricated by same manufacturer as panelboards, which mate and match properly with panelboards.

D. Panelboard Enclosures: Provide galvanized sheet steel cabinet type enclosures, in sizes and NEMA types as indicated, code-gage, minimum 16-gage thickness. Construct with multiple knockouts and wiring gutters. Provide fronts with adjustable trim clamps, and doors with flush locks and keys, all panelboard enclosures keyed alike, with concealed piano door hinges and door swings as indicated. Equip with interior circuit-directory frame, and card with clear plastic covering. Provide baked gray enamel finish over a rust inhibitor coating. Design enclosures for recessed mounting. Provide enclosures which are fabricated by same manufacturer as panelboards, which mate and match properly with panelboards to be enclosed.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine areas and conditions under which panelboards and enclosures are to be installed, and notify Contractor in writing of conditions detrimental to proper completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION OF PANELBOARDS:

A. Install panelboards and enclosures as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC standards and NECA's "Standards of Installation," and in compliance with recognized industry practices to ensure that products fulfill requirements.

B. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Stds 486A and B.

C. Fasten enclosures firmly to walls and structural surfaces, ensuring that they are permanently and mechanically anchored.

D. Provide properly wired electrical connections for panelboards within enclosures.

E. Fill out panelboard's circuit directory card upon completion of installation work.

F. Provide engraved mane tags for all panelboards to indicated the names, the voltage and where they are tied to. Color of name tags for emergency pabelboards to be red.

3.3 GROUNDING:

A. Provide equipment grounding connections for panelboard enclosures as indicated. Tighten connections to comply with tightening torques specified in UL 486A to assure permanent and effective grounds.

3.4 FIELD QUALITY CONTROL:

A. Prior to energization of electrical circuitry, check all accessible connections to manufacturer's tightening torque specifications.

B. Prior to energization of panelboards, check with ground resistance tester phase-to-phase and phase-to-ground insulation resistance levels to ensure requirements are fulfilled. Provide written report for insulation resistance testing.

C. Prior to energization, check panelboards for electrical continuity of circuits, and for short-circuits.

3.5 ADJUSTING AND CLEANING:

A. Adjust operating mechanisms for free mechanical movement.

B. Touch-up scratched or marred surfaces to match original finishes.

3.6 DEMONSTRATION:

A. Subsequent to wire and cable hook-ups, energize panelboards and demonstrate functioning in accordance with requirements. Where necessary, correct malfunctioning units, and then retest to demonstrate compliance.

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END OF SECTION 16470

SECTION 16477 - FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions apply to the work of this section.

B. Division-16 Basic Electrical Materials and Methods sections apply to work of this section.

1.2 SUMMARY:

A. Extent of fuse work required by this section is indicated by drawings, and by requirements of this section.

B. Refer to other Division-16 sections for the following items; not work of this section.

1. Motor disconnects.

1.3 SYSTEM DESCRIPTION:

A. Types of fuses specified in this section include the following:

1. Class RKI time-delay.

1.4 SUBMITTALS:

B. Product Data: Submit manufacturer's technical product data on fuses, including specifications, electrical characteristics, installation instructions, furnished specialties and accessories. In addition, include voltages and current ratings, interrupting ratings, current limitation ratings, time-current trip characteristic curves, and mounting requirements.

C. Codes and Standards:

1. UL Compliance and Labeling: Comply with applicable provisions of UL 198D, "High-Interrupting-Capacity Class K Fuses". Provide overcurrent protective devices which are UL-listed and labeled.

2. NEC Compliance: Comply with NEC as applicable to construction and installation of fusible devices.
3. ANSI Compliance: Comply with applicable requirements of ANSI C97.1 "Low-Voltage Cartridge Fuses 600 Volts or Less".

1.5 MAINTENANCE:

A. Extra Materials:

1. Maintenance Stock, Fuses: For types and ratings required, furnish additional fuses, amounting to one unit for every 5 installed units, but not less than one set of 3 of each amperage size.

B. Provide NEMA 1 fuse box by electrical room for spare fuses. Label the box. Minimum size: 2'x2'x1'.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Manufacturers: Subject to compliance with requirements, provide fuses of one of the following:

Bussmann Div; Cooper Industries.
Shawmut Div; Gould Inc.
Little Fuse.

2.2 FUSES:

A. General: Except as otherwise indicated, provide fuses of types, sizes, ratings, and average time-current and peak let-through current characteristics indicated, which comply with manufacturer's standard design, materials, and constructed in accordance with published product information, and with industry standards and configurations.

B. Class RK1 Time-Delay Fuses: Provide UL Class RK1 time-delay fuses rated 600-volts, 60 Hz, 400 amperes, with 200,000 RMS symmetrical interrupting current rating for protecting motors and circuit- breakers.

PART 3 - EXECUTION

2.3 INSTALLATION OF FUSES:

A. Install fuses as indicated, in accordance with manufacturer's written instructions and with recognized industry practices to ensure that protective devices comply with requirements. Comply with NEC, and NEMA standards for installation of fuses.

B. Coordinate with other work, including electrical wiring, as necessary, to interface installation of fuses with other work.

C. Install fuses in fused switches, if any.

2.4 FIELD QUALITY CONTROL:

A. Prior to energization of fusible devices, test devices for continuity of circuitry and for short-circuits. Replace malfunctioning units with new units, and then demonstrate compliance with requirements.

END OF SECTION 16477

SECTION 16480 - MOTOR CONTROLLERS

PART 1 - GENERAL:

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Division-16 Basic Electrical Materials and Methods sections apply to work specified in this section.

1.2 SUMMARY:

A. Extent of motor controller work is indicated by drawings and schedules.

B. Types of motor controllers specified in this section include the following:

Combination.
Fractional HP manual.

C. Work of this section includes wires/cables, raceways, electrical boxes and fittings, as specified in Division-16 Basic Electrical Materials and Methods sections, and used in conjunction with motor controllers.

D. Refer to applicable Division-16 Basic Electrical Materials and Methods sections for wires/cables, electrical raceways, and boxes and fittings required in connection with motor controllers.

1.3 SUBMITTALS:

A. Product Data: Submit manufacturer's data and installation instructions on motor controllers.

B. Shop Drawings: Submit shop drawings of motor controllers showing accurately scaled equipment locations and spatial relationships to associated motors and equipment.

C. Wiring Diagrams: Submit power and control wiring diagrams for motor controllers showing connections to electrical power panels, feeders, and equipment. Differentiate between portions of wiring which are manufacturer-installed and portions which are field-installed.

1.4 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of motor controllers of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer's Qualifications: Firm with at least 3 years of successful installation experience with projects utilizing motor controller work similar to that required for this project.

C. Codes and Standards:

1. Electrical Code Compliance: Comply with applicable local electrical code requirements of the authority having jurisdiction and NEC Articles 220, 250, and 430, as applicable to installation, and construction of motor controllers.

2. NFPA Compliance: Comply with applicable requirements of NFPA 70E, "Standard for Electrical Safety Requirements for Employee Workplaces."

3. UL Compliance: Comply with applicable requirements of UL 486A and B, and UL 508, pertaining to installation of motor controllers. Provide controllers and components which are UL-listed and labeled.

4. IEEE Compliance: Comply with recommended practices contained in IEEE Standard 241, "Recommended Practice for Electric Power Systems in Commercial Buildings," pertaining to motor controllers.

5. NEMA Compliance: Comply with applicable requirements of NEMA Standard ICS 2, "Industrial Control Devices, Controllers and Assemblies", and Pub No. 250, "Enclosures for Electrical Equipment (1000 Volts Maximum)", pertaining to motor controllers and enclosures.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING:

1. Deliver motor controllers and components properly packaged in factory-fabricated type containers.

A. Store motor controllers and components in original packaging and in a clean dry space; protect from weather and construction traffic.

B. Handle motor controllers and components carefully to avoid breakages, impacts, denting and scoring finishes. Do not install damaged equipment; replace and return damaged units to equipment manufacturer.

1.6 SEQUENCING AND SCHEDULING:

A. Coordinate with other electrical work including wires/cables, electrical boxes and fittings, and raceways, to properly interface installation of motor controllers with other work.

B. Sequence motor controller installation work with other work to minimize possibility of damage and soiling during remainder of construction period.

1.7 MAINTENANCE:

A. Maintenance Data: Submit maintenance data and parts list for each motor controller and component; including "trouble shooting" maintenance guide. Include that data, product data and shop drawings in a maintenance manual; in accordance with requirements of Division 1.

B. Maintenance Stock, Fuses: For types and ratings required, furnish additional fuses, amounting to one unit for every 10 installed units, but not less than 5 units of each.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Manufacturers: Subject to compliance with requirements, provide motor controllers of one of the following (for each type and rating of motor controller):

Allen-Bradley Co.
Appleton Electric Co.; Subsidiary of Emerson Electric Co.
Crouse-Hinds Co.
Furnas Electric Co.
General Electric Co.
GTE Products Corp.
Square D Co.
ITE

2.2 MOTOR CONTROLLERS:

A. General: Except as otherwise indicated, provide motor controllers and ancillary components which comply with manufacturer's standard materials, design and construction in accordance with published product information, and as required for a complete installation.

B. Combination Controllers: Provide full-voltage alternating- current combination reversing controllers, consisting of controller and fused disconnect switch mounted in common enclosure, of types, sizes, ratings, and NEMA sizes indicated. Provide a control power transformer, HOA switch, pilot light, and auxiliary contacts (2 N.O., 2 N.C.). Provide manual reset overload relays. Provide operating handle for disconnect switch mechanism with indication and control of switch position, with enclosure door either opened or closed, and capable of being locked in OFF position with three

padlocks. Construct and mount controllers and disconnect switches in single NEMA Type 1 enclosure; coat with manufacturer's standard color finish.

C. Combination Reversing Controllers: Provide full-voltage alternating- current combination reversing controllers, consisting of controller and fused disconnect switch mounted in common enclosure, of types, sizes, ratings, and NEMA sizes indicated. Provide a control power transformer, HOA switch, pilot light, and auxiliary contacts (2 N.O., 2 N.C.). Provide manual reset overload relays. Provide operating handle for disconnect switch mechanism with indication and control of switch position, with enclosure door either opened or closed, and capable of being locked in OFF position with three padlocks. Construct and mount controllers and disconnect switches in single NEMA Type 1 enclosure; coat with manufacturer's standard color finish.

D. Fractional HP Manual Controllers: Provide single-phase fractional HP manual motor controllers, of sizes and ratings indicated. Equip with manually operated quick-make, quick-break toggle mechanisms; and with one-piece melting alloy type thermal units. Controller to become inoperative when thermal unit is removed. Provide controllers with double break silver alloy contacts, visible from both sides of controller; red pilot lights, and switch capable of being padlocked-OFF. Enclose controller unit in NEMA Type 1 general purpose enclosure suitable for flush mounting; coat with manufacturer's standard color finish.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine areas and conditions under which motor controllers are to be installed, and notify Contractor in writing of conditions detrimental to proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION OF MOTOR CONTROLLERS:

A. Install motor controllers where indicated, in accordance with equipment manufacturer's written instructions and with recognized industry practices; complying with applicable requirements of NEC, UL and NEMA standards, to insure that products fulfill requirements.

B. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standards 486A and B, and the National Electrical Code.

C. Install fuses, of sizes indicated, in each fusible disconnect switch, if any.

D. Provide engraved name tags for all controllers to indicate name, voltage and where they are tied to.

3.3 FIELD QUALITY CONTROL:

A. Prior to energization of motor controller equipment, check with ground resistance tester, phase-to-phase and phase-to-ground insulation resistance levels to ensure requirements are fulfilled.

B. Prior to energization, check circuitry for electrical continuity, and for short-circuits. Provide written report for insulation resistance tests.

C. Ensure that direction of rotation of each motor fulfills requirements.

3.4 GROUNDING:

A. Provide equipment grounding connections for motor controller equipment as indicated. Tighten connections to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounding.

3.5 ADJUSTING AND CLEANING:

A. Adjust operating mechanisms, where necessary, for free mechanical movement.

B. Touch-up scratched or marred enclosure surfaces to match original finishes.

3.6 DEMONSTRATION:

A. Upon completion of installation of motor controller equipment and electrical circuitry, energize controller circuitry and demonstrate functioning of equipment in accordance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and retest to demonstrate compliance.

END OF SECTION 16480

SECTION 16515 - INTERIOR LIGHTING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Division-16 Basic Electrical Materials and Methods sections apply to work specified in this section.

1.2 SUMMARY:

A. Extent, location, and details of interior lighting fixture work are indicated on drawings and in schedules.

B. Types of interior lighting fixtures in this section include the following:

1. Fluorescent.
2. Incandescent
3. HID.

1.3 SUBMITTALS:

A. Product Data: Submit manufacturer's product data and installation instructions on each type interior building lighting fixture and component.

A. Shop Drawings: Submit layout drawings of interior lighting fixtures and their spatial relationship to each other. In addition, submit fixture shop drawings in booklet form with separate sheet for each fixture, assembled in "luminaire type" alphabetical or numerical order, with proposed fixture and accessories clearly indicated on each sheet. Submit details indicating compatibility with ceiling grid system.

B. Wiring Diagrams: Submit wiring diagrams for interior lighting fixtures showing connections to electrical power panels, switches, dimmers, controllers, and feeders. Differentiate between portions of wiring which are manufacturer-installed and portions which are field-installed.

A. Maintenance Data: Submit maintenance data and parts list for each interior lighting fixture and accessory; including "trouble- shooting" maintenance guide. Include that data, product data, and shop drawings in a maintenance manual; in accordance with general requirements of Division 1.

1.4 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of interior lighting fixtures of sizes, types and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer's Qualifications: Firms with at least 3 years of successful installation experience on projects with interior lighting fixture work similar to that required for this project.

C. Codes and Standards:

1. Electrical Code Compliance: Comply with applicable local code requirements of the authority having jurisdiction and NEC Articles 220, 410, and 510 as applicable to installation, and construction of interior building lighting fixtures.

2. NEMA Compliance: Comply with applicable requirements of NEMA Stds Pub/No.'s LE 1 and LE 2 pertaining to lighting equipment.

3. UL Compliance: Comply with UL standards, including UL 486A and B, pertaining to interior lighting fixtures. Provide interior lighting fixtures and components which are UL-listed and labeled.

4. CBM Labels: Provide fluorescent lamp ballasts which comply with Certified Ballast Manufacturers Association standards and carry the CBM label.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Deliver interior lighting fixtures in factory-fabricated containers or wrappings, which properly protect fixtures from damage.

B. Store interior lighting fixtures in original packaging. Store inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, humidity, laid flat and blocked off ground.

C. Handle interior lighting fixtures carefully to prevent damage, breaking, and scoring of finishes. Do not install damaged units or components; replace with new.

1.6 SEQUENCING AND SCHEDULING:

A. Coordinate with other work including wires/cables, electrical boxes and fittings, and raceways, to properly interface installation of interior lighting fixtures with other work.

B. Sequence interior lighting installation with other work to minimize possibility of damage and soiling during remainder of construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Manufacturers: Subject to compliance with requirements, provide products of manufacturers as indicated in the fixture schedule on the drawings.

2.2 FIXTURES:

A. General: Provide lighting fixtures, of sizes, types and ratings indicated; complete with, but not limited to, housings, energy- efficient lamps, lamp holders, reflectors, energy efficient ballasts, starters and wiring. Ship fixtures factory-assembled, with those components required for a complete installation. Design fixtures with concealed hinges and catches, with metal parts grounded as common unit, and so constructed as to dampen ballast generated noise.

B. Wiring: Provide electrical wiring within fixture suitable for connecting to branch circuit wiring as follows:

1. NEC Type AF for 120 volt, minimum No. 18 AWG.

C. Fluorescent Lamp Ballasts: Provide class A electronic fluorescent lamp ballasts, CSA rated, capable of operating lamp types indicated, with less than 10% THD and 5 year warranty.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine areas and conditions under which lighting fixtures are to be installed, and substrate for supporting lighting fixtures. Notify Contractor in writing of conditions detrimental to proper completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF INTERIOR LIGHTING FIXTURES:

A. Install interior lighting fixtures at locations and heights as indicated, in accordance with fixture manufacturer's written instructions, applicable requirements of NEC, NECA's "Standard of

Installation," NEMA standards, and with recognized industry practices to ensure that lighting fixtures fulfill requirements.

B. Provide fixtures and/or fixture outlet boxes with hangers to properly support fixture weight. Submit design of hangers, method of fastening, other than indicated or specified herein, for review by Architect.

C. Install flush mounted fixtures properly to eliminate light leakage between fixture frame and finished surface.

D. Provide plaster frames for recessed fixtures installed in other than suspended grid type acoustical ceiling systems. Brace frames temporarily to prevent distortion during handling.

E. For air supply type fixtures, retain side slot closures in place adjustment by Balancing Contractor.

F. Fasten fixtures securely to indicated structural supports; and ensure that pendant fixtures are plumb and level. Provide individually mounted pendant fixtures longer than 2 feet with twin stem hangers. Provide stem hanger with ball aligners and provisions for minimum one inch vertical adjustment. Mount continuous rows of fixtures with an additional stem hanger greater than number of fixtures in the row.

G. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Stds 486A and B, and the National Electrical Code.

H. Support surface mounted fixtures greater than 2 feet in length at a point in addition to the outlet box fixtures stud.

3.3 FIELD QUALITY CONTROL:

A. Replace defective and burned out lamps for a period of one year following the Date of Substantial Completion.

B. At Date of Substantial Completion, replace lamps in interior lighting fixtures which are observed to be noticeably dimmed after Contractor's use and testing, as judged by Architect.

C. Refer to Division-1 sections for the replacement/restoration of lamps in interior lighting fixtures, where used for temporary lighting prior to Date of Substantial Completion.

D. Extra Materials:

1. Furnish stock or replacement lamps amounting to 2%, but not less than 2 lamps in each case, of each type and size lamp used in each type fixture (indoor and outdoor). Deliver replacement stock as directed to Owner's storage space.

3.4 ADJUSTING AND CLEANING:

B. Clean interior lighting fixtures of dirt and construction debris upon completion of installation. Clean fingerprints and smudges from lenses.

C. Protect installed fixtures from damage during remainder of construction period.

3.5 GROUNDING:

A. Provide equipment grounding connections for interior lighting fixtures as indicated. Tighten connections to comply with tightening torques specified in UL Std 486A to assure permanent and effective grounds.

3.6 DEMONSTRATION:

A. Upon completion of installation of interior lighting fixtures, and after building circuitry has been energized, apply electrical energy to demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.

END OF SECTION 16515

SECTION 16660 - SEISMIC BRACING

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

A. The General Conditions, Supplementary General Conditions Alternates and Addenda, Applicable Drawings and the Technical Specifications shall apply to all work under this division.

1.2 SCOPE OF WORK

A. The materials covered by these specifications consists of furnishing all labor, material and equipment necessary to complete the seismic bracing for all work provided under Division 16000.

B. The work shall include all electrical isolated and non-isolated equipment, fixtures, raceways, panelboards, engine generator, etc.

1.3 CODES - REGULATIONS

A. In the installation of this work, comply in every way with the requirements of the laws, ordinances and rules of the system design and installation shall be based on seismic zone III of the Uniform Building code, 1985 edition and other standards listed below.

B. Reference Standards

Uniform Building Code 1985 edition
NFPA bulletin 90A, current edition
UL Standard 181
Tri-services manual, fagel etal 1973

C. If a conflict occurs between these rules and this specification, the rules are to govern. Accept this condition upon submitting bid, and no extra charge will be allowed after the contract is awarded. This shall not be construed as relieving the contractor from complying with any requirements on the plans or specifications which may be in excess of requirements of the hereinbefore mentioned rules and not contrary to same. Contractor shall bear all costs arising from the installation of any materials or equipment which is in conflict with the above mentioned codes or ordinances.

D. Obtain approvals, inspections, etc., required by code. All fees shall be included in the contract price. The contractor shall furnish a certificate of approval to the Owners Representative from the inspection authority at completion of the work.

1.4 MATERIALS AND WORKMANSHIP

A. All materials and equipment furnished and installed shall be first quality, new and meet the standards of NEMA, IPCEA, LS, UL, NFPA, UBC, UOSH, NEC, and shall bear their label wherever standards have been established and label service is available. Where materials and equipment are specified by manufacturer's name, the type and quality required is thereby denoted. The Owners Representative shall be afforded every facility, deemed necessary to inspect and examine the materials and apparatus being installed to provide their quality, skill and competency of workmanship.

B. Workmanship shall be the best quality of its kind for the respective industries, trades, crafts and practices and shall be acceptable in every respect to the Owner's Representative. Nothing contained herein shall relieve the contractor from making good and perfect work in all details of construction.

C. The contractor shall work in harmony with the Owner's Representative and with other contractors, companies or individuals working in connection with this project. Imperfections or errors by other contractors shall not relieve responsibility of this contractor. Store materials orderly and clean up without interference with other trades.

1.5 QUALITY ASSURANCE

A. The contractor shall be held responsible for purchasing and installing vibrator isolators, flexible connections, rigid steel frames, concrete inertia bases, anchors, inserts, hangers, and attachments, seismic bracing and snubbers as required for seismic control and prevention of the transmission of vibration for both isolated and non-isolated systems.

B. Manufacturers and suppliers approved for use by the contractors Mason Industries, Inc., Korfund, and Amber/Booth Company.

C. The approved manufacturer or supplier shall be totally responsible for the fabrication and operation of the seismic bracing components specified herein for al isolated equipment, non-isolated equipment, fixtures, raceways, etc.

1.6 GUARANTEE

A. The entire electrical system installed under this contract shall be left in proper working order and be in compliance with the drawings, specifications and/or authorized changes to the satisfaction of the Owner's Representative. Without additional charge, replace any work or materials which develop defects, except from ordinary wear, within one year from the date of substantial completion.

PART 2 - PRODUCTS

2.1 RACEWAYS, PANELBOARDS, LIGHTING FIXTURES, ETC.

A. All equipment shall be installed according to 1982 Uniform Building Code Sec. 2312 (g): Cp Factor Table 23j, I Factor Table 23K. I Factor Table 23K. In addition the vertical forces, restraint requirements shall be computed as .5g the value of the lateral forces.

B. All raceway shall be protected against seismic disturbances except as noted below:

All electrical conduit less than 2" inside diameter.

PART 3 - EXECUTION

3.1 SEISMIC REQUIREMENTS

A. All electrical work shall be braced or supported to withstand seismic disturbances and remain operational. Furnish all labor, materials and equipment to provide protection against seismic disturbances and remain in place.

END OF SECTION 16660

SECTION 16835

CLOSED CIRCUIT TELEVISION AND DIGITAL RECORDING SYSTEM

PART 1 GENERAL

1.1 CONDITIONS AND REQUIREMENTS

A. Refer to General Conditions, Supplemental General Conditions, Special Conditions, and Division 1 General Requirements and all other Divisions and Sections related to the security requirements, conditions, equipment and provisions.

B. Specific manufacturer name(s) and model number(s) are used to establish a level of quality and a specific set of operational functions.

1.2 DESCRIPTION OF WORK:

A. Provide a complete and operating 100% solid-state, color video system complete with cameras, monitors, protective enclosures, lenses, mounting hardware, cables, switching equipment and other such products, equipment and wiring normally and reasonably required for the operation of a complete video surveillance and digital recording system.

B. Equipment shall conform to the requirements of FCC and EIA rules and regulations including EIA standard RS-170A covering color television equipment.

C. These systems include interfacing and interconnection with other low voltage systems described in this specification. Verify the requirements for these interfaces and provide auxiliary equipment necessary for complete functioning of all systems.

D. Provide and install a CCTV system as shown on drawings and described herein for location listed above.

A representative from Alcoholic Beverage Control, (Bill Garner, Inventory Auditor phone 801-977-6840) will coordinate and meet with the contractor at the store location before installation of surveillance equipment, to discuss the mounting and positions, of the cameras for a complete operating system as per specification. Coordination is critical with ABC and its IT department on this project.

Digital Video Recorder will need to be delivered to the Department of Alcoholic Beverage Control for software installation and programming prior to install.

E. Provision of conduit, raceways, shelves and backboards is not included under this section of the work but the security subcontractor shall closely coordinate installation of these.

1.3 SUBMITTALS:

A. PRODUCT DATA: Submit manufacturer’s data on closed circuit TV and recording systems including, but not limited to, roughing-in diagrams and instructions for

installation, operating and maintenance, suitable for inclusion in maintenance manuals. Also include standard or typical riser and complete wiring diagrams for controls and system components.

B. SHOP DRAWINGS: Provide shop drawings showing equipment/device locations and connecting iring of entire CCTV system. Include wiring diagrams and riser diagrams.

Provide to the owner the following:

1. A complete set of shop drawings indicating: locations of all cameras, power supplies and controllers; point-to-point wiring diagrams for all devices.
2. Wiring diagrams for: cameras, environmental enclosures, mounts; controllers; auxiliary devices.
3. A complete equipment list identifying: type; model; manufacturer; manufacturer data sheets.
4. A complete I/O list identifying: cameras; remote signaling and auxiliary functions zones or control points; specific devices associated with each zone or control point.

Failure to submit the above information shall result in immediate rejection of the shop drawings and product data.

PART 2 - PRODUCTS

2.1 EQUIPMENT:

A. Power Supply:(1) 16 channel 5A (120VA minimum) 24VAC or 28VAC selectable output per channel with circuit breaker protection.

B. Cameras: 1/3-inch dual voltage 24 VAC 12 VDC high resolution 520 TV lines color camera with 3.5-8mm varifocal auto iris lens ceiling or pendant style mount dome with 3-point axis (left, right, up, down, clockwise, counter clockwise viewing capabilities).

Camera’s to be mounted using pendant mounts, as called out on the drawings.

C. Monitors: 19” CCTV-LCD High Res. RCA Component or BNC Video Inputs. (Will be utilized as a public viewing moniotor) 800 x 600.

Monitor Mount: Ceiling mount for 19” LCD monitors, black.

Flat Screen Monitor: 17” color LCD flat screen monitor. VGA 800 x 600.

D. CCTV EQUIPMENT CONSOLE
Pelco CE9

E. DIGITAL VIDEO RECORDING SYSTEM

Toshiba DVR 16-480-500,16 Camera, 500 GB fixed disk, current Surveillix software.

The digital video management system design shall be a microprocessor-based video processor, multiplexer and recorder running on the Windows 2000 operating system. Designed to operate with black-and-white and color composite video signals, the device shall compress and multiplex video images from up to 16 cameras and store them in the unit's image database. It shall provide a variety of multiple- and single-camera display options, optional operator-selected activity target settings, playback, optional image enhancement tools and several alarm/event triggered response options. The unit shall provide operator-definable live filters to record and trigger alarm events when the light level changes, motion is detected or a perimeter is crossed. The unit shall provide operator-definable filters to search the image database for light changes, motion and perimeter violations, as well as camera, date/time and filter settings, then display a list of matching video segments. It shall provide for simultaneous recording, playback, transmitting, database searching and archiving. One channel of audio and up to four text inputs shall be supported with required hardware properly installed and set up according to manufacturer's instructions. Live audio shall be available for listening while viewing live video. Recorded audio shall be available for listening while viewing recorded video from any camera recorded during the same time frame. The unit shall be capable of displaying up to 16 cameras during playback mode with or without text. Text shall be available during playback without obstruction of the video image. All display features shall be available from an on-screen interface. Some features shall also be available from an optional manufacturer-specific camera control device. All programming features shall be available from an on-screen programming interface. The unit shall provide for network operation with a manufacturer-specific software application.

Camera selection for display shall be controlled from the main screen. It can also be controlled from an optional manufacturer-specific camera control device.

Sequential switching of each camera in full screen or in the lower right quadrant shall be controlled through on-screen programming. It can also be controlled from an optional manufacturer-specific camera control device.

A call/spot monitor option shall permit an additional video monitor either to display a single camera's live video signal or to automatically display video in sequence from alarmed cameras.

In playback mode, video output shall be available as a signal in single-camera format at 640x480 pixels, in four-camera format at 320x240 pixels per pane, in nine-camera format at 213x160 pixels per pane or in 16-camera format at 160x120 pixels per pane. When full-screen display is selected, the signal in single-camera format shall be resized to 800x600, in four-camera format to 400x300 per pane, in nine-camera format to 267x200 per pane or in 16-camera format to 200x150 per pane. The unit shall allow operator selection and display of stop-action or frozen images of any stored image while in playback mode. As an option, the unit shall allow magnification of a display image up to a factor of 16 times its original size.

Playback tools shall provide the means to enhance any stored image for display or output to an attached printer. This selection of tools shall include image enhancement, image sharpening, brightness and contrast control, and hue and saturation/lightness control.

In playback mode, the unit shall allow a selected image to be saved to an internal floppy disk drive or loaded from a floppy disk and displayed on the unit. The unit shall allow the use of enhancement tools on the loaded image.

Images stored in the database shall be identified to allow search and retrieval by type of event or image. Searches shall be specified by alarm, camera number, date/time, event type (i.e., video loss) or filter. Search results shall be provided in a scrollable list to allow selection for display.

The digital video management system shall be approximately 17.5² D x 17² W x 6.75² H. A single unit shall fit into a standard 19² rack.

Front panel power and reset switches shall have a tactile response (click) and a minimum operating life of 100,000 cycles when operating at a maximum rate of two cycles per second. The buttons shall be accessible through pinholes on the front panel.

F. Video Cabling:

Video cables used in overall signal path lengths (camera to furthest monitor) of 250 feet or less shall be of the coaxial type and have a copper braided shield with 95% minimum coverage with a 22 gauge stranded copper center conductor with a nominal impedance of 75 ohms. The cable shall have a cellular polyethylene (foam) insulation and black polyethylene jacket. DC resistance of center conductor shall be no greater than 15 ohms per 1000 foot length. Cable shall be West Penn #816.

Video cables used in overall signal path lengths (camera to furthest monitor) of more than 250 feet shall be of the coaxial type and have a copper braided shield with 95% minimum coverage with a 14 gauge solid copper center conductor with a nominal impedance of 75 ohms. The cable shall have polyethylene insulation and black polyethylene jacket. DC resistance of center conductor shall be no greater than 2.6 ohms per 1000 foot length. Not more than 25 feet (composite) of the video cable specified above may be used in these longer runs to facilitate termination and connection of the video system. Cable shall be West Penn #811.

Connectors for use throughout the video Surveillance system for video signals shall be 2 Piece Crimp 'BNC' type and where possible all equipment shall be provided with matching connectors. Signal cable connectors shall be provided as required to match the equipment.

G. ADDITIONAL CCTV EQUIPMENT: See CCTV Riser.

PART 3 EXECUTION

3.1 INSTALLATION:

A. Security video camera and monitor interconnections shall be made as shown on the drawings.

B. Coaxial video and signal cable shall be installed in metallic conduits and shall be continuous from outlet to outlet without splices. Termination of cables shall be at

equipment locations only. Install coaxial cable without sharp bends and terminate only with connectors.

C. Special care in cable installation shall be exercised to avoid grounds due to careless terminations or damage to the jacket over the shield. Take special care to ensure that random contact of shields of adjacent cables do not occur in consoles and at junction boxes.

D. Exterior units shall be mounted for optimum coverage and shall protect camera from accidental blows and vandalism. Provide all required mounting hardware.

E. Before final camera locations are selected, the low voltage systems subcontractor shall provide an operational video system at the project site and demonstrate the field-of-view available from several optional locations in the vicinity of the location shown. Provide several interchangeable lenses or a 'zoom' system to allow the Owner to select the exact field-of-view desired on a monitor equal in size to the one to be installed for each camera location. Carefully mark the exact locations selected and the lens focal lengths used in a distinctive manner on the 'As-Built' set of drawings and obtain a signature signifying acceptance by the Owner for each location and lens combination.

F. Locate each camera only after completing the above described procedure with the Owner. Provide all hardware and fully install all surveillance system equipment.

Perform the following start-up tasks:

1. Aim all cameras.
2. Provide and adjust all lenses as described above.
3. Set all camera outputs to 1.0 volt peak-to-peak under minimum rated subject illumination when the subject is a 50% black and white standard test pattern. Set all switcher outputs for 1.0 volt peak-to-peak (within 0.3 volts) for every switcher input.
4. Program all camera identifiers as directed by the Owner.
5. Make such other settings and adjustments as required to bring the system on-line and operating in accordance with these specifications.

G. Coordinate non-video connections to the weatherproof camera enclosures, switchers, monitors, and other equipment specified for use in this section. These connections include grounding and coordination for installation of 120 VAC power.

H. Camera identification shall be provided for all cameras. Identifications are to be provided by owner.

I. Program the switchers, quad splitters, DVR’s, etc. for operation as requested by the owner.

J. Coordinate with the custom cabinet supplier to assure proper installation dimensions, ventilation and mounting requirements. Custom panels with monitors installed shall not deflect more than 1/8 inch. Additional support for the panel shall be installed to limit the deflection if required.

3.2 TRAINING:

A. The Contractor shall include in the base contract all costs required to train the Owner operating and maintenance personnel in the use and maintenance of systems provided under this division of the specifications. Instructors certified in writing, by the manufacturer of the specific system, shall conduct the training sessions. Provide a minimum of 4 hours or training to be divided into two training sessions. Training sessions are to be recorded. The videotapes or disks are to be turned over to the owner with the O&M Manuals.

3.3 WARRANTY:

A. Provide a one year parts and on site labor warranty. This does not include abuse, mishandling or acts of nature.

END OF SECTION 16835

SECTION 16900

FIRE ALARM/DETECTION SECURITY SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
B. Division-16 Basic Materials and Methods sections apply to work specified in this section.

1.2 DESCRIPTION OF WORK:

A. Extent of fire alarm/detection security systems work is indicated by drawings and schedules.

B. Install a new addressable fire alarm security system

C. Comply with NEC as applicable to construction and installation of fire alarm and detection system components and accessories. Provide components and systems, which are UL-listed and labeled for fire alarm. Provide fire alarm and detection systems and accessories, which are FM approved. Comply with State and local requirements as applicable.

D. Comply with applicable provisions of current NFPA Standards for 72A Local Protective Signaling Systems, 72B Auxiliary Protective Signaling Systems, 72C Remote Station Protective Signaling Systems (as applicable), local building codes, and meet requirements of local authorities having jurisdiction.

1.3 SUBMITTALS:

A. PRODUCT DATA: Submit manufacturer's data on fire alarm and detection systems including, but not limited to, roughing-in diagrams and instructions for installation, operating and maintenance, suitable for inclusion in maintenance manuals. Also include standard or typical riser and complete wiring diagrams for panel and system.

B. SHOP DRAWINGS: Provide shop drawings showing equipment/device locations and connecting wiring of entire fire alarm and detection system. Include wiring diagrams and riser diagrams of panel.

C. CERTIFICATION: Submit a written statement to the Architect and the state and local Fire Marshal's Office that each device of the fire alarm system has been installed, inspected and tested in accordance with applicable requirements of NFPA Standard 72. This statement shall be submitted at the time of completion of the fire alarm system installation.

D. Provide to the Fire Marshall's office the following:

1. A complete set of shop drawings indicating:

   a. Location of all alarm-initiating and alarm-signaling devices.
   b. Point-to-point wiring diagrams for all alarm-initiating and alarm-signaling devices.

2. Wiring diagrams for:

   a. Fire Security Alarm control panel.
   b. Auxiliary function relays and solenoids.
   c. Remote signaling equipment.

3. Standby battery calculations.

4. A complete equipment list identifying:

   a. Type
   b. Model
   c. Manufacturer
   d. Manufacturer catalog data sheets
   e. UL Listing and/or FM approval showing compatibility of device with Fire Alarm Control Panel (FACP).

5. A complete zone list identifying all:

   a. Alarm-initiating and alarm-signaling devices.
   b. Remote signaling and auxiliary function zones.
   c. Specific devices associated with each zone.

6. A complete Certificate of Compliance.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. MANUFACTURER: Subject to compliance with requirements, provide fire alarm/detection security system as manufactured:.

Fire Alarm System: Silent Knight 5808.
Access Control System: TAC:INET

2.2 FIRE ALARM/DETECTION SECURITY SYSTEMS:

A. GENERAL: Provide an electrically operated, electrically supervised fire alarm/security system as described herein. Include control units, power supplies, alarm initiating and

indicating devices, arming panel, door contacts, glass break sensors, motion sensors, conduit, wire, fittings and accessories required to provide a complete operating system. Enclose entire system in raceway. Provide basic wiring materials which comply with Division 16, Basic Materials and Methods Sections for raceways, conductors, boxes, fittings, supports, etc.

B. SYSTEM DESCRIPTION: Provide a combination Fire alarm Security system with the following functions and features:

1. Eight Zone Panel
2. Eight Partions
3. 75 User codes
4. Two bell circuits
5. Seven authority levels
6. Temporal code compliant
7. Supports UL268 listed commercial wireless smode detectors
8. Supervised dialer circuit
9. Event logging storage, printing and retrieval
10. Automatic scheduling features
11. Easily programmed and maintained through Compass Windows based software
12. Programmable auxiliary Form C relays
13. Hardwired addressable technology
14. Notification appliance circuits Two
15. Class A Style D capability

C. SYSTEM TYPE: Analog addressable, non-coded. Either manual activation of a fire alarm station or activation of an automatic initiating device energizes all fire alarm signaling devices, sounding a non-coded alarm and providing device identification on an annunciator panel.

D. SYSTEM OPERATION: Provide system such that any manual station or automatic initiating device annunciates all alarm indicating units (bells, horns, buzzers, chimes, visual alarm lamps, etc.) continuously until the manual station or initiating device is restored to normal and the fire alarm control unit reset. Annunciate alarm signals by zone at the control panel and all remote annunciators. Provide all conductors, raceway, equipment and labor to accomplish the following:

1. Deactivate air supply and return fan units simultaneously by means of a supervised master fan shutdown relay with slave relays as required. Restart air units automatically after panel has been reset. Provide a bypass switch for master fan shut down relay for drill purposes, and indicate by a locked-in lamp that the circuit has been bypassed.
2. Selectively activate and/or deactivate fan units in accordance with schedule shown on the drawings.
3. Release all magnetic door holders upon activation of an alarm from any zone by use of a master relay in the control panel.
4. Provide supervised circuits for the following:
5. System shall report to Central Station as determined by facility owner. Install one conductor pair from the fire alarm panel to the telephone terminal board. Make all connections at both the fire alarm panel and the telephone terminal board.

Make arrangements at the appropriate stage of construction to arrange for the leased line. This request must be made at least two weeks prior to final connection.

6. Provide fire alarm security control panel with capability of shutting down individual initiating devices for maintenance purposes without affecting the continued operation of other initiating devices.
7. The general system shall not activate elevator recall, only the local device. Recall initiating detectors shall have auxiliary contacts. Appropriate wiring in conduit shall be run from the initiating devices to the elevator control panel. These devices shall also initiate an evacuation alarm.
8. Sprinkler Supervision. Provide a signal initiating and supervisory circuit to each sprinkler riser and subdivision. Provide continuous alarm signal upon actuation of any waterflow signal initiating device. Sound alarm until the condition has been corrected and panel manually reset as required by UL 864. Provide separate alarm zones for: (1) alarm zones from "waterflow alarms", (2) alarm zones from "supervisory alarm" indicating sprinkler system trouble. Provide power to all sprinkler system alarm bells furnished under Section 15.
9. Monitor all doors as shown on drawings.
10. Provide motion and glass breakage sensors as shown on the drawings
11. Provide system arming station as shown on the drawings.
12. Provide dialer compatible to central station monitoring.

2.3 SCOPE OF THE WORK:

A. Install complete Fire Security Alarm detection system.
B. Install all system alarm devices as show on prints.
C. Install new duct smoke detectors and fan relays at all fan units over 2000 CFM as shown on drawings. Shut down all supply and return fans upon a general alarm signal.
D. Install new smoke detectors in the corridors and various rooms as per prints. 6. Install new pull stations as indicated on the drawings.
E. All initiating devices connected to the fire alarm control panel shall be analog addressable.
F. All wiring shall be in conduit. All conduit and connectors, shall be made of steel. All conduit runs shall form a complete loop from the fire alarm control panel.

2.4 PERIPHERAL DEVICES:

A. Remote identification module devices shall be attached to any single normally open initiating device (heat detector, waterflow switch, duct detectors, sprinkler, tamper and flow switches, pull stations, etc.). The modules shall supply addressing and status information to the FC7200A system through the dual loop module.

2.5 CONTROL POINT MODULE:

A. The control point module shall be connected to the same loop as the initiating devices, and shall provide a relay output (Form "C" 2 Amp @ 24 VDC, resistive only).
B. This relay output shall be used to perform auxiliary functions.

2.6 MANUAL FIRE ALARM STATION:

A. Provide red enclosure, manual fire alarm stations with the following features:

1. Poly Carbonate construction, for semi-flush mounting.
2. Addressable alarm type electrically compatible with system requirements.
3. Double Action
4. Break glass design requiring unit to be opened for resetting, and requiring resetting before closing.
5. Electrically compatible with system requirements.
6. Key reset, keyed like fire control panel. Provide one spare "glass" for each station required.

2.7 IONIZATION SMOKE DETECTORS:

A. All ionization smoke detectors shall be capable of being replaced without disconnecting any wires or wire connectors from the base of the detector. Each detector shall be installed on a separate base. The detector base shall be capable of receiving a photoelectric, ionization, or electronic thermal detector. All ionization fire detectors shall be UL 268 listed. All detectors shall have (2) viewable LEDs to indicate the status of the device.

2.8 DUCT FIRE DETECTORS WITH SAMPLING TUBE):

A. Provide ionization type with UL 268A listings. Each detector shall be equipped with a remote light located as on the drawings. Each detector shall have (2) form "c" alarm contacts rated at 10 amps.

2.9 AUDIOVISUAL ALARM HORNS SEMI-FLUSH MOUNTED OR EQUAL):

A. Provide audio-visual alarm horns with the following features:
   1. Die cast or stamped steel construction, finished in red enamel, suitable for indoor or outdoor application.
   2. Capable of 90 db sound level at 10 feet.
   3. Flush mounted.
   4. Integrally mounted flashing light unit, with Lexan lens with block letters "FIRE", and minimum flash rate of ONE per second, and 75 candela minimum.
   5. Electrically compatible with system requirements.
   6. Horns shall sound the temporal pattern (code 3) until silenced.
   7. Audiovisual alarm horns shall have the ability to silence horns while maintaining the strobe flash, until reset.
   8. Mechanical horn mechanism only, electronic horns are not acceptable.
   9. Maximum 24 horns per circuit, maximum 8 strobes per circuit.

B. AUXILIARY RELAY:

Remote auxiliary relay boards shall be rated at 10 AMPS @ 120 VAC. A red LED shall light to indicate relay activation. All relays shall transfer on general alarm and latch on until reset. All relays shall be supervised. The control output provided can be used in conjunction with fire alarm applications (i.e. fan controls, dampers, doors, and any other general alarm control).

C. ZONE MODULES:

Provide style "6" zone modules capable of receiving and annunciating an alarm from any detector, even with a single fault condition on any on any initiating circuit.

D. Power all smoke detectors from the "Style 6" initiating loop wiring. For systems which power smoke detectors separately from the "Style 6" loop, provide monitoring for both the power source and the independent zone wiring, so that complete trouble and alarm indication is achieved by zone. Provide capability to operate all smoke detectors, even with a single fault condition on the smoke detector power wiring. Provide the number of zones shown on the fire alarm zone schedule (see drawings).

E. SIGNALING MODULES:

Provide signaling as required. Provide power adequate to sound all signaling devices concurrently. Provide supervised indicating circuits for polarized 12V D.C. alarm signaling devices. Provide 30% spare capacity.

Each signal circuit shall have a separate disconnect switch for servicing the fire alarm system. Each and every indicating circuit shall have a distinct location description. Power supply shall be at fire alarm control panel. Remote power supplies and indicating circuits will not be acceptable.

F. SYSTEM CONFIGURATION PROGRAMMING:

To help the owner in programming, system changes, and servicing, the fire alarm system shall have the following functions.

1) The FACP shall be capable of an auto-configuration, which via a password, all analog devices and panel modules are automatically programmed into the system. At this point the system will operate as a general alarm system without any other programming.

2) If any two devices are addressed the same, the LED's on both devices will light steady and the panel will read "extra address and the address number".

3) If any device is installed and not programmed into the system the LED will light steady and the panel will read the same as above.

G. BATTERIES:

Provide Gel Cell standby batteries capable of operating fire alarm system for minimum of 24 hours, then perating all indicating units for at least five minutes. Locate batteries in fire alarm control unit, or in similar type enclosure located as directed. Provide all interconnecting wiring. Place batteries which vent hydrogen gas in separate enclosure.

1. Provide wall mounted Security System arming station, door position indicator switches and door monitors, motion and glass break sensors.

PART 3 – WIRING

3.1 GENERAL REQUIREMENTS:

A. All new wire used on the fire alarm system shall be U.L. Listed as fire alarm protective signaling circuit cable per NEC, Article 760. Bell wire or thermostat wire is not acceptable.
B. If twisted or shielded wire is required or recommended by the manufacturer it must be used.

PART 4 - FINAL ACCEPTANCE AND GUARANTEE

4.1 GUARANTEE:

A. Furnish a three-year guarantee for all equipment, materials and installation, including all labor, transportation, and equipment.

B. Emergency Response. The fire alarm equipment supplier shall provide an emergency response within four hours of any reported system failure to resolve the problem on a continuous basis.

4.2 FINAL TEST:

A. Before the installation shall be considered completed and acceptable, a test on the system shall be performed as follows:

1. The contractor's job foreman, a representative of the manufacturer, a representative of the district, and the fire department shall operate every building fire alarm device to ensure proper operation and correct annunciation at the control panel.

2. The supervisory circuitry of the initiating and indicating circuits shall also be verified.

PART 5 - AS BUILT DRAWINGS AND OPERATION AND MAINTENANCE MANUALS:

5.1 LABELING:

A. All devices shall be labeled with their appropriate address. The labels shall be 36 point Kroy labels.

B. All initiating devices shall be programmed to include the device address and a complete user text English location description. i.e. Device L4S76, Smoke Detector, 1st floor Rm.17.

5.2 AS BUILT DRAWINGS:

A. A complete set of CAD "as-built" drawings showing installed wiring, color coding, specific interconnections between all equipment, and internal wiring of the equipment shall be delivered to the owner upon completion of the system.

B. A building map shall be supplied to the owner indicating the exact location of all devices along with the addresses of the individual devices. Install building fire alarm map adjacent to the fire alarm panel. Provide high quality plastic sign (map holder) with two layers. The back layer shall be painted black. The front layer shall be a clear center for viewing the CAD fire alarm drawing. Edges of the sign shall be colored to match the building interior. The building map shall indicate the various by the use of different colors (minimum of five colors).

C. The disk containing the files shall be supplied to the owner. These disks shall include all information required to allow the Owner to change the fire alarm program themselves. These computer disks shall contain a minimum of the following:

1. CAD drawing files of building fire alarm map
2. CAD drawing files of as-built fire alarm/security components and point to point connections.
3. General configuration programming.
4. Job specific configuration programming.
5. Tutorial file on complete programming of fire alarm system.

5.3 OPERATING AND MAINTENANCE MANUALS:

A. Operating and maintenance manuals shall be submitted prior to testing of the system. A total of (4) manuals shall be delivered to the Owner. Manuals shall include all service, installation, and programming information.

5.4 TRAINING:

A. Provide Two (2) hours training on the operation and installation of fire alarm system, at job site, at no cost to owner.

END OF SECTION 16900