

PROJECT MANUAL

EMPLOYEE FITNESS & WELLNESS CENTER



EL PASO COUNTY

500 E. San Antonio
El Paso, Texas



March 2019



305 Leon Street
El Paso, Texas 79901
(915) 533-2700

TABLE OF CONTENTS

Note: The numbering and locations of sections is unique to this project. Read all sections of the specifications completely. Failure to do so, or assuming that items are included by others because of the organization of work in these documents, will not relieve the bidders from completing the entire job within the contract price.

The General Contractor is responsible for bidding and providing a complete job and for coordinating his subcontractors' bids and work, wherever called for or specified herein or on the plans, period.

T E C H N I C A L S E C T I O N S

COUNTY OF EL PASO FRONT END DOCUMENTS

DIVISION 1 – GENERAL

- 01000 GENERAL REQUIREMENTS FOR CONSTRUCTION
- 01039 COORDINATION AND MEETINGS
- 01300 SUBMITTALS
- 01500 TEMPORARY FACILITIES
- 01560 TEMPORARY CONTROLS
- 01600 MATERIALS & EQUIPMENT
- 01700 PROJECT CLOSE OUT
- 01740 WARRANTIES & BONDS & MSDS SHEETS

DIVISION 2 – SITE WORK

- 02840 IRRIGATION SPECIFICATIONS
- 02930 PLANTING SPECIFICATIONS

DIVISION 3 – CONCRETE

- 03214 BRICK PAVERS
- 03300 CAST IN PLACE CONCRETE
- 03353 STAMPED CONCRETE

DIVISION 4 – MASONRY (NOT USED)

DIVISION 5 – METAL

- 05410 LIGHT GAGE METAL FRAMING
- 05500 METAL FABRICATIONS

DIVISION 6 – WOOD AND PLASTICS

- 06100 ROUGH CARPENTRY
- 06200 FINISH CARPENTRY

DIVISION 7 – THERMAL & MOISTURE CONTROL

- 07200 THERMAL AND SOUND INSULATION
- 07241 EXTERIOR INSULATED FINISH SYSTEM
- 07272 MEMBRANE BARRIER
- 07420 MANUFACTURED METAL PANELS
- 07600 FLASHING AND SHEET METAL
- 07900 JOINT SEALANTS



1 March 2019

DIVISION 8 – DOORS, WINDOWS AND GLASS

08110 STEEL DOORS & FRAMES
08211 FLUSH WOOD DOORS
08710 DOOR HARDWARE
08800 GLASS AND GLAZING

DIVISION 9 – FINISHES

09250 GYPSUM DRYWALL
09300 CERAMIC TILE
09305 TILE SETTING MATERIALS AND ACCESSORIES
09510 SUSPENDED ACOUSTICAL CEILING
09511 ACOUSTICAL PANEL CEILINGS
09620 SPECIALTY RUBBER FLOORING
09900 PAINTING

DIVISION 10 MISCELLANEOUS ITEMS

10160 TOILET PARTITIONS
10500 METAL LOCKERS
10522 FIRE EXTINGUISHERS
10800 TOILET AND BATH ACCESSORIES

DIVISION 11 – EQUIPMENT

11001 EQUIPMENT AND MISCELLANEOUS ITEMS

DIVISION 12 – FDFDFDSFJSDFJK (NOT USED)

DIVISION 13 – SPECIAL CONSTRUCTION (NOT USED)

DIVISION 14 – VERTICAL TRANSPORTATION (NOT USED)

DIVISION 15 – MECHANICAL

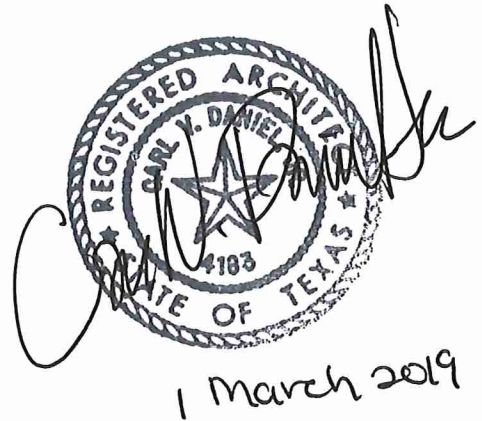
15000 MECHANICAL GENERAL CONDITIONS
15180 INSULATION FOR MECHANICAL SYSTEMS
15400 PLUMBING
15500 FIRE SPRINKLER SYSTEM
15800 HEATING, VENTILATING, AND AIR CONDITIONING
15900 TEST AND BALANCE

DIVISION 16 – ELECTRICAL

16000 GENERAL REQUIREMENTS FOR ELECTRICAL WORK
16060 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
16120 LOW VOLTAGE ELECTRICAL POWER, CONDUCTORS AND CABLES
16125 WIRING DEVICES
16130 RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS
16195 IDENTIFICATION FOR ELECTRICAL SYSTEMS

DIVISION 17 – IT

17000 IT SPECIFICATIONS



1. **CONTRACTOR'S RESPONSIBILITY:** The Contractor, Sub-Contractors, and materials supplier's are separately and jointly responsible for the proper working, workmanship, installation, operations, appearance, and durability of items incorporated into the project. As a professional, the Contractor shall not use the excuse that work was installed as detailed or specified and does not function or fit properly. If the Contractor or Sub-Contractor are in disagreement with any items, details, methods, specifications, he shall notify the architect prior to ordering or starting the work in question. Such matters will be clarified in writing by the Engineer prior to their incorporation into the project.
2. **MINOR ADJUSTMENTS:** The Contractor is obligated to make minor adjustments in the field as directed by the Architect and Engineer, without additional cost to the Owner.
3. **SITE EXAMINATION:**
 - A. **Location:** The extent and location of the work is as shown on the plans. The Contractor shall confine his use to the site and area, except as required by the Contract Documents to do work off the site, or as determined by direction of the Architect.
 - B. **Inspection of Premises:** The Contractor will be held to have examined the site and the scope of work as described in the Contract Documents and to have satisfied himself as to the conditions that will be obligated to perform his work, or conditions that will in any manner affect the work under this contract. No extra payment will be allowed for additional work that could have been determined by inspection.
 - C. The Contractor shall verify all measurements at the area of construction as the work progresses and shall be responsible for their correctness. Failure to do so will not constitute a reason for extra charge or compensation on account of differences between actual dimensions of the work and the measurements indicated on the drawings. Any difference which may be found shall be submitted to the Architect for consideration before proceeding with the work.
 - D. The General Contractor shall employ a full-time, competent field superintendent and during the progress of the work, the General Contractor shall lay out on the slabs the exact location of all partitions, doors openings and coordinate all other work and sub-trades as a guide to all trades. Offset lines for all partitions shall be distinctly indicated on the floors and shall be maintained as long as needed.
 - E. Before ordering any materials or doing any work the Sub-Contractor shall be responsible for the verification of all measurements of the area of construction he will be working and shall be responsible for their correctness. Any differences found shall be submitted to the Owner for consideration before proceeding with the work or ordering of material.
4. **SAFETY:** The Contractor and his Sub-Contractors are responsible for using good safety procedures and practices at all times. The Owner and the Architect are not responsible for any safety procedures or practice, at any time, on or off the job site, for any reason.

5. INSPECTION AND TESTING:

- A. Inspection Agency: An independent testing laboratory will be selected by the Contractor to perform the specific testing of construction materials.
- B. Payment for Testing: Testing laboratory charges shall be paid by the Owner and shall not be included as part of this Contract.
- C. Payment for Retesting: Should the results of the laboratory tests indicate that the material or workmanship fails to comply with the requirements of the Specifications, the work shall be removed or reworked until it does satisfy the requirements. The final results shall be verified as acceptable by the laboratory tests, which shall be paid for the Contractor, at his own expense.

6. CODES, PERMITS, REGULATIONS AND LICENSES:

- A. Compliance: All work pertaining to, all materials supplied for, and executing and completing this Contract, shall comply with the provisions specified in these Specifications and with latest editions of all applicable codes, requirements, laws regulations and ordinances, including any and all amendments and addenda thereto, as adopted by legally constituted authorities having jurisdiction and governing the work, including but not necessarily limited to those of:
 - 1. Local Building Code, Southern Standard (Building code.)
 - 2. Federal Occupational Safety and Health Act.
 - 3. Local Mechanical Code and Plumbing Code.
 - 4. The National Local Electrical Codes.
 - 5. National Fire Protection Association.
 - 6. All other codes, laws, regulations and ordinances called for within applicable Sections of these Specifications.
- B. Inclusion: Said codes, laws, regulations and ordinances are hereby made a part of the Contract Documents, as they may apply.
- C. Copies at Site: Contractor shall secure and maintain at the project site one copy of all the Codes, Laws, and Ordinances as specified herein and within other sections of these Specifications.
- D. Conflicts: In the event of a conflict between these documents and a code requirement, the code requirement shall govern (with the Architect's agreement prior to resolution of the problem), with no increase in price.

7. PUMPING AND DRAINAGE: Permit no surface or subsurface water or other fluid to accumulate in excavations or under structures. Should such conditions develop or be encountered, control water or other fluid and suitably dispose of by means of temporary pumps, piping, drainage lines and ditches, dams or other methods as approved by Architect at no cost to Owner.**8. WATERTIGHT-WEATHERTIGHT CONSTRUCTION:** Anything in the Contract Documents notwithstanding, the Contractor accepts the responsibility of constructing a watertight-weather-tight structure.

9. **REPAIR:** All streets, curbs, utilities and adjacent structures or property damaged during this construction will be repaired or replaced by the Contractor at no cost to the Architect or Owner.
10. **LABOR:** All labor shall be performed in the best and work workmanlike manner, using current acceptable standards of practice, by mechanics skilled in their respective trades. The standards of work required throughout shall be such as will bring results of first class quality only. Sub Contractors or Mechanics whose work is unsatisfactory to the Owner or the Architect or are considered by the Owner to be unskilled or otherwise objectionable, shall be dismissed from the job.
11. **CONTRACT DOCUMENTS:** Bidder is reminded to carefully read all sections of the specifications, especially the Special Conditions and General and Supplementary General Conditions. The intent of these drawings and specifications shall be interpreted to meet all codes, good workmanship and acceptable standards of practice. Some drawings may be diagrammatic, but in all cases the measurements are to be checked from the work in place. Should a variation be found, it must be referred to the Architect for instructions.
12. **SUPERINTENDENCE:** The required Contractor's Field Superintendent shall be approved by the owner and shall as specified in the General Conditions, shall have authority to make decisions required on the job, and shall keep the project quality and progress of work consistent with the Agreement.
13. **SITE:** Accept the site on an "as-found" basis on date of "Notice to Proceed" and do all work required to render a complete project.
14. **CONSTRUCTION SCHEDULE:** Contractor is to provide a complete construction schedule, using approved scheduling method. First payment will be held until schedule is submitted. Schedule is to be presented in graphic form and in 4 copies, one copy to be at the job site. Schedule to be updated on monthly basis showing all changes in the schedule.
15. **PROTECTION:** It shall be the Contractor's responsibility to protect the safety of the public and employees by securing all work, materials, debris, machinery and equipment during and after working hours.
16. **GUARANTEES:** The Contractor shall deliver to the Owner, with his request for final payment, copies of all manufacturer's guarantees, service contracts, and all other guarantees specified, including his own guarantee for a one year period.
17. **SPECIFICATIONS:** The specifications are intended to supplement the drawings, the two being considered cooperative and therefore, it will not be the province of these specifications to mention any portion of the construction which the drawings are competent to explain, and such omission will not relieve the Contractor from carrying out such portions of the construction which the drawings are competent to explain, and such omission will not relieve the Contractor from carrying out such portions as are only indicated from the drawings, and should items be required by these specifications which are not indicated on the drawings, they are to be supplied and installed.

18. **HINDRANCES AND DELAYS:** No charge shall be made by the Contractor for hindrances or delay from any cause during the progress of any portion of work embraced in this contract.
19. **LOSSES FROM NATURAL CAUSES:** All loss or damage out of the nature of the work to be done, or from the action of the elements or from unforeseen circumstances in the prosecution of the same, or from unusual obstructions or difficulties which may be encountered in the prosecution of the work shall be sustained and borne by the Contractor at his own cost and expense.
20. **PARKING:** Parking is the contractors responsibility.
21. **STORAGE OF MATERIALS, ETC.:** The Contractor is responsible for materials stored on the site. Any loss of or damage to such materials will be borne by the Contractor. This is a dangerous site; protect your personnel and materials.
22. **OSHA REGULATIONS:** The Contractor shall abide by OSHA regulation and shall be responsible to see that all safety devices, guardrails, ladders, warning signs, etc., are provided and used by all persons at the construction site. He shall provide whatever temporary facilities are necessary to meet current OSHA regulation; to include all sub-contractors.
23. **INTERPRETATION OF QUESTIONS:**
- A. Only written instructions from the Owner, Architect or Contractor are binding throughout bidding and construction.
 - B. In case of specification and drawing conflict, or drawings conflict, the superior quality shall govern.
 - C. All questions directed to the Owner by telephone or letter shall come from the General Contractor only. **SUB-CONTRACTORS ARE TO WORK THROUGH THE GENERAL CONTRACTOR.**
24. **COMMON REFERENCE STANDARDS:** Reference in the Specifications to known standards such as codes, specifications, etc., promulgated by professional or technical associations, institutes and societies, are intended to mean the latest edition of each such standard referred to shall be considered a part of the specifications to the same extent as if reproduced therein in full. The following is a representative list such entities:
- | | |
|-------|---|
| AASHO | American Association of State Highway Officials |
| ACI | American Concrete Institute |
| AIEE | American Institute of Electrical Engineers |
| AISC | American Institute of Steel Construction |
| ASA | American Standards Association |
| ASME | American Society of Mechanical Engineers |
| ASTM | American Society of Testing and Materials |
| AWSC | American Welding Society Code |
| CSI | Constructions Specifications Institute |
| FIA | Factory Insurance Association |
| NEC | National Electrical Code |
| UL | Underwriter's Laboratories, Inc. |
| WCLIB | West Coast Lumber Inspection Bureau |

25. **CHANGE ORDERS:** The General Contractor may not issue change orders to sub-contractors without the written approval of the Architect.
26. **BRACING & SHORING:** Brace and shore all construction elements and all excavations to protect workers, the public and the project.
27. **Not Used**
28. **COORDINATION:** The General Contractor is responsible for the assignment of work to the trades. Do not infer inclusion of an item to one Sub-Contractor over another due to placement within the drawings or specifications. All work covered in any area of the documents must be done. Who does what is determined by the General Contractor, who must read all specifications sections and all plans, and coordinate all work among the subs and deliver a complete job.
29. **SHOP DRAWING AND MATERIAL BROCHURES & SUBMITTALS:**
- A. Shop drawings and materiel brochures & submittals are for the benefit of the contractor and establish his intent toward fabrication and installation of building components. The accuracy of design, dimensions and quantity shown on shop drawings and material submittals are the responsibility of the contractor not the Engineer or Owner. The Contractor shall approve the shop drawings and material submittal to the Architect, Engineer or Owner.
 - B. All items submitted must meet requirements of the General Conditions & must be approved by the General Contractor & appropriate Sub-contractor prior to submission. The Contractor's stamp indicating each item has been check and **meet plans & specification requirements** must appear on each submitted item or it will not be processed.
 - C. Submittal data will be accepted for processing ONLY when it is completely marked to indicate **compliance with each and every specification requirement**. Each and every requirement must be highlighted or written cost difference & explanation for non-compliance provided. Incomplete or inadequately marked submittals will not be processed.
 - D. It is the Contractor's responsibility to insure that submittals are complete, accurate, and reflect the intent of the Project Documents. Submittals processing by the Architect **does not** relieve the Contractor of responsibility for providing all equipment and materials in accordance with requirements of the Project Document.
 - E. Fabrication prior to complete processing of shop drawings and material submittals is at the Contractor's risk.
 - F. Shop drawing shall indicate clearly the number of items their location, dimensions, materials, assembly, fastenings, finishes, specifications, and colors. They shall provide installation details at large enough scale to show definitely and accurately the requirements, including proper anchorage.
 - G. The originals intent of the construction documents must be met, **REGARDLESS SUBSTITUTIONS OR REVISIONS.**

30. **THE PROJECT LOG:** The Contractor shall keep and maintain a Daily Log. All unforeseen conditions that impact the object shall also be recorded. The log must be accessible to the Owner and the Architect. Inventory of plumbing materials shall be kept in the project log book.

31. **NOT USED**

32. **CONTRACTORS SHALL PROVIDE PERFORMANCE AND PAYMENT BONDS FOR 100% OF THE JOB COST FROM A COMPANY LICENSED IN THE STATE OF TEXAS AND APPROVED BY THE OWNER.**

33. **MATERIAL SAFETY DATA SHEETS**

MSDS SHEETS: The contractor shall obtain and review all Material Safety Data Sheets of Shop Drawings/Product Data Samples and similar submittals, to ascertain that no Asbestos Materials, Asbestos-Containing Materials, or other Hazardous Materials are being utilized or installed. The Contractor shall submit, in compliance with the Texas Department of Health; Texas Asbestos Health Protection Rules; December 14, 1998, a statement that no Asbestos Containing Building Materials (ACBM) were used during the construction. Contractor shall compile the information from Material Safety Data Sheets (MSDS) of all products used in the construction of the building (project) and finding no asbestos in any of those products, may make this statement. Submit complete MSDS sheets and the statement to Engineer and Owner with final pay application

34. **NOT USED**

35. **EXISTING CONDITIONS:**

A. Contractors' Examination of Site:

1. By executing Contracts, Contractors, and Subcontractors represent that they have:
 - a. Visited the site and made due allowances for difficulties and contingencies;
 - b. Compared contract documents with existing conditions and informed themselves of conditions to be encountered, including work by others, if any, being performed; and
 - c. Notified Architect of ambiguities and errors they have discovered within Contract documents or between contract documents and existing conditions.
 - d. While work under this contract is in progress, protect existing buildings, grounds, contents, and occupants, including those on adjacent property, whether private or public, from damage or harm due to the work under this contract.
 - e. Damage caused by Contractor to existing structures, grounds plants, pavements, utilities, work by others, fixtures, or furnishings, shall be repaired by Contractor and left in as good condition as existing before the damaging, unless such existing work is shown to be removed or replaced by new work.

END SECTION 01000

SECTION 01039

COORDINATION AND MEETINGS

PART 1 GENERAL 1.1.

SECTION INCLUDES

- A. Coordination.
- B. Field Engineering.
- C. Pre-construction Meeting.
- D. Pre-installation Meeting.
- E. Progress Meetings.
- F. Preparation.
- G. Cutting and Patching.

1.2 RELATED SECTIONS

- A. Section 01041 - Project Coordination

1.3 COORDINATION

- A. Coordinate scheduling, submittals and Work to assure efficient and orderly sequence of installation of interdependent construction elements.
- B. Coordinate completion and clean up of Work of separate sections in preparation for Substantial Completion.
- C. Prior to OWNER occupancy of premises, the Contractor shall coordinate access to site for corrective of defective Work and Work not in accordance with Contract Documents.
- D. Contractor shall obtain all necessary permits from regulatory agencies prior to beginning construction.

1.4 FIELD ENGINEERING

- A. Employ a Land Surveyor registered in the State of Texas and acceptable to the OWNER and Architect

- B. Control datum for survey is as indicated on the drawings of the Construction Documents.
- C. All field engineering will be established and maintained by the Contractor.
- D. Confirm all drawing dimensions and elevations.
- E. Provide field-engineering services. Establish elevations and playcourt alignment, utilizing recognized engineering survey practices.

1.5 PRECONSTRUCTION MEETING

- A. The OWNER will schedule a meeting after Notice of Award.
- B. The Preconstruction meeting shall be conducted prior to the commencement of construction activities.
- C. The Owner, Engineer, Contractor and its superintendent, major subcontractors and manufacturer's shall be required to attend the meeting.

D. Agenda:

1. Execution of Owner-Contractor Agreement.
2. Submission of executed bonds and insurance certificates.
3. Submission of list of Subcontractors and list of Products.
4. Tentative construction schedule.
5. Critical Work sequence.
6. Designation of responsible personnel.
7. Procedures for processing field decisions, submittals, substitutions, Contract closeout procedures and Change Orders.
8. Procedures for processing Applications for Payment.
9. Distribution of Contract Documents.
10. Submittal of Shop Drawings, Product Data and Samples.
11. Preparation of record documents.
12. Use of the premises.
 - Office
13. Work and storage areas.
14. Equipment deliveries and priorities.
15. Safety procedures.
16. First Aid.
17. Security.
18. Housekeeping.
19. Working hours.
20. Use of premises by Owner and Contractor.
21. Owner's requirements and partial occupancy.
22. Use of temporary utilities.

23. Procedures for testing.
24. Inspection of construction activities.

E. Record minutes of meeting and distribute copies to all participants. 1.6

PRE-INSTALLATION MEETING

A. Conduct a pre-installation meeting at the site before each construction activity that requires coordination with other construction.

B. The Installer and representative 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.

C. Notify the Engineer four days in advance of the scheduled meeting dates

D. Review the progress of other construction activities and preparations for the particular activity under consideration at each pre-installation meeting, including requirements for:

1. Contract Documents.
2. Options.
3. Related Change Orders.
4. Purchases.
5. Deliveries.
6. Shop Drawings, Product Data and Quality Control Samples.
7. Possible conflicts.
8. Compatibility problems.
9. Time schedules.
10. Weather limitations.
11. Manufacturer's recommendations.
12. Compatibility of materials.
13. Acceptance of substrates.
14. Temporary facilities.
15. Space and access limitations.
16. Governing regulations.
17. Safety.
18. Inspection and testing requirements.
19. Protection.

E. Record significant discussions and agreements and disagreements of each conference meeting. Furnish all participants a copy of the recorded document, including the Owner and the Engineer.

F. Do not proceed if the conference cannot be successfully concluded. Initiate

whatever actions are necessary to resolve impediments to performance of Work and reconvene the conference at the earliest feasible time.

1.7 PROGRESS MEETINGS

- A. Progress meetings shall be conducted on regular scheduled intervals.
- B. The scheduled meeting dates shall be determined by the agreement of the Owner, Engineer and the Contractor prior to beginning of construction activities.
- C. Prepare agenda and furnish copies to all participants at least one day prior to the scheduled meeting.
- D. Make arrangements for meetings and preside at meetings. E.

Agenda:

1. Review minutes of previous meetings
2. Review of Work progress.
3. Field observations, problems, and decisions.
4. Identification of problem, which impede planned construction activity.
5. Review of submittal schedule and status of submittals.
6. Review delivery schedules.
7. Maintenance of progress schedule.
8. Planned progress during succeeding work period.
9. Coordination of projected progress.
10. Effect of proposed changes on progress schedule and coordination.
11. Other business related to Work.

PART 2 PRODUCTS

Not Used

3 EXECUTION

Not Used

END OF SECTION

SECTION 01300 – SUBMITTALS

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Submittal Procedures
- B. Construction progress schedules
- C. Proposed Products list
- D. Product Data
- E. Shop Drawings
- F. Samples
- G. Design data
- H. Test reports
- I. Certificates
- J. Manufacturer's instructions

1.2 RELATED SECTIONS

- A. Section 01010 – Scope of Work
- B. Section 01400 – Quality Control
- C. Section 01700 – Project Closeout: Contract Closeout Procedures

1.3 SUBMITTAL PROCEDURES

- A. Transmit each submittal with AIA Form G810 or ARCHITECT accepted form.
- B. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.
- C. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate.
- D. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.
- E. Schedule submittals to expedite the Project, and deliver to Carl Daniel Architects at 305 Leon Street, El Paso, Texas, 79901. Coordinate submission of related items.
- F. For each submittal for review, allow 15 days excluding delivery time to and from the contractor.
- G. Identify variations from Contract Documents and Product or system limitations, which may be detrimental to successful performance of the completed Work.
- H. Provide space for Contractor and Architect review stamps.

- I. When revised for resubmission, identify all changes made since previous submission.
- J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
- K. Submittals not requested will not be recognized or processed.

1.4 CONSTRUCTION PROGRESS SCHEDULES

- A. Submit initial schedule in accordance with the General Conditions.
- B. Revise and resubmit as required.
- C. Submit revised schedules with each Application for Payment, identifying changes since previous version.
- D. Submit a computer generated horizontal bar chart with separate lines for each major portion of Work or operation, identifying the first workday of each week.
- E. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration.
- F. Indicate estimated percentage of completion for each item of Work at each submission.
- G. Indicate submittal dates required for shop drawings, product data, samples, and product delivery dates, including those furnished by Owner and required by Allowances.

1.5 PROPOSED PRODUCTS LIST

- A. Within 15 days after date of Notice to Proceed, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
- B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.6 PRODUCT DATA

- A. Submit the number of copies, which the Contractor requires, plus two copies, which will be retained by the Architect.
- B. Mark each copy to identify applicable products, models, options and other data. Supplement manufacturer's standard data to provide information unique to this project.
- C. After review distribute in accordance with the Submittal Procedures article above and provide copies for record documents described in Section 01700 – CONTRACT CLOSEOUT.
- D. Contractor shall submit the herbicide product to the ARCHITECT for review and approval by the SISD.

1.7 SHOP DRAWINGS

- A. Submit the number of opaque reproductions, which Contractor requires, plus two copies which will be retained by the Architect.
- B. After review, produce copies and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01700 – CONTRACT CLOSEOUT.

1.8 SAMPLES

- A. Samples For Review:
 - 1. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
 - 2. After review, produce duplicates and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01700 – CONTRACT CLOSEOUT.
- B. Samples for Selection:
 - 1. Submit to Architect for aesthetic, color, or finish selection.
 - 2. Submit samples of finishes from the full range of manufacturer's standard colors, textures, and patterns for Architect selection.
 - 3. After review, produce duplicates and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01700 – CONTRACT CLOSEOUT.
- C. Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
- D. Include identification on each sample, with full Project information.
- E. Submit the number of samples specified in individual specification sections; one of which will be retained by Architect.
- F. Reviewed samples, which may be used in the Work are indicated in individual specification sections.
- G. Samples will not be used for testing purposes unless specifically stated in the specification section.

1.9 TEST REPORTS

- A. Submit test reports to the Architect for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.10 CERTIFICATES

- A. When specified in individual specification sections, submit certification by the manufacturer, installation/application subcontractor, or the Contractor to Architect, in quantities specified for Product Data.
- B. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or Product, but must be acceptable to Architect.

1.11 MANUFACTURER'S INSTRUCTIONS

- A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, adjusting, and finishing, to Architect for delivery to Owner in quantities specified for Product Data.
- B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- C. Refer to Section 01400 – Quality Control.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SCOPE

- A. Related Documents: Drawings and general provisions of Contract, including General, Supplementary and Special Conditions, and Division 1 Specifications, apply to work of this Section.

GENERAL

- A. Temporary barricades, screens, utilities and facilities shall be furnished, relocated and removed as the work progresses in order to maintain continuous progress in construction and a clean site.
- B. Provide ground runners or pallets and weatherproof covers for all materials and equipment stored at the site.

UTILITIES FOR CONSTRUCTION

- A. General: Contractor shall provide water, gas, electric lighting and power, sewage, and services required until the construction is completed and accepted by the Owner. Prevent leaks, short circuits, etc.; any such defects which develop shall be promptly repaired, at no cost to Owner. Provide adequate lighting for construction.
- B. Toilet Facilities: The Contractor shall provide and maintain toilets for the use by workmen employed at the site.
- C. Temporary Heat: Where and when heat is required in the construction, provide such heat from a temporary heat source.
- D. Temporary Telephone: The Contractor shall provide telephone service in his construction office, (not a pay station) and pay regular service charges for same. Telephone toll charges shall be paid by the using party.

FIELD OFFICES

- A. Provide weather-tight temporary offices (heated, cooled, and illuminated) for the use of the Contractor, Owner, and Architect for the duration of the job.

JOB SIGNS

- A. Provide job signs as directed by the Architect.

END OF SECTION 01500

SECTION 01560

TEMPORARY CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Temporary Controls: Barriers and fencing, protection of the Work, water control, dust control, erosion and sediment control, noise control, and pollution control.

1.2 RELATED SECTIONS

- A. Section 011010 – Scope of Work
- B. Section 011039 – Coordination and Meetings
- C. Section 01500 - Temporary Facilities

1.3 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walk-ways required by governing authorities for public rights-of-way.
- C. Provide protection for plant life designated to remain. Replace damaged plant life.
- D. Protect non – owned vehicular traffic, stored materials, site and structures from damage.

1.4 FENCING

- A. Construction: Commercial grade chain link fence.
- B. Provide 6 foot high fence around construction site; equip with vehicular gates with locks.
- C. Chain Link fence shall prevent unauthorized persons entering the construction site.

1.5 WATER CONTROL

- A. Grade site to drain. Maintain excavations free of water.
- B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

1.6 SECURITY

- A. Coordinate with Owner's security program.

1.7 DUST CONTROL

- A. Execute Work by methods to minimize raising dust from construction operations.
- B. Provide positive means to prevent air-borne dust from dispersing into atmosphere.

1.8 EROSION AND SEDIMENT CONTROL

- A. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
- B. Minimize amount of bare soil exposed at one time.
- C. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
- D. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
- E. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

1.9 NOISE CONTROL

- A. Provide methods, means, and facilities to minimize noise produced by construction operations.

1.10 POLLUTION CONTROL

- A. Provide methods, means, and facilities to prevent contamination of soil, water and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.

END OF SECTION 01560

PART 1 - GENERAL**1.01 SCOPE**

- A. Related Documents: Drawings and general provisions of Contract, including General, Supplementary and Special Conditions and Division 1 Specification sections, apply to the work in this section.

1.02 SUMMARY

- A. This section specifies administrative and procedural requirements governing the Contractor's selection of products for use in the Project.

1.03 DEFINITIONS

- A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and similar terms. Such terms are self-explanatory and have well recognized meanings in the construction industry.
1. "Products" are items purchased for incorporation in the work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - a. "Named Products" are items identified by manufacturer's product name, including make or model designation, indicated in the manufacturer's published product literature, that is current as of the date of the Contract Documents.
 2. "Materials" are products that are substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
 3. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections such as wiring or piping.

1.04 SUBMITTALS

- A. Product List Schedule: A list of products for this project is required. Prepare a schedule in tabular form showing each product. Include the manufacturer's name and proprietary product names for each item listed.

1.05 QUALITY

- A. Source Limitations: To the fullest extent possible, provide products of the same kind, from a single source.
1. When specified products are available only from sources that do not or cannot produce a quantity adequate to complete project requirements in a timely manner, consult with the Architect for a determination of the most important product qualities before proceeding.

- B. Compatibility of Options. When the Contractor is given the option of selecting between two or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.
1. Each prime Contractor is responsible for providing products and construction methods that are compatible with products and construction methods of other prime or separate Contractors.
- C. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer nameplates or trademarks on exposed surfaces of products which will be exposed to view in occupied spaces or on the exterior.
1. Labels: Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface that is not conspicuous.
 2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operate equipment. Locate on an easily accessible surface which inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:
 - a. Name of product and manufacturer.
 - b. Model and serial number.
 - c. Capacity.
 - d. Speed.
 - e. Ratings.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle products in accordance with the manufacturer's recommendations, using means and methods that will prevent damage, deterioration and loss, including theft.
1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.
 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other losses.
 3. Deliver products to the site in the manufacturer's original sealed container or other packaging system, complete with labels and instruction for handling, storing, unpacking, protecting and installing.
 4. Inspect products upon delivery to ensure compliance with the Contract Documents, and to ensure that products are undamaged and properly protected.
 5. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.
 6. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.
 7. Store products subject to damage by the elements above ground, under cover in a weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instruction.

PART 2 – PRODUCTS

2.01 PRODUCT SELECTION

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, unused at the time of installation.
 - 1. Provide products complete with all accessories, trim, finish, safety guards, connections and other devices and details needed for a complete installation and for the intended use and effect.

- B. Product Selection Procedures: Product selection is governed by the Contract Documents and governing regulations; include the following:
 - 1. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.
 - 2. Performance Specification Requirements: Where Specifications compliance with performance requirements, provide products that comply with these requirements, and are recommended by the manufacturer for the application indicated. General overall performance of a product is implied where the product is specified for a specific application.
 - 3. Compliance with Standards, Codes and Regulations: Where the Specification require matching an established Sample, the Architect's decision will be final on whether a proposed product matches satisfactorily.

PART 3 - EXECUTION

3.01 INSTALLATION OF PRODUCTS

- A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other work.
 - 1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 01600

PART 1 – GENERAL

1.01 SCOPE

- A. Related Documents: Drawings and general provisions of Contract, including General, Supplementary and Special Conditions, and Division 1 Specifications, apply to work of this Section.
- B. If any article or directions contained within this division conflict with PARTS I, II, III, and IV of these specifications, PARTS I, II, III, and IV shall govern.

1.02 SUMMARY

- A. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturer's standard warranties on products and special warranties.
 - 1. Refer to the General Conditions for terms of the Contractor's special warranty of workmanship and materials.
 - 2. General closeout requirements are included in Section "Project Closeout".
 - 3. Specific requirements for warranties for the Work and products and installations that are specified to be warranted, are included in the individual sections of Divisions 2 through 16.
 - 4. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.
- B. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.03 WARRANTY REQUIREMENTS

- A. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
- B. Reinstatement of Warranty: When Work covered by warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement.
 - 1. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

- C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work, regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
- D. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights, and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.
- E. The Owner reserves the right to refuse to accept Work for the project where a special warranty, certification, or similar commitment is required on such Work or part of Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

1.04 SUBMITTALS

- A. Submit written warranties to the owner's construction department. If the certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the work, or a designated portion of the work, submit written warranties upon request of the owner's construction department.
 - 1. When a designated portion of the work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the owner's construction department.
- B. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier, or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner for approval before final execution.
 - 1. Refer to individual Sections of Divisions 2 through 16 for specific content requirements, and particular requirements for submittal of special warranties.
- C. Form of Submittal: At Final Completion, compile two copies of each required warranty and bond properly executed by the Contractor, or by the subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly, sequenced based on the Table of Contents of the Project Manual.
- D. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8 1/2" by 11" paper.

1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the 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 the installer.
2. Identify each binder on the front and the spine with the typed or printed title "Warranties and Bonds", the project title or name, and the name of the Contractor.
3. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

END OF SECTION 01700

PART 1 – GENERAL**1.01 SCOPE**

- A. Related Documents: Drawings and general provisions of Contract, including General, Supplementary and Special Conditions, and Division 1 Specifications, apply to work of this Section.

1.02 SUMMARY

- A. This Section specifies administrative and procedural requirements for project closeout, including but not limited to:
1. Operating and Maintenance manual submittal.
 2. Submittal of warranties.
 3. Final Cleaning.
- B. Closeout requirements for specific construction activities are included in the appropriate sections in Divisions 2 through 16.

1.03 RECORD DOCUMENT SUBMITTALS

- A. General: Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Owner reference during normal working hours.
- B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop drawings. Mark the set to show the actual installation where the installation varies substantially from the work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
1. Mark record sets with a red erasable pencil; use other colors to distinguish between variations in separate categories of the work.
 2. Mark new information that is important to the Owner, but was not shown on Contract Drawings and Shop Drawings.
 3. Note related Change Order numbers where applicable.
 4. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates, and other identification on the cover of each set.
 5. Transfer all documented changes to a set of mylar reproducible drawings for submission to the Owner as final as-built drawings.
- C. Record Specifications: Maintain one complete copy of the Project Manual, including addenda, and one copy of other written construction documents such as Change Orders and modifications issued in printed form during construction. Mark these documents to show substantial variations in actual work performed in

comparison with the text of the Specifications and modifications. Give particular attention to substitutions, selection of options, and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. Note related record drawing information and Product Data.

1. Upon completion of the Work, submit record Specifications to the construction department for the Owner's records.
- D. Record Product Data: Maintain one copy of each Product Data submittal. Mark these documents to show significant variations in actual work performed in comparison with information submitted. Include variations in products delivered to site, and from manufacturer's installation instructions and recommendations. Give particular attention to concealed products and portions of the work which cannot otherwise be readily discerned later by direct observation. Note related Change Orders and mark-up of record drawings and Specifications.
1. Upon completion of mark-up, submit complete set of record Product Data to the Owner.
- E. Record Sample Submitted: Immediately prior to the date or dates of Substantial Completion, the Contractor will meet at the site with the Architect and the Owner's personnel to determine which of the submitted samples that have been maintained during progress of the work are to be transmitted to the Owner for record purposes. Comply with delivery to the Owner's Sample storage area.
- F. Miscellaneous Record Submittals: Refer to other Specification Sections for the requirements of miscellaneous record keeping and submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the Owner.
- G. Maintenance Manuals: Organize operating and maintenance data into suitable sets of manageable size. Bind properly indexed data in individual heavy-duty 2-inch, 3-ring vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Include the following types of information:
1. Emergency Instructions
 2. Spare Parts List
 3. Copies of warranties
 4. Wiring diagrams
 5. Recommended "turn-around" cycles
 6. Inspection procedures
 7. Shop Drawings and Product Data
 8. Fixture lamping schedule

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION**3.01 CLOSEOUT PROCEDURES**

- A. Operating and Maintenance Instructions: Arrange for each installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. If installers are not experienced in procedures, provide instruction by manufacturer's representatives. Include a detailed review of the following items:
1. Maintenance Manuals
 2. Record documents
 3. Spare parts and materials
 4. Tools
 5. Lubricants
 6. Fuels
 7. Identification systems
 8. Control sequences
 9. Hazards
 10. Cleaning
 11. Warranties and Bonds
 12. Maintenance Agreements and similar continuing commitments
- B. As part of instruction for operating equipment, demonstrate the following procedures:
1. Start-up
 2. Shutdown
 3. Emergency operations
 4. Noise and vibration adjustments
 5. Safety procedures
 6. Economy and efficiency adjustments
 7. Effective energy utilization.

3.02 FINAL CLEANING

- A. General: General cleaning during construction is required by the General Conditions and included in Section "Temporary Facilities".
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.
1. Complete the following cleaning operations:
 - a. Remove labels that are not permanent labels.
 - b. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compound and other substances that are

- noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
- c. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original reflective condition. Leave concrete floors broom clean.
 - d. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
 - e. Clean the site, including landscaping development areas, of rubbish, litter, and other foreign substances. Sweep paved areas broom clean; remove stains, spills, and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth, even-textured surface.
- C. Removal of Protection: Remove temporary protection and facilities installed for protection of the work during construction.
- D. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the site and dispose as directed and approved by EPCC & City Code.
- 1. Where extra materials of value remaining after completion of associated Work have become the Owner's property, arrange for disposition of these materials as directed.

END OF SECTION 01740

SECTION 02840 - IRRIGATION SPECIFICATIONS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: Provide all labor, material, transportation, and services necessary to furnish and install the Irrigation System as shown on the Drawing and described herein.
- B. Standards: All work and materials shall comply with governing Codes, safety orders, standards, and regulations, and meet the minimum requirements of the governing agencies.

1.02 QUALITY ASSURANCE & AGREEMENTS

- A. Permits and Fees: The Contractor shall obtain and pay for any and all permits and all observations as required.
- B. Manufacturer's Directions: Manufacturer's directions and detailed drawings shall be followed in cases where the manufacturers of articles used in this Contract furnish directions covering points not shown in the Drawings and Specifications.
- C. Ordinances and Regulations: All local, municipal and state laws, and rules and regulations governing or relating to any portion of this work are hereby incorporated into and made a part of these Specifications, and their provisions shall be carried out by the Contractor. Anything contained in these Specifications shall not be construed to conflict with any of the above rules, regulations, or requirements of the same. However, when these Specifications and Drawings call for or describe materials, workmanship, or construction of a better quality, higher standard, or larger size than is required by the above rules and regulations, the provisions of these Specifications and Drawings shall take precedence.
- D. Explanation of Drawings:
 - 1. Due to the Scale of the Drawings, it is not possible to indicate all offset, fittings, sleeves, etc., which may be required. The Contractor shall carefully investigate the structural and finished conditions affecting all of his work and plan his work accordingly, furnished such fittings, etc., as may be required to meet such conditions. Drawings are generally diagrammatic and indicative of the work to be installed. The work shall be installed in such a manner as to avoid conflicts between the irrigation system, planting and architectural features.
 - 2. All work called for on the Drawings by notes or details such be furnished and installed whether or not specially mentioned in the specifications.
 - 3. The Contractor shall not willfully install the irrigation system as shown on the Drawings when it is obvious in the field that obstructions, grade differences, or discrepancies in area dimensions exist that might not have been considered in engineering. Such obstructions or differences should

be brought to the attention of the Owner. In the event this notification is not performed, the Contractor shall assume full responsibility for any revision necessary.

1.03 SUBMITTALS

A. Materials List:

1. The Contractor shall furnish the article, equipment, materials, or processes specified by name in the Drawings and Specifications. No substitution shall be allowed without prior written approval by the Landscape Designer/Licensed Irrigator.
2. Complete material list shall be submitted prior to performing any work. Material list shall include the manufacturer, model number, and description of all materials and equipment to be used. Although manufacturer and other information may be different, the following is a guide to proper submittal format:

Item No.	Description	Manufacturer	Model No.
1	Backflow Preventer	Febco	825Y
2	Automatic Controller	Calsense	ETI-DTR2
3	Master Valve	Clayval	136ACSKC-24V
4	Etc.	Etc.	Etc.

Irrigation submittal must be specific and complete. All items must be listed and should include solvent, primer, wire, connectors, valve, boxes, etc. No copies of manufacturer's literature (catalog cuts) are required as submittal information.

3. The Contractor may submit substitutions for equipment and materials listed on the Drawings by following procedures as outlined in Section 1.05 of the Irrigation Specifications.
4. Equipment or materials installed or furnished without prior approval of the Landscape Designer/Licensed Irrigator may be rejected and the Contractor may be required to remove such materials from the site at his own expense.
5. Approval of any Item, alternate or substitute indicates only that the product or products apparently meet the requirements of the Drawings and Specifications on the basis of the information or samples submitted.
6. Manufacturer's warranties shall not relieve the Contractor of his liability under the guarantee. Such warranties shall only supplement the guarantee.

B. RECORD DRAWINGS:

1. The Contractor shall provide and keep up-to-date a complete record set of blueline prints which shall be corrected daily, showing the change from the original Drawings and Specifications and the exact installed locations, sizes, and kinds of equipment. Prints for this purpose may be obtained

from the Owner at cost. This set of drawings shall be kept on the site and shall be used only as a record set.

2. The Contractor shall make neat and legible notations on the record drawing progress sheets daily as he proceeds, showing the work as actually installed. For example, should a piece of equipment be installed in a location that does not match the plan, the Contractor must indicate that equipment has been relocated in a graphic manner so as to match the originals as indicated in the irrigation legend. The relocated equipment and dimensions will then be transferred to the original record drawing plan at the proper time.
 3. Before the date of the final observation, the Contractor shall transfer all information from the "record drawing" prints to a sepia mylar or similar mylar material. All work shall be in waterproof India Ink and applied to the mylar by a technical pen made expressly for use on mylar material. Such pen shall be similar to those manufactured by Rapidograph, Kueffel & Esser, or Faber Castell. The dimensions shall be made as to be easily readable even on the final controller chart (see Section C). The original mylar "record drawing" plan shall be submitted to the Landscape Designer/Licensed Irrigator for approval prior to the completion of the controller chart.
 4. The Contractor shall dimension from two (2) permanent points of reference, such as building corners, sidewalks, edges, road intersections, etc., the location of the following items:
 - a. Connection to existing water lines.
 - b. Connection to existing electrical power.
 - c. Gate valves.
 - d. Routing of sprinkler pressure lines (dimension max. 100' along routing).
 - e. Control valves.
 - f. Routing of control wiring and locations of all splice boxes.
 - g. Quick coupling valves.
 - h. Stub-outs for future connections.
 - i. Other related equipment as directed by the City.
 5. On or before the date of the final field observation, the Contractor shall deliver the corrected and completed sepias to the Owner. Delivery of the sepias will not relieve the Contractor of the responsibility of furnishing required information that may be omitted from the prints.
- C. Controller Charts:
1. As-built drawings shall be approved by the Landscape Designer/Licensed Irrigator before controller charts are prepared.
 2. Provide one controller chart for each controller sequence.
 3. The chart shall show the area controlled by the automatic controller and shall be the maximum size which the controller door will allow.
 4. The chart is to be a reduced drawing of the actual installed system. However, in the event the controller sequence is not legible when the

drawing is reduced, it shall be enlarged to a size that will be readable when reduced.

5. The chart shall be a block line or blueline print and a different color shall be used to indicate the area of coverage for each station.
 6. When completed and approved, the chart shall be hermetically sealed between two pieces of plastic, each piece being a minimum 20 mils.
 7. These charts shall be completed and approved prior to the final field observation of the irrigation system.
- D. Operation and Maintenance Manuals:
1. Prepare and deliver to the Owner within ten calendar days prior to completion of construction, two hard-cover, three ring binders containing the following information:
 - a. Index sheet which states Contractor's name, address and telephone number, and which lists each installed equipment and material item including names and addresses of manufactures local representatives.
 - b. Catalog and parts sheets on every material and equipment item installed under this Contract.
 - c. Guarantee statement.
 - d. Complete operating and maintenance instructions on all major equipment.
 2. In addition to the above mentioned maintenance manuals, provide the Owner's maintenance manuals, provide the Owner's maintenance personnel with instructions for major equipment and show evidence in writing to the Owner at the conclusion of the project that this service has been rendered.
- E. Equipment to be Furnished:
1. Supply as part of this contract the following tools:
 - a. Two (2) sets of special tools required for removing, disassembling and adjusting each type of sprinkler and valve supplied on this project.
 - b. Two (2) four-foot valve keys for operation of gate valves.
 - c. Two (2) keys for each automatic controller.
 - d. One (1) quick coupler key and matching hose swivel for every five (5) or fraction thereof of each type of quick coupling valve installed.
 2. The above mentioned equipment shall be turned over to the Owner at the conclusion of the project. Before final observation can occur evidence that the Owner has received material must be shown to the Landscape Designer/Licensed Irrigator.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Handling of PVC pipe and fittings: The Contractor is cautioned to exercise care in handling, loading, unloading, and storing PVC pipe and fittings. All PVC pipe shall be transported in a vehicle which allows the length of pipe to lie flat so as not to subject it to under bending or a

concentrated external load at any point. Any section of pipe that has been dented or damaged will be discarded, and if installed, shall be replaced with new piping.

1.05 SUBSTITUTIONS

- A. If the Contractor wishes to substitute any equipment or materials for the equipment or materials listed on the Drawings and Specifications, he may do so by providing the following information to the Landscape Designer/Licensed Irrigator for approval:
 - 1. Provide a statement indicating the reason for making the substitution. Use a separate sheet of paper for each item to be submitted.
 - 2. Provide descriptive catalog literature, performance charts and flow charts for each Item to be substituted.
 - 3. Provide the amount of cost savings if the substituted item is approved.
- B. The Landscape Designer/Licensed Irrigator shall have the sole responsibility in accepting or rejecting any submittal item as an approved equal to the equipment and materials listed on the Drawings and Specifications.

1.06 GUARANTEE

- A. The guarantee for the irrigation system shall be made in accordance with the attached form. The General Conditions and Supplementary Conditions of these Specifications shall be filed with the Owner prior to acceptance of the irrigation system.
- B. A copy of the Guarantee form shall be included in the operations and maintenance manual.
- C. The guarantee form shall be re-typed onto the Contractor's letterhead and shall contain the following information:

GUARANTEE FOR IRRIGATION SYSTEM

We hereby guarantee that the irrigation system we have furnished and installed is free from defects in materials and workmanship, and the work has been completed in accordance with the Drawings and Specifications, ordinary wear and tear, unusual abuse or neglect expected. We agree to repair or replace any defects in material or workmanship which may develop during the period of one year from date of acceptance and also to repair or replace any damage resulting from the repairing or replacing of such defects at no additional costs to the Owner. We shall make such repairs or replacements within a reasonable time, as determined by the Owner, after receipt of written notice. In the event of our failure to make such repairs or replacements within a reasonable time after receipt of written notice from the Owner, we authorize the Contractor to proceed to

have said repair or replacements made at our expense and we will pay the costs and charges therefore upon demand.

PROJECT: _____

LOCATION: _____

SIGNED: _____

ADDRESSED: _____

PHONE: _____ DATE OF ACCEPTANCE: _____

PART 2 - PRODUCTS

2.01 MATERIALS

- A. General: Use only new materials of brands and types noted on drawings, specified herein, or approved equals.
- B. PVC Pressure Main Line Pipe and Fittings:
 - 1. Pressure main line piping for sizes 3" and larger shall be PVC Class 315.
 - 2. Class 315 pipe shall be made from on NSF approved Type I, Grade I PVC compound conforming to ASTM resin specification D1784. All pipe must meet requirements as set forth In Federal Specification PS-22-70, with an appropriate standard dimension (S.D.R.) (Solvent-weld Pipe).
 - 3. Pressure main line piping for sizes 1-1/2" and smaller shall be PVC Schedule 40 with solvent welded joints.
 - 4. Schedule 40 pipe shall be mode from NSF approved Type I, Grade 1 PVC compound conforming to ASTM resin specification D1785. All pipe must meet requirements as set forth in Federal Specification PS-21-70.
 - 5. PVC solvent-weld fittings shall be Schedule 40, 11-1 NSF approved conforming to ASTM test procedure D2466.
 - 6. Solvent cement and primer for PVC solvent-weld pipe and fittings shall be of type and installation methods prescribed by the manufacturer.
 - 7. All PVC pipe must bear the following markings: Manufacture's name, nominal pipe size, schedule or class, pressure rating in P.S.I., NSF(National Sanitation Foundation) approval, and date of extrusion.
 - 8. All Fittings shall bear the manufacturer's name or trademarks, material designation, size, applicable I.P.S. schedule and NSF seal of approval.
- C. PVC Non-Pressure Lateral Line Piping:
 - 1. Non-pressure buried laterals line piping shall be PVC Schedule 40 with solvent-weld joints when installed in planting areas.
 - 2. Non-pressure lateral line piping installed under paved areas shall be PVC Schedule 40 with solvent-welded joints.

3. Pipe shall be made from NSF approved, Type I, Grade II, PVC compound conforming to ASTM resin specification D1794. All pipe must meet requirements set forth in Federal Specification PS-22-70 with and appropriate standard dimension ratio.
 4. Except as noted in paragraphs 1, 2, and 3 of this section (2.01B), all requirements for non-pressure lateral line pipe and fittings shall be the same as for solvent-weld pressure main line pipe and fittings as set forth in section 2.01B of the Specifications.
- D. Brass Pipe and Fittings:
1. Where indicated on the Drawings, use red brass screwed pipe conforming to federal Specification #WW-P-351.
 2. Fittings shall be red brass conforming to federal Specifications #WW-P-460.
- E. Copper Pipe and Fittings:
1. Pipe: Type K, hard tempered.
 2. Fittings: Wrought copper, solder joint type.
 3. Joints shall be soldered with silver solder, 45% silver, 15% copper, 16% zinc, 24% cadmium, solidus at 1125° F, and liquidus at 1145° F.
- F. Valves:
1. Ball Valves
 - a. Ball valves shall be a 125 lbs. SWP bronze valve with screw-in bonnet non rising stem, and solid wedge disc. with a stainless steel handle.
 - b. Ball valves shall be similar to those manufactured by Nibco or approved equal.
 2. Resilient Wedge Gate Valve (2" and larger)
 - a. Resilient Wedge Gate valves be epoxy coated cast iron and equipped with a 2" operating nut.
 - b. Resilient Wedge Gate valves shall be No. 403 RT -RW as supplied by Watts or approved equal.
 - c. All Resilient Wedge Gate valves shall be installed per detail.
- G. Quick Coupling Valves:
1. Quick coupling valves shall have a brass two-piece body deigned for working pressure of 150 P.S.I.
 2. Quick coupling valves 1" shall be operable with a quick coupler key. Key size and type shall be as shown on the Drawings.
- H. Backflow Prevention Units:
1. Backflow prevention unit shall be of size and type indicated on the Irrigation drawings. Install backflow prevention units in accordance with the Drawings.
 2. Wye strainers at backflow prevention units shall have a bronzed screwed boy with 60 mesh model screen and shall be similar to Bailey #1008 or approved equal.
 3. All pressure main line piping between the point of connection and the backflow preventer shall be installed as required by local code. The Contractor shall verify with the local governing body as to material type

and installation procedures prior to start of construction. Submit shop drawings for approval.

I. Control Wiring:

1. Except as noted otherwise connections between the automatic controllers and electric control valves shall be made with direct burial copper wire AWG-U.F. 600 volt. Control wiring installed in controlled wire conduit within structure shall be made with AWG- TW solid copper wire. Pilot wire shall be a different color wire for each automatic controller. Common wires shall be white with a different color stripe for each automatic controller. Install in accordance with valve manufacturer's specifications and wire charts in no case shall wire size be less than #14.
2. Wiring shall occupy the same trench and shall be installed along the same route as pressure supply or lateral lines wherever possible.
3. Where more than one (1) wire is placed in a trench the wiring shall be taped together at intervals of fifteen (15) feet.
4. An expansion curl shall be provided within three (3) feet of each wire connection. Expansion curl shall be of sufficient length at each splice connection at each electric control valve, so that in case of repair, the valve bonnet may be brought to the surface without disconnecting the control wires. Control wires shall be laid loosely in trench without stress or stretching wire conductors.
5. All splices shall be made with Scotch-Lock #3576 Connector Sealing Packs. Rainbird Snap-Tile wire connectors, or approved equal. Make only one splice with each connector sealing pack.
6. Field splices between the automatic controller and electric control valves will not be allowed without prior approval of the Landscape Designer.

J. Automatic Controller:

1. Automatic controller(s) shall be of the size and type shown on the Drawings.
2. Final location of automatic controller(s) shall be approved by the Owner.
3. Unless otherwise noted on the Drawings, the 120 volt electrical power to each automatic controller location is to be furnished by others. The final electrical hook-up shall be the responsibility of the Contractor.

K. Electric Control Valves:

1. All electric control valves shall be the same size and type shown on the Drawings.
2. Provide and install one control valve box for each electric control valve.

L. Control Valve Boxes:

1. Use 10" x 10-3/4" round box for all gate valves Carson Industries #910-12B with bolt-down cover or approved equal. Extension sleeves shall be PVC with minimum size of six (6) inches.
2. Use 9-1/2" x 16" x 11" rectangular box for all electric control valves. Carson Industries #1419-12B with bolt-down cover or approved equal.
3. Use 6" diameter x 8-3/4" deep round plastic valve box for all quick coupling valves. Carson Industries #608-12 with flex-lock cover or approved equal.

4. Use 9-1/2" x 16" x 118 rectangular box for all electric control valves installed within on-grade landscaped areas. Carson Industries #1419-12B with bolt-down cover or approved equal.
 5. Use 10" x 10-1/4" round box for all quick coupling valves installed within an on-structure landscaped areas. Carson Industries #910-12B with bolt-down cover or approved equal.
- M. Sleeving:
1. Sleeving under hardscape or paved areas for mainline, lateral line or control wiring shall be Schedule 40 P.V.C. or approved equal.
- N. Vandal Resistant Controller Enclosure:
1. Controller enclosure shall be of size and type shown on the Irrigation Drawing and Irrigation Submittal sheet.
 2. A backboard shall be secured to the controller enclosure housing to provided a base for mounting the automatic sprinkler controller and terminal station.
 3. A 117 volt duplex box shall be provided with an On/Off switch and a 117 volt receptacle. Metal conduit shall run from the 117 volt supply to the controller housing. All power within the housing shall be properly phased.
 4. A terminal strip shall be provided, clearly indicating the proper point of connection of all appropriate wiring (station valves, master valve, common, central control).

PART 3 – EXECUTION

3.01 OBSERVATION OF SITE CONDITIONS

- A. All scaled dimensions are approximate. The Contractor shall check and verify all size dimensions and receive approval form the Landscape Designer/Licensed Irrigator prior to proceeding with work under this Section.
- B. Exercise extreme care in excavating and working near existing utilities. The Contractor shall be responsible for damage to utilities which are caused by his operations or neglect. Check existing utility drawings for existing utility locations.
- C. Coordinate installation of sprinkler materials including pipe, so there shall be no interference with utilities or other construction or difficulty in planting tree, shrubs and ground covers.
- D. The Contractor shall carefully check all grades to satisfy him/herself that he may safely proceed before starting work on the irrigation system.
- E. The Contractor shall observe any existing irrigation systems, and maintain functional during extent of renovations.

3.02 PREPARATION

- A. Physical Layout:

1. Prior to installation, the Contractor shall size stake out all pressure supply lines, routing and location of sprinkler heads.
 2. All layout shall be approved by the Landscape Designer/Licensed Irrigator prior to installation.
- B. Water Supply:
1. The Irrigation system shall be connected to water supply point(s) of connection as indicated on the Drawings.
 2. Connections shall be made at the approximate location(s) shown on the Drawings. The Contractor is responsible for minor changes caused by actual site conditions.

3.03 INSTALLATION

- A. Trenching:
1. Dig trenches straight and support pipe continuously on bottom of trench. Lay pipe to an even grade. Trenching excavation shall follow layout indicated on the Drawings and as noted.
 2. Provide for a minimum of eighteen (18) inches cover for all irrigation lines installed under paving or hardscaping.
 3. Provide for a minimum of eighteen (18) inches cover for all pressure supply lines of three (3) inches or larger in diameter.
 4. Provide for a minimum of eighteen (18) Inches cover for all pressure supply lines of two and one half (2-1/2") Inches or smaller.
 5. Provide for a minimum of twelve (12) inches for all non-pressure lines.
 6. Provide for a minimum cover of eighteen (18) inches for all control wiring.
 7. Refer to City Standard details when within City streets susceptible to traffic loads.
- B. Backfilling:
1. The trenches shall not be backfilled until all required tests are performed. Trenches shall be carefully backfilled with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, sand, or other approved materials, free from large clods of earth or stones. Backfilling shall be mechanically compacted in landscaped areas to a dry density equal to adjacent undisturbed soil in planting areas. Backfill will conform to adjacent grades without dips, sunken areas, humps or other surface irregularities.
 2. A fine granular material backfill will be initially placed on all lines. No foreign matter larger than one-half (1/2) inch in size will be permitted in the initial backfill.
 3. Flooding of trenches will be permitted only with approval of the Landscape Designer/Licensed Irrigator.
 4. If settlement occurs and subsequent adjustments in pipe, valves, sprinkler heads, lawn, planting, or other construction are necessary, the Contractor shall make all required adjustments without cost to the owner.
- C. Trenching and Backfill Under Paving:

1. Trenches located under areas where paving, asphaltic concrete, or concrete will be installed, shall be pipe and six (6) inches above the pipe and compacted and backfilled with sand (a layer four (4) inches below the layer to 95% compaction, using manual or mechanical tamping devices. Trenches for piping shall be compacted to equal the compaction of the existing adjacent undisturbed soil and shall be left in a firm unyielding condition. All trenches shall be left flush with the adjoining grade. The Contractor shall set in place, cap and pressure test all piping under paving prior to the paving work.
 2. Generally, piping under existing walk is done by jacking, boring, or hydraulic driving, but where any cutting or braking of old walk and/or concrete is necessary, it shall be done and replaced by the Contractor as a part of the Contract cost. Permission to cut or break old walk and/or concrete shall be obtained from the City or Owner.
 3. Refer to City Standard details when within City streets susceptible to traffic loads.
- D. Assemblies:
1. Routing of irrigation lines as indicated on the Drawings is diagrammatic. Install lines (and various assemblies) in such a manner as to conform with the detail in the Drawings.
 2. Install NO multiple assemblies in plastic lines. Provide each assembly with its own outlet.
 3. Install all assemblies specified herein accordance with respective detail. In absence of detail drawings or specification pertaining to specific items required to complete work, perform such work in accordance with best standard practice with prior approval of the Landscape Designer.
 4. PVC pipe and fittings shall be thoroughly cleaned of dirt, dust, and moisture before installation. Installation and solvent-welding methods shall be as recommended by the pipe and fittings manufacturer.
 5. On PVC to metal connections, the Contractor shall work the metal connection first. Teflon tape or approved equal, shall be used on all threaded PVC to PVC, and on all threaded PVC to metal joints. Light wrench pressure is all that is required. Where threaded PVC connections are required, use threaded PVC adapters into which the pipe may be solvent-welded.
- E. Line Clearance
1. All lines shall have a minimum clearance of six (6) inches from each other and twelve (12) inches from lines of other trades, with the exception of the control wire sleeve(s) which shall be installed adjacent to pressure supply line. Parallel lines shall not be installed directly over one another.
 2. Valves shall be connected to controller in numerical sequence.
- F. Automatic Controller Assembly:
1. Install as per manufacturer's instructions. Remote control as shown on the Drawings.
- G. High Voltage Wiring for Automatic Controller:

1. 120 volt power connection to the automatic controller shall be provided by the Contractor.
 2. All electrical work shall conform to local codes, ordinances, and union authorities having jurisdiction.
- H. Remote Control Valves:
1. Install where shown on the Drawings. Where grouped together allow at least twelve (12) inches between adjacent valve boxes. Install each remote control valves in a separate valve box.
- I. Flushing of System:
1. After all new sprinkler pipe lines and risers are in place and connected, all necessary diversion work has been completed and prior to installation of sprinkler heads, the control valves shall be opened and full head of water used to flush out the system.
 2. Sprinkler heads shall be installed only after flushing of the system has been accomplished to the complete satisfaction of the Landscape Designer/Licensed Irrigator.
- J. Sprinkler Heads:
1. Install the sprinkler heads as designated on these Drawings. Sprinkler heads to be installed in this work shall be equivalent in all respects to those itemized.
 2. Spacing of heads shall not exceed the maximum indicated on the Drawings. In no case shall the spacing exceed the maximum recommended by the manufacturer.

3.04 TEMPORARY REPAIRS

The Owner reserves the right to make temporary repairs as necessary to keep the sprinkler system equipment in operating condition. The exercise of this right by the Owner shall not relieve the Contractor of his responsibilities under the terms of the guarantee as herein specified.

3.05 EXISTING TREES

Where it is necessary to excavate adjacent to existing trees, the Contractor shall use all possible care to avoid injury to trees and tree roots. Excavation in areas where two (2) inch and larger roots occur shall be done by hand. All roots two (2) inches and larger in diameter, except directly in the path of pipe or conduit, shall be tunneled under and shall be heavily wrapped with burlap to prevent scarring or excessive drying. Where a ditching machine is run close to trees having roots smaller than two (2) inches in diameter, the wall of the trench adjacent to the tree shall be hand trimmed, making clean cuts through. Roots one (1) inch and larger in diameter shall be painted with two coats of Tree Seal, or equal. Trenches adjacent to tree should be closed within twenty-four (24) hours; and where this is not possible, the side of the trench adjacent to the tree shall be kept shaded with burlap or canvas.

3.06 FIELD QUALITY CONTROL

- A. Testing of Irrigation System:
 - 1. When the Irrigation System is completed, perform a coverage test in the presence of the Licensed Irrigator to determine if the water coverage for planting area is complete and adequate. Furnish all materials and perform all work required to correct any inadequacies of coverage due to deviations from the Drawings, or where the system has been willfully installed as indicated on the Drawings when it is obviously inadequate, without bringing this to the attention of the Licensed Irrigator.
 - 2. Upon completion of each phase of work, the entire system shall be tested and adjusted to meet site requirements.

3.07 MAINTENANCE

- A. The entire Irrigation System shall be under full automatic operation for a period of seven (7) days prior to any planting.
- B. The Owner reserves the right to waive or shorten the operation period.

3.08 CLEAN-UP

Clean-up shall be made as each portion of work progresses. Refuse and excess dirt shall be removed from the site, all walks and paving shall be groomed or washed down, and any damage sustained on the work of others shall be repaired to its original condition.

FINAL SITE OBSERVATION PRIOR TO ACCEPTANCE

- A. Any items deemed not acceptable by the Landscape Designer/Licensed Irrigator shall be reworked to the complete satisfaction of the Landscape Designer/Licensed Irrigator.
- B. The Contractor shall show evidence to the Landscape Designer/Licensed Irrigator that the Owner has received all accessories, charts, record drawings, and equipment as required before final site observation can occur.

3.09 SITE OBSERVATION SCHEDULE

- A. The Contractor shall be responsible for notifying the Landscape Designer/Licensed Irrigator in advance for the following observation meetings, (verify with Owner), according to the time indicated:
 - 1. Pre-Job Conference – 5 days
 - 2. Lateral line and installation – 24 hours
 - 3. Pressure supply line testing – 48 hours
 - 4. Coverage test – 48 hours
 - 5. Final observations – 5 days

B. When observations have been conducted by someone other than the Owner show evidence in writing of when and by whom these observations were made.

SECTION 02930 - PLANTING SPECIFICATIONS

PART 1 - GENERAL

1.01 SCOPE OF WORK

Contractor shall provide materials, labor, and equipment incidental to and necessary for completing all work, as indicated on the drawings, as reasonably implied, or as delineated in the Specifications as follows.

1.02 STANDARDS

All work and materials shall comply with governing codes, safety orders, standards, and regulations, and meet the minimum requirements of the governing agencies.

1.03 QUALITY ASSURANCE

- A. All Contractors performing Site Development work must be licensed in accordance with the laws of the state and the City.
- B. Contractor shall provide the Landscape Designer and the Owner with a list of Subcontractors and Material Suppliers expected to be employed during the course of construction.
- C. Contractor shall obtain and keep in force Public Liability and Property Damage Insurance, during entire course of the Construction Contract. The amount of insurance shall be determined by the Owner.
- D. Prior to start of site development work, the Contractor shall notify the Landscape Designer of starting and completion dates. Contractor shall supply the Landscape Designer/Licensed Irrigator and Owner with the name and telephone number of the person in charge of the work.

1.04 RESPONSIBILITIES AND COORDINATION

- A. Permits: The Contractor shall obtain and pay for all permits and inspections required by governing authorities for the work to be performed.
- B. Existing Conditions: The Contractor shall verify all conditions and dimensions shown on the plans at the site prior to commencement of any work under this contract. The Contractor shall verify the location and depth of all underground utilities prior to start of work.
- C. Temporary Utilities: The Contractor shall apply for and pay all cost incurred for all temporary utilities such as water, electrical power and gas as required by him for the construction of this project. Temporary services shall be coordinated with the City and other contractors on the job site.
- D. Survey, Reference Points, and Elevations: The Contractor is responsible for establishing all surveys, reference points and elevations required by him, and shown on plans for proper execution of site construction.
- E. Traffic: The Contractor is responsible for all temporary traffic barriers and detours required by him for the construction of the project. All temporary traffic barriers and detours shall conform to all conditions required by the City or governing authorities.

1.05 DEFECTIVE AND UNAUTHORIZED WORK

All work which is determined by inspection to be defective in its construction or deficient in any of the requirements of the plans and specifications, shall be remedied or removed, and replaced by the Contractor at his own expense in a manner acceptable to the Landscape Designer.

1.06 INSPECTIONS

The Contractor shall arrange for inspections by notifying the Landscape Designer, City and governing authorities 24 hours prior to time of inspection, unless otherwise noted. Inspections shall be as listed below, but not necessarily in this order. Only the inspection pertaining to the project scope of work will apply:

Rough Grading
Drain Lines and Catch Basins
Irrigation Main Pressure Test (for turf areas)
Irrigation System Operations Test
Soil Preparation and Finish Grading
Plant Material and Placement
Final Inspection – 7 days.

1.07 GUARANTIES

- A. Plant Materials: All trees, shrubs, ground cover; bedding plants and lawn shall be guaranteed from date of final acceptance of landscape construction for periods as follows:
- Trees 24" box & larger = 1 year
 - Trees 15 gal. & smaller = 1 year
 - Shrubs All sizes = 120 days
 - Ground Cover = 120 days
 - Bedding Plant = 120 days
 - Lawn (sod) = 120 days
 - Lawn (seed) = 120 days from first mowing

Guarantees begin after final inspection and project acceptance by Landscape Designer and/or Owner's Representative. Landscape Contractor shall replace and plant all materials which have died within the time span stated above at no cost and within 14 days of receiving written notice from the Landscape Designer or Owner. If dead material is not replaced and planted within the 14 day period, Owner may replace dead material with new material and charge the Landscape Contractor for all expenses incurred.

- B. Construction Materials: The contractor shall guarantee all workmanship and materials for all site development, for a period of one year from date of final acceptance of project.

1.08 MATERIAL AND LABOR RELEASES

Upon completion of the work, the Contractor shall present to the Owner signed copies of all labor and materials releases for all work performed under Site Development.

1.09 DISPOSAL AND CLEAN-UP

Remove all waste materials (including excavated material classified as unacceptable soil material), trash and debris generated or encountered during the course of landscape

construction, and legally dispose of it. During the course of the work, remove surplus materials from the site and leave premises in a neat and clean condition. Clean up and remove all remaining debris and surplus materials upon completion of work, leaving the premises neat and clean. The site shall be cleaned upon the request of the inspector.

PART 2 – EXECUTION

2.01 PROTECTION

Keep all plant material delivered to site in a healthy condition for planting. Plants shall not be allowed to dry out. Bare root stock shall be separated and heeled-in, in moist earth or other suitable material until planting. Balled and burlapped plants shall have root ball kept moist and covered until planting.

2.02 INSTALLATION

Detailed layout of plants within the planting areas shall be performed by Contractor and approved by the Landscape Designer and Owner prior to planting. Soil excavated from planting holes shall be amended to backfill around trees and shrubs using the mixture shown in planting details per plans.

PART 3 – SOIL PREPARATION AND FINISH GRADING

3.01 SCOPE OF WORK

- A. Provide all materials and equipment, and perform all work necessary for and incidental to the soil preparation and finish grading of all planting and lawn areas as shown on plans, as reasonably implied, or as delineated in the specifications.
- B. Furnishing, placement and grading of topsoil for backfilling of planters if required.
- C. Cleaning and finish grading of planter areas and planting areas.

3.02 TOPSOIL

- A. Topsoil imported to site for use as fill, backfill in planters and mounding, shall be sandy textured. Silt plus clay content of this soil shall be no greater than 15% by weight. The boron content of this soil shall be no greater than 1 part per million as measured on the saturation extract. The sodium absorption ratio (SAR) shall not exceed 3.0 millimhos per centimeter at 25 C. In order to ensure conformance, soil analysis and recommendations are required.

3.03 SOIL AMENDMENTS

All soil amendments shall be as specified in the Agronomic Suitability/Fertility soils report furnished by the Contractor.

3.04 SOIL PREPARATION FOR PLANTING BEDS

- A. After rough grades have been established, prepare all lawn and planting areas by tilling or cross ripping to a depth of 12". All rock and debris more than 2" in diameter shall be removed from the site, except for areas that are to be sodded, in which all rocks and debris more than 1" in diameter shall be removed.
 - B. Apply, spread, and rototill in all soil amendments as recommended to a depth of 6". Water area thoroughly after rototilling is complete.
-

- C. Incorporate evenly into the top 4" to 6" the following for each 1,000 square feet of planting area:
4 cubic yards of composted organic mulch, 200 lbs. of Gro-Power or approved equal.
The above soil conditioning are minimal qualities only and should be used only for bidding purposes, because soil conditions may change drastically from the time these specifications were developed to the time the actual soil conditioning take place. Therefore, the Contractor shall obtain his own soils analysis. These soils tests shall be conducted by an approved Agronomic soils testing laboratory. Copies of the soil test to be provided during the Pre-construction job conference.

3.05 FINISH GRADING

After rototilling operations are complete, grade areas to establish finish grades for planting. All flow lines shall be maintained and proper tolerances shall be met after settlement at the end of the project maintenance period.

Finish grading shall leave surface of the ground uniformly smooth and free of abrupt grade change.

Berms and swales shall be gradual, not to exceed 3:1 slope at any point.

PART 4 – TREES AND SHRUBS

4.01 SCOPE OF WORK

Provide all material, equipment, and labor necessary to install all trees and shrubs as shown on plans, as reasonably implied and as delineated in the specifications.

4.02 PRODUCTS

- A. Nomenclature – Plant names indicated on the drawings conform to the "Standard Plant Names" established by the American Joint Committee on Horticulture. Except for names covered therein, the established custom of the nursery is followed.
- B. Condition – Plants shall be symmetrical, typical for variety and species, sound, healthy, vigorous, free from plant disease, insect pests, or their eggs, and shall have healthy, normal root systems, well-filling their container, but not to the point of being root bound. Plants shall not be pruned at any time unless indicated in plans, and in no case shall trees be topped.
- C. Trees and shrubs shall be grown at a recognized nursery in accordance with good horticulture practices and shall be of the size and caliper normally associated with the container size specified on plans. All tags, labels, nursery stakes and ties shall be removed. Trees shall have a single leader unless otherwise indicated in plans.
- D. All plant material delivered to the site showing signs of damage or disease or is insufficient in size to carry out the intent of the planting plan will not be accepted and will be replaced at Contractor's expense.
- E. Sizes of Plants – Shall be as stated on the Plan. Container stock (1-gallon, 5-gallon, and 15-gallon) shall have been grown in containers for at least one (1) year, but not over two (2) years.
- F. Substitutions - All plants designated in plans may be found at one or a combination of the following nurseries, among others: Sierra Vista Growers, Mountain States Wholesale Nursery, Sunland Nursery, Production Growers, and
-

Enchanted Gardens. Substitutions for indicated plant material will be permitted ONLY if substitute materials are approved in advance by the Landscape Designer, and are made at no additional cost.

- G. If applicable, stake all trees immediately after planting to prevent wind damage.

4.03 SOIL AMENDMENT

Soil amendments shall be as recommended in the Agronomic soils report.

4.04 TREE STAKES

Trees shall either be staked according to standard horticultural practice, or guaranteed by contractor for upright growth for a period of one year.

PART 5 – LANDSCAPE MAINTENANCE

5.01 SCOPE OF WORK

Provide all materials, labor and equipment necessary for, or incidental to, performing all maintenance requirements as reasonably implied or as delineated in the specifications including, but not limited to the following:

- Maintain all plants and planted areas.
- Keep planted areas free of weeds and debris.
- Prune trees and shrubs.
- Maintain irrigation schedule and regulate water application.

5.02 GENERAL

Maintenance shall start immediately after landscape irrigation and planting. Maintain all plants and planted areas on a continuous basis as they are installed during the progress of the work, and continue to maintain them until final acceptance of total project. Replace any dead or dying plants as directed by the Landscape Designer and Owner's Representative. Should plants die due to timer/controller issues prior to project acceptance, contractor shall replace plants in order to achieve substantial completion. This shall be true regardless of reasons behind timer/controller failure.

- A. Irrigation: Operate irrigation system on an established program to maintain all plants and planted areas in a healthy condition. Irrigation system run-off shall be kept to a minimum. Damage to irrigation system resulting from maintenance and equipment and/or maintenance personnel, shall be restored to its original condition at no cost to the Owner. Failure of any part of the irrigation system shall be brought to the attention of the Landscape Designer/Licensed Irrigator. No repairs other than emergency repairs shall be accomplished without permission from the Landscape Designer/Licensed Irrigator.
 - B. Weed Control: Keep all planted areas free of weeds and debris by cultivating areas at intervals not to exceed 10 calendar days. The Contractor may elect to remove such concentrations of weeds manually or by an approved herbicide program.
 - C. Pest Control: Spray all plants and planted areas at beginning of maintenance program and as may become necessary thereafter by an approved method of pest control, to keep all plants and planted areas free of insects and disease.
-

Method shall be reviewed by the Landscape Designer/Licensed Irrigator prior to any applications. Pest control shall include Gopher control.

- D. Pruning: Prune all plants as designated and directed by Landscape Designer/Licensed Irrigator, at start of maintenance program and continue to prune plants as directed or as may become necessary until the end of the maintenance program.
- E. Remove trash weekly. Edge ground cover to keep in bounds and trim top growth as necessary to achieve an overall even appearance.

- END OF SECTION -

SECTION 03214

BRICK PAVERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Pedestrian/light vehicular pavers.

1.2 RELATED SECTIONS

- A. Section 32 13 16.23 - Stamped Concrete Paving.

1.3 REFERENCES

- A. ASTM International, Inc. (ASTM):
 1. ASTM C 902 - Standard Specification for Pedestrian and Light Traffic Paving Brick.
 2. ASTM C 1272 - Standard Specification for Heavy Vehicular Paving Brick.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 1. Preparation instructions and recommendations.
 2. Storage and handling requirements and recommendations.
 3. Cleaning methods.
- C. Verification Samples: For each product and finish specified, two full-size samples representing actual products, colors and textures.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of ten years experience.
- B. Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five years demonstrated experience in installing products of the same type and scope as specified.
- C. Mock-Up: Provide a completely assembled, typical wall areas installed with related accessories, in composite configurations designed to fulfill the performance criteria, and representative of the design as shown on the Drawings.
 1. Locate mock-up in location as directed by the Architect.
 2. Do not proceed with remaining work until workmanship is approved by Architect.
 3. Mock-up area may become part of finished work.
 4. Mock-up area may not become part of finished work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle materials and products in strict compliance with manufacturer's instructions and recommendations and industry standards.

- B. Store materials in manufacturer's original sealed, labeled packaging until ready for installation and in accordance with manufacturer's instructions. Protect from damage.

1.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.8 WARRANTY

- A. Manufacturer's Standard Material Warranty: At project closeout, provide to Owner or Owners Representative an executed copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer:
 - Endicott Clay Products Co
 - Pacific Clay Products
 - Acme Brick Co.
- B. Substitutions: Or Equal

2.2 PEDESTRIAN/LIGHT VEHICULAR PAVERS

- A. Pedestrian/Light Vehicular Pavers: Nominal 4 inch x 8 inch brick pavers with
 1. Actual Product Size: 4 x 8 x 1-1/4 inches (102 x 203 x 32 mm).
 2. Color: as selected by owner
 3. Pattern: Circular pattern see drawings for more detail

PART 3

PART 4 EXECUTION

4.1 EXAMINATION AND PREPARATION

- A. Prepare substrates using the methods recommended by the manufacturer for achieving best result for the substrates under project conditions.
- B. Do not proceed with installation until substrates have been prepared using the methods recommended by the manufacturer and deviations from manufacturer's recommended tolerances are corrected. Commencement of installation constitutes acceptance of conditions.
- C. If preparation is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.

4.2 INSTALLATION

- A. Install pavers accordance with manufacturer's instructions and in proper relationship with adjacent construction.

4.3 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

PART 1 – GENERAL**1.01 SCOPE**

- A. Related Documents: Drawings and general provisions of Contract, including General, Supplementary and Special Contract Conditions and Division 1 Specification sections, apply to the work in this section.
- B. Provide the cast-in place concrete system, complete.

1.02 SUMMARY

- A. This Section specifies cast-in-place concrete, including formwork, reinforcing, mix design, placement procedures, and finishes.

1.03 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, curing compounds, and others as requested by Architect.
- C. Shop drawings for reinforcement, prepared by registered Professional Engineer for fabrication, bending and placement of concrete reinforcement. Comply with ACI SP-66 (88), "ACI Detailing Manual," showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of concrete reinforcement. Include special reinforcement required for openings through concrete structures.
- D. Laboratory test reports for concrete materials and mix design test.
- E. Materials Certificates in lieu of materials laboratory test reports when permitted by Architect. Materials certificates shall be signed by manufacturer and contractor, certifying that each material item complies with or exceeds specified requirements. Provide certification from admixture manufacturers that chloride content complies with specification requirements.

1.04 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of following codes, specifications, and standards, except where more stringent are shown or specified:
 - 1. ACI 318, "Building Code Requirements for Reinforced Concrete."
 - 2. Concrete reinforcing Steel Institute (CRSI), "Manual of Standard Practice."

- B. Materials and installed work may require testing and retesting at any time during progress of work. Tests, including retesting of materials for installed work, shall be done at Contractor's expense.

PART 2 – PRODUCTS

2.01 FORM MATERIALS

- A. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.
- B. Forms and Unexposed Finish Concrete: Plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least 2 edges and side for tight fit.
- C. Form Coatings: Provide commercial formulation form-coating compounds with a maximum VOC of 350 mg/l that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
- D. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent form deflection and to prevent spalling concrete upon removal. Provide units that will no metal closer than 1-1/2 inches to exposed surface.
1. Provide ties that, when removed, will leave holes not larger than 1-inch diameter in concrete surface.

2.02 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
- B. Steel Wire: ASTM A 82, plain, cold drawn steel.
- C. Welded Wire Fabric: ASTM A 185, welded steel wire fabric.
- D. Supports for Reinforcements: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire-bar-type supports complying with CRSI specifications.

For slabs-on-grade, use supports with sand plates or horizontal runners where base material will support chair legs.

For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs that are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).

2.03 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I.

1. Use one brand of cement throughout project unless otherwise acceptable to Architect.

B. Fly Ash: ASTM C 618, Type C or Type F.

C. Normal Weight Aggregates: ASTM C 33 and as herein specified. Provide aggregates from a single for exposed concrete.

1. For exterior exposed surfaces, do not use fine or coarse aggregates containing spalling-causing deleterious substances.

2. Local aggregates not complying with ASTM C 33 but that special tests or actual service have shown to produce concrete of adequate strength and durability may be used when acceptable to Architect.

D. Water: Drinkable

E. Admixtures, General: Provide admixtures for concrete that contains not more than 0.1 percent chloride ions.

F. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

"Air-Tite," Cormix

"Air-Mix" or "Perma-Air," Euclid Chemical Co.

"Darex AEA" or "Daravair," W.R. Grace & Co.

"MB-VR" or "Micro-Air," Master Builders, Inc.

"Sealtight AEA," W.R. Meadows, Inc.

"Sika AER," Sika Corp.

G. Water-Reducing Admixture: ASTM C 494, Type A

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

"Chemtard," ChemMasters Corp.
"PSI N," Cormix.
"Eucon WR-75," Euclid Chemical Co.
"WRDA," W.R. Grace & Co.
"Pozzolith Normal" or "Polyheed," Master Builders, Inc.
"Prokrete-N," Prokrete Industries
"Plastocrete 161," Sika Corp

H. High-Range Water-Reducing Admixture (Super Plasticizer): ASTM C 494, Type F or Type G.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

"Q-set," Conspec Marketing & Manufacturing Co.
"Gilco Accelerator," Cormix.
"Accelguard 80," Euclid Chemical Co.
"Daraset," W.R. Grace & Co.
"Pozzutec 20," Master Builders, Inc.

I. Water-Reducing, Retarding Admixture: ASTM C 494, Type D.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are limited to, the following:

"PSI-R Plus," Cormix
"Eucon Retarder 75," Euclid Chemical Co.
"Daratard-17," W.R. Grace & Co.
"Pozzolith R," Master Builders, Inc.
"Protard," Prokrete Industries
"Plastiment," Sika Corporation

2.04 RELATED MATERIALS

- A. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.
- B. Moisture-Retaining Cover: One of the following, complying with ASTM C 171
- a. Waterproof paper
 - b. Polyethylene film
 - c. Polyethylene-coated burlap

- C. Liquid Membrane-Forming Curing Compound: Liquid-type membrane forming curing compound complying with ASTM C 309, Type I, Class A. Moisture loss not more than 0.055 gr./sq. cm. When applied at 200 sq. ft./gal.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

"A-H 3 Way Sealer," Anti-Hydro Co., Inc.
"Spartan-Cote," The Burke Co.
"Conspec #1," Conspec Marketing & Mfg. Co.
"Hardtop," Cormix
"Day-Chem Cure and Seal," Dayton Superior Corp.
"Eucocure," Euclid Chemical Co.
"Horn Clear Seal," A.C. Horn, Inc.
"L&M Cure," L & M Construction Chemicals, Inc.
"Masterkure," Master Builders, Inc.
"CS-309," W.R. Meadows, Inc.
"LR-151," Prokrete Industries
"Kure-N-Seal," Sonneborn-Rexnord
"Stontop CS2," Stonhard, Inc.

- D. Water-Based Acrylic Membrane Curing Compound: ASTM C 309, Type I, Class B.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

"Highseal," Conspec Marketing and Mfg. Co.
"Safe Cure and Seal," Dayton Superior Corp.
"Aqua-Cure," Euclid Chemical Co.
"Dress & Seal #18WB," L&M Construction chemicals, Inc.
"Masterseal W," Master Builders, Inc.
"Intex," W.R. Meadows, Inc.
"Silka Membrane," Sika Corp.

- E. Evaporation Control: Monomolecular film-forming compound applied to exposed concrete slab surfaces for temporary protection from rapid moisture loss.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

"Aquafilm," Ardex, Inc.
"Eucobar," Euclid Chemical Co.
"E-Con," L&M Construction Chemicals, Inc.
"Confilm," Master Builders, Inc.

2.05 PROPORTIONING AND DESIGN OF MIXES

- A. Prepare design mixes for each type and strengths of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method used, use an independent testing facility acceptable to Architect for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing.
- a. Limit use of fly ash to not exceed 25 percent of cement content by weight.
- B. Submit written reports to Architect of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until proposed mix designs have been reviewed by Architect.
- C. Design mixes to provide normal weight concrete with the following properties, as indicated on drawings and schedules:
- a. 3000-psi, 28-day compressive strength; W/C ratio, 0.46 maximum
- D. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect before using in work.

2.06 ADMIXTURES

- A. Use water-reducing admixture or high-range water-reducing admixture (Superplasticizer) in concrete as required for placement and workability.
- B. Use nonchloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 deg F (10 deg C).
- C. Use high-range water-reducing admixture (HRWR) in pumped concrete, concrete for industrial slabs, architectural concrete, parking structure slabs, concrete required to be watertight, and concrete with water/cement ratios below 0.50.
- D. Use air-entraining admixture in all concrete. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of plus or minus 1-1/2 percent within following limits:
- a. 6.0 percent $\frac{3}{4}$ -inch to $\frac{1}{2}$ -inch max. aggregate.

- E. Use admixtures for water reduction and set control in strict compliance with manufacturer's directions.
- F. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:
 - 1. Ramps, slabs, and sloping surfaces: Not more than 3 inches.
 - 2. Reinforced foundation systems: Not less than 1 inch and not more than 3 inches.
 - 3. Concrete containing HRWR admixture (Superplasticizer): Not more than 8 inches after addition of HRWR to site-verified 2-inch to 3-inch slump concrete.
 - 4. Other concrete: Not more than 4 inches.

2.07 CONCRETE MIXING

- A. Ready-Mix Concrete: Comply with requirements of ASTM C 94, and as specified.
 - 1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 – EXECUTION

3.01 GENERAL

- A. Coordinate the installation of joint materials with placement of forms and reinforcing.

3.02 FORMS

- A. General: Design, erect, support, brace, and maintain formwork to support vertical and lateral, static and dynamic loads that might be applied until concrete structure can support such loads. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances complying with ACI 347.
- B. Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent leakage of cement paste.

- C. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.
- D. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- E. Chamfer exposed corners and edges as indicated, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- F. Provision for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.
- G. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before concrete is placed. Retighten forms and bracing before concrete placement as required to prevent mortar leaks and maintain proper alignment.

3.03 PLACING REINFORCEMENT

- A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports and as herein specified.

Avoiding cutting or puncturing vapor retarder during reinforcement placement and concreting operations.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.
- E. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as approved by Architect.
- F. Place reinforcement to obtain at least minimum coverages for concrete protection. Arrange space, and securely tie bars and bar support to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

- G. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.04 JOINTS

- A. Construction Joints: Locate and install construction joints as indicated or, if not indicated, locate so as not to impair strength and appearance of the structure, as acceptable to Architect.
- B. Provide keyways at least 1 ½ inches deep in construction joints in walls and slabs and between walls and footings. Accepted bulkheads designed for this purpose may be used for slabs.
- C. Place construction joints perpendicular to maintain reinforcement. Continue reinforcing across construction joints.

3.05 INSTALLATION OF EMBEDDED ITEMS

- A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached thereto.
- B. Forms for Slabs: Set edge forms, bulkheads, and intermediate screed strips for slabs to obtain required elevations and contours in finished surfaces. Provide and secure units to support screed strips using strike-off templates or compacting-type screeds.

3.06 PREPARATION OF FORM SURFACES

- A. General: Coat contact surfaces of forms with an approved, nonresidual, low-VOC, form-coating compound before reinforcement is placed.

Do not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

3.07 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work.
- B. General: Comply with ACI 304, "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete," and as herein specified.

Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete that has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete to avoid segregation at its final location.

- C. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
1. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading rodding, or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI 309.
 2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators 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 set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.
- D. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limit of construction joints; until the placing of a panel or section is completed.
1. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items in into corners.
 2. Bring slab surfaces to correct level with straightedge and strike off. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.
 3. Maintain reinforcing in proper position during concrete placement.
- E. Cold-Weather Placing: Comply with provisions of ACI 306 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

When air temperature has fallen to or is expected to fall below 40 deg F (4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) at point of placement.

1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 2. Do not use calcium chloride, salt, and other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.
- F. Hot-Weather Placing: when hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 as herein specified.
1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg F (32 deg C). Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice calculated to total amount of mixing water. Use of liquid nitrogen to cool concrete is Contractor's option.
 2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.

Fog spray forms, reinforcing steel, and subgrade just before concrete is placed.
 3. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, when acceptable to Architect.

3.08 FINISH OF FORMED SURFACES

- A. Rough Form Finish: For formed concrete surfaces not exposed to view in the finish work or concealed by other construction. This is the concrete surface having texture imparted by form-facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding ¼ inch in height rubbed down or chipped off.
- B. Smooth Form Finish: For formed concrete surfaces exposed to view or to be covered with a coating material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, painting, or other similar system. This is an as-cast concrete surface obtained with selected form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch defective areas with fins and other projections completely removed and smoothed.
- D. Grout-Cleaned Finish: Provide grout-cleaned finish to schedule concrete surfaces that have received smooth form finish treatment.

Combine one part portland cement to 1 ½ parts fine sand by volume, and a 50:50 mixture of acrylic or styrene butadiene-based bonding admixture and water to consistency of thick paint. Blend standard portland cement and white portland cement, amounts determined by trial patches, so that final color of dry grout will match adjacent surfaces.

Thoroughly wet concrete surfaces, apply grout to coat surfaces, and fill small holes. Remove excess grout by scraping and rubbing with clean burlap. Keep damp by fog spray for at least 36 hours after rubbing.

- E. Related Unformed Surfaces: At top of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, strike-off smooth and finish with texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.09 MONOLITHIC SLAB FINISHES

- A. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified; slab surfaces to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo; and as otherwise.

After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating, using float blades or float shoes only, when surface water has disappeared, when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible to power units. Check and level surface plane to tolerances of Ft 18 – F 15. Cut down high spots and fill low

- B. Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed to view and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or other thin film finish coating system.

After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with surface leveled to tolerances of Ff 20 – F1 17. Grind smooth surface defects that would telegraph through applied floor covering system.

- C. Trowel and Fine Broom Finish: Where ceramic or quarry tile is to be installed with thin-set mortar, apply trowel finish as specified, then immediately follow with slightly scarifying surface by fine brooming.
- D. Nonslip Broom Finish: Apply nonslip broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

Immediately after float finishing, slightly roughen concrete surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.10 CONCRETE CURING AND PROTECTION

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather, protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply in accordance with manufacturer's instructions after screeding and bull floating, but before power floating and troweling.

Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.

- B. Curing Methods: Perform curing of concrete by curing and sealing compound, by moist curing, by moisture-retaining cover curing, and by combinations thereof, as herein specified.

- C. Provide moisture curing by following methods.

Keep concrete surface continuously wet by covering with water.

Use continuous water-fog spray.

Cover concrete surface with specified absorptive cover, thoroughly saturate cover with water, and keep continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4-inch lap over adjacent absorptive covers.

- D. Provide moisture-cover curing as follows:

Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and lapped at least 3 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during period using cover material and waterproof tape.

- E. Provide curing and sealing compound to exposed interior slabs and to exterior slabs, walks and curbs as follows:

Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours and after surface water sheen has disappeared). Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

Use membrane curing compounds that will not affect surfaces to be covered with finish materials applied directly to concrete.

- F. Curing Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces, by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.
- G. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces, by application of appropriate curing method.

Final cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture-retaining cover, unless otherwise directed.

3.11 REMOVAL OF FORMS

- A. General: Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete, provide concrete is sufficiently hard to not be damaged by form-removal operations, and provided curing and protection operations are maintained.
- B. Formwork supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements, may not be removed in less than 14 days and until concrete has attained at least 75 percent of design minimum compressive strength at 28 days. Determine potential compressive strength of in-place by testing field-cured specimens representative of concrete location or members.
- C. Forming-facing material may be removed 4 days after placement only if shores and other vertical supports have been arranged to permit removal of form-facing material without loosening or disturbing shores and supports.

3.12 REUSE OF FORMS

Clean and repair surfaces of forms to be reused in work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-coating compound as specified for new formwork.

When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces except as acceptable to Architect.

3.13 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work other trades is in place. Mix, place, and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.
- B. Reinforced Masonry: Provide concrete grout for reinforced masonry lintels and bond beams where indicated on drawings and as scheduled. Maintain accurate location of reinforcing steel during concrete placement.

3.14 CONCRETE SURFACE REPAIRS

- A. Patching defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Architect.
 - 1. Cut out honeycomb, rock pockets, voids over $\frac{1}{4}$ inch in any dimension, and holes left by tie rods and bolts, down to solid concrete but in no case to depth of less than 1 inch.

Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with specified bonding agent. Place patching mortar before bonding compound has dried.
 - 2. For exposed-to-view surfaces, blend white portland cement and standard portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off higher than surrounding surface.
- B. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry-pack mortar, or precast cement cone plugs secured in place with bonding agent.
 - 1. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.
- C. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having required slope.

1. Repair finished unformed surfaces that contain defects that affect durability of concrete. Surface defects, as such, include crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through nonreinforced sections regardless of width, spalling, popouts, honeycomb, rock pockets, and other objectionable conditions.
 2. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.
 3. Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with patching compound. Finish repaired areas to blend into adjacent concrete. Proprietary underlayment compounds may be used when acceptable to Architect.
 4. Repair defective areas, except random cracks and single holes not exceeding 1 inch in diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
- D. Repair isolated random cracks and single holes not over 1 inch in diameter by dry-pack method. Groove top of cracks and cut out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part portland cement to 2 1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry-pack before bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.
- E. Perform structural repairs with prior approval of Architect for method and procedure, using specified epoxy adhesive and mortar.
- F. Repair methods not specified above may be used, subject to acceptance of Architect.

3.15 QUALITY CONTROL TESTING DURING CONSTRUCTION

- A. General : The Owner will employ a testing laboratory to perform tests and to submit test reports.

Sampling and testing for quality control during placement of concrete may include the following, as directed by Architect.

- B. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
1. Slump: ASTM C 143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
 2. Air Content: ASTM C 173, volume method for lightweight or normal weight concrete; ASTM C 231 pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.
 3. Concrete Temperature: Test hourly when air temperature is 40 deg F (4 deg C) and below, when 80 deg F (27 deg C) and above, and each time a set of compression test specimens is made.
 4. Compression Test Specimen: ASTM C 31; one set of 4 standard cylinder for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cure test specimens are required.
 5. Compressive Strength Tests: ASTM C 39; one set for each day's pour exceeding 5 cu. yds. plus additional sets for each 50 cu. yds. more than the first 25 cu. yds. of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.

When frequency of testing will provide fewer than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.

When total quantity of a given class of concrete is less than 50 cu. yds. Architect may waive strength test if adequate evidence of satisfactory strength is provided.

When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

Strength level of concrete will be considered satisfactorily if averages of sets of three consecutive strength tests results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 500 psi.

- C. Test results will be reported in writing to Architect, Structural Engineer, Ready-Mix Producer, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day test and 28-day tests.
- D. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.
- E. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. Contractor shall pay such tests when unacceptable concrete is verified.

END OF SECTION 03300

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Stamped concrete.

1.2 RELATED SECTIONS

- A. Section 03300 - Cast-in-Place Concrete.

1.3 REFERENCES

- A. ASTM C 309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- B. ASTM C 979 - Standard Specification for Pigments for Integrally Colored Concrete.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- D. Verification Samples: For each finish product specified, two samples, minimum size 12 inches (305 mm) square representing actual product, color, and patterns.
- E. Manufacturer's Certification: Submit manufacturer's certification that materials comply with specified requirements and are suitable for intended application.
- F. Applicator's Project References: Submit applicator's list of successfully completed stamped concrete projects, including project name and location, name of architect, and type and quantity of materials applied.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum 5 year experience manufacturing similar products.
- B. Installer Qualifications: Minimum 2 year experience installing similar products.
 - 1. Regularly engaged, for preceding 5 years, in application of stamped concrete of similar type to that specified.
 - 2. Employ persons trained for application of stamped concrete.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Construct Mock-ups of Stamped Concrete:
 - a. Use same materials and methods for use in the Work.
 - b. Location: Determined by Architect.

- c. Minimum Size: 4 feet by 4 feet (1219 mm by 1219 mm).
2. Receive approval of mock-ups by Architect for patterns, colors, textures, finishing, curing, cleaning, sealing, special effects, and workmanship before application of stamped concrete.
3. Approved Mock-ups:
 - a. Standard for patterns, colors, textures, finishing, curing, sealing, special effects, and workmanship of stamped concrete.
 - b. Retain through completion of Work for use as quality standard.

1.6 PRE-INSTALLATION MEETINGS

- A. Convene minimum two weeks prior to starting work of this section.
 1. Require attendance of parties directly affecting work of this section, including:
 - a. Contractor.
 - b. Architect.
 - c. Applicator.
 - d. Owners representative.
 2. Review:
 - a. Mock-ups.
 - b. Materials.
 - c. Preparation.
 - d. Application.
 - e. Finishing.
 - f. Curing.
 - g. Cleaning.
 - h. Sealing.
 - i. Protection.
 - j. Coordination with other work.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Acceptance Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Storage and Handling Requirements:
 1. Store and handle materials in accordance with manufacturer's instructions.
 2. Keep materials in manufacturer's original, unopened containers and packaging until application.
 3. Store materials in clean, dry area indoors.
 4. Store materials out of direct sunlight.
 5. Keep materials from freezing.
 6. Protect materials during storage, handling, and application to prevent contamination or damage.

1.8 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.
- B. Apply materials when air and surface temperatures are between 55 degrees F (13 degrees C) and 80 degrees F (27 degrees C).
- C. Do not apply materials when rain, snow, or excessive moisture is expected during application or within 24 hours after application.

1.9 SEQUENCING

- A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer:
 - Solomon Colors
- B. Substitutions: Or Equal

2.2 MATERIALS

- A. Concrete Topping and Hardener: "Color Hardener".
- B. Dry Integral Concrete Color: "Powdered Color".
 - 1. Compliance: ASTM C 979.
 - 2. Color: as selected by architect
- C. Stamping Mats: "Creative Image Mats".
 - 1. Pattern: as selected by architect
- D. Curing Compound:
 - 1. Clear, non-yellowing, non-staining, breathable, UV stable.
 - 2. Compliance: ASTM C 309.
 - 3. Compatible with colored concrete.
- E. Concrete Cleaner:
 - 1. Biodegradable
- F. Sealer:
 - 1. Natural-look, water-based, acrylic, clear sealer.
 - 2. VOC: 100 g/L.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to receive stamped concrete.
- B. Notify Architect of conditions that would adversely affect application or subsequent use.
- C. Do not begin preparation or application until unacceptable conditions are corrected.

3.2 PREPARATION

- A. Protection of In-Place Conditions: Protect adjacent surfaces, areas, adjoining walls, and landscaping from contact with stamped concrete materials.
- B. Preparation of Subgrade:
 - 1. Ensure subgrade is uniformly graded, compacted, and moistened.
 - 2. Ensure subgrade is free of standing water.
 - 3. Do not place concrete over soft, frozen, or muddy subgrade.

- C. Concrete:
 - 1. Specified in Section 03300 - Cast-in-Place Concrete, unless otherwise specified in this section.
 - 2. Slump: Maximum 4 inches.
 - 3. Calcium Chloride: Do not use calcium chloride or admixtures containing calcium chloride.
 - 4. Fine and Course Aggregates:
 - a. Non-reactive.
 - b. Free of deleterious material.

3.3 APPLICATION

- A. Apply stamped concrete materials in accordance with manufacturer's instructions at locations indicated on the Drawings.
- B. Concrete Topping and Hardener:
 - 1. Apply concrete topping and hardener in accordance with manufacturer's instructions.
 - 2. Apply concrete topping and hardener to give complete and uniform coverage to concrete.
 - 3. Ensure uniform color results.
- C. Integrally Colored Concrete: Design mix, batch, add colorant, place, finish, and cure concrete in accordance with integral concrete color manufacturer's instructions.
- D. Colored Bond Breaker/Antiquing Release Agent: Release and imprint concrete with colored bond breaker/antiquing release agent in accordance with manufacturer's instructions.
- E. Colorless Bond Breaker:
 - 1. Apply colorless bond breaker in accordance with manufacturer's instructions to bottom of stamping mats and on concrete surface, when concrete has reached plastic stage desirable for imprinting.
 - 2. Do not trowel or mix colorless bond breaker into plastic concrete surface.
- F. Stamping Mats:
 - 1. Press stamping mats in accordance with manufacturer's instructions into concrete that has reached plastic stage desirable for imprinting.
 - 2. Use stamping mats to create patterns in concrete as indicated on the Drawings.
- G. Approved Mock-ups: Match approved mock-ups for patterns, colors, textures, finishing, curing, cleaning, sealing, special effects, and workmanship.

3.4 CURING

- A. Cure concrete in accordance with manufacturer's instructions.
- B. Apply curing compound in accordance with manufacturer's instructions.
- C. Do not cure concrete using materials or methods harmful to concrete surface, including:
 - 1. Low-pressure or high-pressure steam.
 - 2. Burlap.
 - 3. Plastic sheeting.
 - 4. Membrane paper.
 - 5. Water misting.

6. Sodium-silicone-type hardeners.

3.5 CLEANING

- A. Clean concrete in accordance with manufacturer's instructions.
- B. Apply concrete cleaner in accordance with manufacturer's instructions to remove:
 - 1. Excess colored bond breaker/antiquing release agent.
 - 2. Efflorescence.
 - 3. Cement scale.
- C. Apply concrete cleaner before sealing concrete surface.

3.6 SEALING

- A. Seal concrete surfaces in accordance with manufacturer's instructions.
- B. Apply sealer to clean and dry concrete surfaces in accordance with manufacturer's instructions after concrete has cured a minimum of 28 days.
- C. Apply sealer uniformly over entire stamped concrete surface.
- D. Do not allow traffic on finished sealed surfaces for the following periods after application:
 - 1. Foot Traffic: Minimum 24 hours.
 - 2. Heavy Traffic: Minimum 72 hours.

3.7 PROTECTION

- A. Exterior Surfaces: Protect applied stamped concrete to ensure that, except for normal weathering, concrete will be without damage or deterioration at time of Substantial Completion.

END OF SECTION

PART 1 – GENERAL

RELATED DOCUMENTS:

Drawings general provisions of Contract and Division – 1 Requirements apply to work of this section.

DESCRIPTION OF WORK:

Types of work in this section include light gage metal framing for:

Suspended Metal Support System

Metal Stud Support System

Miscellaneous Framing Required

QUALITY ASSURANCE:

Metal Support Standard: ASTM C 754

Fire-Resistance Rating: Where gypsum drywall systems with fire resistance ratings are indicated or are required to comply with governing regulations, provide materials and installations identical with applicable assemblies which have been tested and listed by recognized authorities, including UL and AIA.

Comply with FM "Approval Guide" where applicable.

Manufacturer: Obtain metal framing products from a single manufacturer, or from manufacturers recommended by the prime manufacturer of metal framing.

Allowable Tolerances: 1/8" in 8'-0" for plumb, level, warp, and bow.

Component Design: Calculate structural properties of studs and joists in accordance with American Iron and Steel Institute (AISI) "Specification for Design of Cold-Formed Structural Members"

Welding: Use qualified welders and comply with American Welding Society (AWS) D1.3, "Structural Welding Code – Sheet Steel".

A. SUBMITTALS:

Product Data: Submit manufacturer's product specifications and installation instructions for each metal framing component, including other data as may be required to show compliance with these specifications.

PART 2 – PRODUCTS

METAL SUPPORT MATERIALS:

Wall/Partition Support Materials:

Framing: Electro-galvanized steel channels with openings for conduit and piping with steel tracks and stiffeners; UL approved as required. ASTM C 645; 25 gage minimum unless otherwise indicated or as recommended by the manufacturer for the application indicated.

Depth of Section: 3-5/8" or as required for application

Runners: Match studs; type recommended by stud manufacturer for floor and ceiling support of studs, and for vertical abutment of drywall work at other work.

Stud System Accessories: Provide stud manufacturer's standard clips, shoes, ties, reinforcements, fasteners and other accessories as needed for a complete stud system.

Furring: 7/8" x 25 gage screw-type electro-galvanized steel channel, 1-1/2" x 9/16" x 16 gage galvanized steel channels.

Ceiling Support Materials and Systems:

General: Size ceiling support components to comply with ASTM C 754 unless indicated otherwise.

Main Runners: Steel channels with rust inhibitive paint finish, hot or cold-rolled, 1-1/2" steel channels, 0.475 lbs. per lin. Ft.

Hanger Wire: ASTM A 641, soft, Class 1 galvanized, prestretched, sized as per GA-2031.

Hanger Anchorage Devices: Screws, clips, bolts, cast-in-place concrete inserts or other devices. Size devices for 3 x calculated load supported except size direct pull-out concrete inserts for 5 x calculated loads.

Furring Members: ASTM C 645; 25 gage, hat-shaped.

Where shown on "Resilient", provide manufacturer's special type designed to reduce sound transmission.

Direct Suspension System: Manufacturer's standard zinc-coated or painted steel system or furring runners, furring tees, and accessories designed for concealed support of gypsum drywall ceilings; of proper type for use intended.

B. MISCELLANEOUS REQUIREMENTS:Materials and Finish

For 16-gage and heavier units, fabricate metal framing components of structural quality steel with a minimum yield point of 40,000 psi; ASTM A 446, A 570, or A 611.

Provide galvanized finish to metal framing components complying with ASTM A 525 for minimum G 60 coating, when noted on drawings.

Fasteners: Provide nuts, bolts, washers, screws, and other fasteners with corrosion-resistant plated finish.

Electrodes for Welding: Comply with AWS Code and as recommended by stud manufacturer.

Galvanized Repair: Where galvanized surfaces are damaged, prepare surfaces and repair in accordance with procedures specified in ASTM A 780.

PART 3 - EXECUTION**INSTALLATION OF METAL SUPPORT SYSTEMS:****General:**

Do not bridge building expansion joints with support system, frame both sides of joints with furring and other support as indicated.

Install metal framing systems in accordance with manufacturer's printed or written instructions and recommendations.

Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.

Install supplementary framing, blocking and bracing in metal framing system wherever walls or partitions are indicated to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to the wall or partition. Where type of supplementary support is not otherwise indicated, comply with stud manufacturer's recommendations and industry standards in each case, considering weight or loading resulting from item supported.

Frame wall openings larger than 4 square feet with double stud at each jamb of frame except where more than two are either shown or indicated in manufacture's instructions. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with stud shoes or by welding, and space jack studs same as full-height studs of wall. Secure stud system wall opening frame in manner indicated.

Install horizontal stiffeners in stud system, spaced (vertical distance) at not more than 54 inches o.c. Weld at each intersection, where required.

Wire tying of framing components is not permitted.

WALL/PARTITION SUPPORT SYSTEMS:

Install runner tracks at floors, ceilings and structural walls and columns where gypsum drywall stud system abutts other work, except as otherwise indicated.

All runners at floors and used in the following areas shall be set in a continuous bed of sealant including, but not limited to: exterior walls, fire-rated partitions, tenant separations, restrooms, kitchens, all rooms containing any fixtures requiring water or waste water connections.

Extend partition stud system through acoustical ceilings and elsewhere as indicated to the structural support or substrate above the ceiling.

Partitions which stop at ceiling shall be braced to structure above with diagonal 18 gage metal stud braces at both sides of doors and openings, wall ends, and at 10' o.c. maximum along wall runs between corners.

Space studs 16" o.c., except as otherwise indicated or as recommended by the manufacturer for the application indicated.

Frame door opening with vertical studs securely attached by screws at each jamb either directly to frame to jamb anchor clips on door frame; install runner track sections (for jack studs) at head and secure to jamb studs.

Provide runner tracks of same gage as studs. Space jack studs same as partition studs.

Install double 20 gage studs for single doors up to 4'-0" wide weighing more than 200 lbs. but no more than 300 lbs.; screw attach web of back-to-back studs direct to jamb anchor clips nested between flange of stud.

Frame openings other than door openings in same manner as required for door openings; and install framing below sills of openings to match framing required above door heads.

Space wall furring members 16" o.c., except as otherwise indicated.

Install supplementary framing, runner, furring, blocking and bracing at opening and terminations in the work, and at locations required to support fixtures, equipment, services, heavy trim, furnishings and similar work which cannot be adequately supported directly on gypsum board alone.

Ceiling Support Suspension Systems:

Secure hangers to structural support by connecting directly to structure where possible, otherwise connect to inserts, clips or other anchorage devices at fasteners as indicated.

Space 8-gage hanger wires 48" o.c., maximum along carrying channels and within 6" of ends of carrying channel run. Suspend from structural steel only, not from metal deck.

Install 1-1/2" carrying channels 48" o.c., and within 6" of walls. Position channels for proper ceiling height, level and secure with hanger wire saddle-tied along channel. Provide 1" clearance between runners and abutting walls and partitions. At channel splices, interlock flanges, overlap ends 12" and secure each end with double-strand 18-gage tie wire.

Level carrying channels to a tolerance of 1/4" in 12'-0", measured both lengthwise on each runner and transversely between parallel runners.

Erect metal furring channels at right angles to 1-1/2" carrying channels or main support members. Provide 1" clearance between furring ends and abutting walls and partitions. Secure furring to carrying channels with clips or saddle-tie to supports with double-strand 18-gage tie wire. At splices, nest furring channels at least 8" and securely wire-tie each with double-strand 18-gage tie wire.

At light troffers or any openings that interrupt the carrying or furring channels, install additional cross reinforcing and hangers as required to restore lateral stability of grillage.

All metal work shall be galvanized.

END OF SECTION 05410

PART 1 - GENERAL

RELATED DOCUMENTS

Drawing and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

Provide the metal fabrications required for this job, complete.

This section includes the following metal fabrications:

Rough hardware

Ladders and safety cages where required

Nosings

Loose bearing and leveling plates

Miscellaneous framing and supports for overhead doors, suspended partitions, etc.

Miscellaneous steel trim

Shelf and relieving angles

Steel pipe railings

Metal stairs

Related Sections: The following sections contain requirements that relate to this section.

Division 5 Section "Structural Steel" for structural steel framing system components.

Division 5 Section "Handrails and Railings" for ornamental metal handrails and railing systems.

Definitions

Definitions in ASTM E 985 for railing-related terms apply to this section.

SYSTEM PERFORMANCE REQUIREMENTS

Structural Performance: Design, engineer, fabricate, and install the following metal fabrications to withstand the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply of each load to produce the maximum stress in each respective component of each metal fabrication.

Top Rail of Guardrail System: Capable of withstanding the following loads applied as indicated:

Concentrated load of 300 lbs applied at any point noncurrently, vertically downward or horizontally.

Uniform load of 100 lbs per linear ft, applied noncurrently, vertically downward or horizontally.

Handrails Not Serving as Top Railing: Capable of withstanding the following loads applied as indicated.

Concentrated loads of 200 lbs applied at any point noncurrently, vertically downward or horizontally.

Uniform load of 50 lbs per linear foot applied noncurrently, vertically downward or horizontally.

Concentrated and uniform loads above need not be assumed to act concurrently.

Infill Area of Guardrail Systems: Capable of withstanding a horizontal concentrated load of 200 lbs applied to one sq. ft. at any point in the system including panels, intermediate rails, or other elements composing the infill area.

Above load need not be assumed to act concurrently with uniform horizontal loads on top rails of railing systems in determining stress on guard.

Heavy Duty Metal Bar Gratings: Capable of withstanding a uniform load of 250 lbs per sq. ft. or a concentrated load of 8000 lbs, whichever produces the greater stress.

SUBMITTALS

General: Submit the following in accordance with Conditions of Contract and Division 1 Specification section.

Product Data for products used in miscellaneous metal fabrications, including paint products and grout.

Shop drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other sections.

Samples representative of materials and finished products as may be requested by Architect.

Field Measurements: Check actual locations of walls and other construction to which fabrications must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabrication of products without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to guaranteed dimensions. Allow for trimming and fitting.

Sequence and coordinate installation of wall handrails as follows:

Mount handrails only on completed walls. Do not support handrails temporarily by any means not satisfying structural performance requirements.

Mount handrails only on gypsum board assemblies reinforced to receive anchors, and where the location of concealed anchor plates has been clearly marked for benefit of Installer.

PART 2 - PRODUCTS

FERROUS METALS

Metal Surfaces, General: For metal fabrications exposed to view upon completion of the Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use material whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, and, for steel sheet, variations in flatness exceeding those permitted by reference standards for stretch-leveled sheet.

Steel plates, Shapes, and Bars: ASTM A 36.

Rolled Steel Floor Plates: ASTM A 786.

Steel Bars for Gratings: ASTM A 569 or ASTM A 36.

Wire Rod for Grating Cross Bars: ASTM A 510.

Steel Tubing: Product type (manufacturing method)

Hot-Formed Steel Tubing: ASTM A 501.

Steel Pipe: ASTM A 53; finish, type, and weight class as follows:

Black finish, unless otherwise indicated.

Galvanized finish for exterior installations where indicated.

Type F, standard weight (schedule 40), unless otherwise indicated, or another weight, type, and grade required by structural loads.

STAINLESS STEEL

Bar stock: ASTM A 276, Type 302 or 304.

Plate: ASTM A 167, Type 302 or 304.

ALUMINUM

Extruded Bars and Shapes: ASTM B 221, alloys as follows:

6061-T6 or 6063-T6 for bearing bars of gratings and shapes.
6061-T1 for grating cross bars.

GROUT AND ANCHORING CEMENT

Nonshrink Metallic Grout: Premixed, factory-packaged, ferrous aggregate grout complying with CE CRD-C 621, specifically recommended by manufacturer for heavy duty loading applications of type specified in this section.

FASTENERS

General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.

Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A.

Lag Bolts: Square head type, FS FF-B-561.

Machine Screws: Cadmium plated steel, FS FF-S-92.

Wood Screws: Flat head carbon steel, FS FF-S-111.

Plain Washers: Round, carbon steel, FS FF-W-92.

Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class, and style as required.

Lock Washers: Helical spring type carbon steel, FS FF-W-84.

PAINT

Shop Primer for Ferrous Metal: Manufacturer's or fabricator's standard, fast-curing, lead-free, universal modified alkyd primer selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated, and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure complying with performance requirements of FS TT-P-645.

Galvanizing Repair Paint: High zinc dust content paint for reglvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint-20.

Zinc Chromate Primer: FS TT-P-645.

FABRICATION, GENERAL

Form metal fabrications materials of size, thickness, and shape indicated but not less than that needed to comply with performance requirement indicated. Work to dimensions indicated or accepted on shop drawings, using proven detail of fabrication and support. Use type of material indicated or specified or various components of each metal fabrication.

Form exposed work true to line and level with accurate angles and surface and straight sharp edges.

Ease exposed edges to a radius of approximately 1/32", unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

Remove sharp or rough areas on exposed traffic surfaces.

Weld corners and seams continuously to comply with AWS recommendations and the following: Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (counter-sunk) screws or bolts. Locate joints where least conspicuous.

Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of jointed pieces. Clearly mark units for reassembly and coordinated installation.

Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.

Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

ROUGH HARDWARE

Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 sections.

STEEL LADDERS

General: Fabricate ladders for the locations shown, with dimensions spacings, details and anchorages as indicated. Comply with requirements of ANSI A14.3.

Siderails: Continuous steel flat bars, 1/2" x 2 1/2", with eased edges, spaced 18 inches apart.

Bar Rungs: Round steel bars, 3/4" diameter, spaced 12 inches o.c.

Fit rugs in center line of side rails, plug weld and grind smooth outer rail faces.

Support each ladder at top and bottom and at intermediate points space not more than 5'-0" o.c. by means of welded or bolted steel brackets.

Size brackets to support design dead and live loads indicated and to hold centerline of ladder rungs clear of the wall surface by no less than 7 inches.

Extended side rails 42 inches above top rung, and return rails to wall or structure unless other secure handholds are provided. If the adjacent structure does not extend above the top rung, goose-neck the extended rails back to the structure to provide secure ladder access.

Provide non-slip surface on top of each rung, either by coating the rung with aluminum oxide granules set in epoxy resin adhesive, or by using a type of manufactured rung which is filled with aluminum oxide grout.

LADDER SAFETY CAGES

General: Fabricate ladder safety cages to comply with ANSI A14.3; assemble by welding or riveting.

Primary Hoops: Steel bars, 5/16 inch X 4 inches, for top, bottom, and for cages longer than 20 feet, intermediate primary hoops.

Secondary Intermediate Hoops: Steel bars 5/16 inches X 2 inches hoops spaced not more than 4'-0" o.c. between primary hoops.

Vertical Bars: Steel bars, 5/16 inch X 2 inches, secured to each hoop, spaced approximately 9 inches o.c.

Fasten assembled safety cage to ladder rails and adjacent construction as indicated.

Galvanize ladder safety cages, including fasteners, in the following locations:

Exterior locations

Interior locations where indicated

LOOSE BEARING AND LEVELING PLATES

Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free wraps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.

LOOSE STEEL LINTELS

Fabricate loose structural steel lintels from steel angles and shapes of indicated for openings and recesses in masonry walls and partitions at locations indicated.

Welding adjoining members together to form a single unit where indicated.

Size loose lintels for equal bearing of one inch per foot of clear span but not less than 8 inches bearing at each side of openings, unless otherwise indicated.

Galvanize loose steel lintels locate in exterior walls.

MISCELLANEOUS FRAMING AND SUPPORTS

General: Provide steel framing and supports for applications indicated or which are not a part of structural steel framework, as required to complete work.

Fabricate units to sizes, shape, and profiles indicated and required to receive adjacent other construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welding construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.

MISCELLANEOUS STEEL TRIM

Provide shapes and sizes indicated for profiles shown. Unless otherwise indicated, fabricate units from structural steel shapes, plates and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices whenever possible. Provide cutouts, fitting, and anchorages as required for coordination of assembly and installation with other work.

SHELF AND RELIEVING ANGLES

Fabricate shelf and relieving angles from steel angles of sizes indicated and for attachment to concrete framing. Provide slotted holes to receive 3/4" bolts, spaces not more than 6 inches from ends and not more than 24" o.c., unless otherwise indicated.

For cavity walls, provide vertical channel brackets to support shelf/relieving angles from back-up masonry and concrete. Align expansion joints in angles with indicated expansion joints in cavity wall exterior wythe.

Galvanize shelf angles to be installed on exterior concrete framing.

Furnish wedge-type concrete inserts, complete with fasteners, for attachment of shelf angles to cast-in place concrete.

STEEL PIPE RAILINGS AND HANDRAILS

General: Fabricate pipe railings and handrails to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of pipe, post spacings, and anchorage, but not less than that required to support structural loads.

Interconnect railing and handrail members by butt-welding or welding with internal connectors, at fabricator's option, unless otherwise indicated.

Form changes in direction of railing members as follows:

By insertion of prefabricated elbow fittings and radius bends of radius indicated, at fabricator's option.

By any method indicated above, applicable to change of direction involved.

Form simple and compound curves by bending pipe in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross-section of pipe throughout entire bend without buckling, twisting, cracking, or otherwise deform exposed surface of pipe.

Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated.

Close exposed ends of pipe by welding 3/16" thick steel plate in place or by use of prefabricated fittings, except where clearance of end of pipe and adjoining wall surface is 1/4 inch or less.

Toe Boards: Where indicated, provide toe boards at railings around openings and at the edge of open-sided floor and platforms. Fabricate to dimensions and details indicated, or if not indicated, use 4" high x 1/8" steel plate welded to, and centered between, each railing post.

Brackets, Flanges, Fitting, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fitting, and anchors for interconnections of pipe and attachment of railings and handrails to other work. Furnish inserts and other anchorage devices for connecting railings and handrails to concrete or masonry work.

For railing posts set in concrete, fabricate sleeves from steel pipe not less than 6 inches long and with an inside diameter not less than 1/2 inch greater than the outside diameter of post, with steel plate closure welded to bottom of sleeve.

Provide friction fit, removable cover designed to keep sleeves clean and hold top edge of sleeve 1/2" below finished surface of concrete.

For removable railing posts, slip-fit sockets from steel pipe whose inside diameter is sized for a close fit with posts and to limit deflection of post without lateral load, measured at top, to not more than 1/12 of post height. Provide socket covers designed and fabricated to resist accidental dislodgment.

Fillers: provide steel sheet or plate fillers of thickness and size indicated or required to support structural loads of handrails where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses. Size fillers to produce adequate bearing to prevent bracket rotation and overstressing of substrate.

For exterior steel railings and handrails formed from steel pipe with galvanized finish, galvanize fittings, brackets, fasteners, sleeves, and other ferrous components.

For interior steel railings and handrails formed from steel pipe with galvanized finish, galvanize fittings, brackets, fasteners, sleeves, and other ferrous components.

For interior steel railings formed from steel pipe with black finish provide nongalvanized ferrous metal fitting, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.

FINISH, GENERAL

Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

Finish metal fabrications after assembly.

STEEL AND IRON FINISHES

Galvanizing: For those items indicated for galvanizing, apply zinc-coating by hot-dip process compliance with the following requirements:

ASTM A 153 for galvanizing iron and steel hardware.

Preparation for Shop Priming: Prepare uncoated ferrous metal surface to comply with minimum requirements indicated below for conditions of installed metal fabrications:

Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finish or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA1 "Paint Application Specification No. 1 for shop painting.

Stripe paint all edges, corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

Center nosing on tread widths with noses flush with riser faces and tread surfaces.

Set sleeves in concrete with tops flush with finish surface elevations; protect sleeves from water and concrete entry.

INSTALLATION, GENERAL

Fastening to In-Place Construction; Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.

Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation of miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces, level, plumb, true, and free of rack; and measured from established lines and levels.

Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.

Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joint, but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.

Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding appearance and quality of welds made, methods used in correcting welding work.

Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint or zinc chromate primer.

SETTING LOOSE PLATES

Clean concrete and masonry bearing surfaces of any bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.

Set loose level and bearing plates on wedges, or other adjustable devices. After bearing members have been positioned and plumbed tighten the anchor bolts. Do not remove wedges or shims, but if producing, cut off flush with the edge of the bearing plate before packing with Gout.

INSTALLATION OF SUPPORT FOR TOILET PARTITIONS

Anchor support securely to, and rigid brace from, overhead building structure & walls.

INSTALLATION OF STEEL PIPE RAILING AND HANDRAILS

Adjust railings prior to anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated, or if not indicated, as required by design loading. Plum posts in each direction. Secure posts and railing ends to building construction as follows:

Anchor posts in concrete by means of pipe sleeves preset and anchored into concrete. After posts have been inserted into sleeves, fill annular space between post and sleeve solid with the following anchoring material, mixed and placed to comply with anchoring material manufacturer's directions.

Anchoring posts in concrete by core drilling holes not less than 5" deep and 3/4" greater than outside diameter of post. Clean holes of all loose material, insert posts and fill annular space between post and concrete with the following anchoring material, mixed and placed to comply with anchoring material manufacturer's directions.

Anchor posts to steel with steel oval flanges, angle type or floor type as required by conditions, weld to posts and bolted to steel supporting members.

Anchor rail ends into concrete and masonry with steel round flanges welded to rail ends and anchored into wall construction with lead expansion shields and bolts.

Anchor rail ends to steel with steel oval or round flanges welded to rail ends and bolted to structural steel members, unless otherwise indicated.

Install removable railing section where indicated in slip-fit metal socket cast into concrete. Accurately locate sockets to match post spacing.

Secure handrails to wall with wall brackets and end fittings. Provide bracket with not less than 1 1/2" clearance from inside face of handrail and finish wall surface. Locate brackets as indicated, or if not indicated, at spacing required to support structural loads. Secure wall brackets and wall return fittings to building construction as follows:

Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.

For concrete and solid masonry anchorage, use drilled-in expansion shield and either concealed hanger bolt or exposed lag bolt, as applicable.

For hollow masonry anchorage, use toggle bolts having square heads.

For steel framed gypsum board assemblies, fasten brackets directly to steel framing or concealed anchors using self-tapping screws of size and type required to support structural loads.

Expansion Joints: Provide expansion joints at locations indicated, or if not indicated, at intervals not to exceed 40 feet. Provide slip joint with internal sleeve extending 2 inches beyond joint on either side; fasten internal sleeve securely to one side; locate joint within 6 inches of post.

ADJUST AND CLEANING

Touch-up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same materials as used for shop painting to comply with SSPC-PA 1 requirements for touch-up of field painted surfaces.

Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

Touch-up Painting: Cleaning and touch-up painting of field welds, bolted connections, and abraded areas of the shop paint on miscellaneous metal is specified in Division 9 Section "Painting" of these specifications.

For galvanized surfaces clean welds, bolted connections and abraded areas and apply galvanizing repair to comply with ASTM A 780.

END OF SECTION 05500

PART 1 - GENERAL

PART 1 - GENERAL

SCOPE: Furnish and install the rough carpentry system, complete.

RELATED DOCUMENTS: The conditions of the contract, including General Conditions and General Requirements, apply to this section.

QUALITY ASSURANCE:

- A. Lumber grading rules and wood specified to be in conformance with PS 20.
- B. Grading rules of the following associations apply to materials furnished under this section:
 - 1. West Coast Lumber Inspection Bureau (WCLIB).
 - 2. Western Wood Products Association (WWPA).
- C. Plywood Grading Rules:
 - 1. Softwood Plywood-Construction and Industrial: PS-1.
- D. Grade Marks:
 - 1. Identify lumber and plywood by official grade mark.
 - 2. Lumber:
 - a. Grade stamp to contain symbol of grading agency certified by Board of Review, American Lumber Standards Committee, mill number or name, grade of lumber, species or species grouping or combination designation, rules under which graded were applicable, and condition of seasoning at time of manufacture.
 - b. S-GRN: Unseasoned
 - c. S-DRY: Maximum 19% moisture content
 - d. MS-15 or KD: Maximum of 15% moisture content.
 - 3. Softwood Plywood:
 - a. Conforming to PS-1.
- E. Testing:
 - 1. ASTM E-84, maximum 25 flame spread rating.
- F. Requirements of Regulatory Agencies:
 - 1. Fire hazard classification: Underwriters Laboratories, Inc., for treated lumber and plywood.
 - 2. Preservation treated lumber and plywood: American Wood Preservers Bureau, Quality Mark.
 - 3. Pressure treated material: American Wood Preservers Bureau Standards.
 - 4. Working stresses: Softwood Lumber, NATIONAL DESIGN SPECIFICATIONS, National Forest Products Association.
- G. References Standards:
 - 1. American Wood Preservers Bureau (AWPB).
 - a. AWPB LP-2, Standard for Softwood Lumber, Timber and Plywood, Pressure Treated with Water-borne Preservatives for above ground use.

2. National Forest Products Association (NFPA):
 - a. National Design Specifications for Wood Construction. 1982.
 1. Design Values for Wood Construction, July 1982.
 2. Working Stresses for Joists and Rafters.
 3. Wood Structural Design Data.
3. Product Standards (PS):
 - a. PS 1-83, Construction and Industrial Plywood.
 - b. PS 20-70, American Softwood Lumber Standard.
4. Western Wood Products Association (WWPA).
 - a. Standard Grading Rules for Western Lumber.
5. A.I.T.C.

SUBMITTALS

- A. Certification:
 1. Preservative treated wood: Submit certification for water-borne preservative that moisture content was reduced to 19 & maximum, after treatment.

PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Immediately upon delivery to job site, place materials in area protected from weather.
- B. Store materials a minimum of 6 inches, above ground on framework or blocking and cover with protective waterproof covering providing for adequate air circulation or ventilation.
- C. Do not store seasoned materials in wet or damp portions of building.
- D. Protect sheet materials from corner braking and damaging surfaces, while unloading.

COMPLIANCE WITH STANDARD AND INDUSTRY SPECIFICATIONS:

- A. Any material or operation specified by reference to the published specifications of a manufacturer, the American Society for Testing and Materials (ASTM) or other published standard, shall comply with the requirements of the standard listed. In case of a conflict between the referenced specification and the project specification, the one having the more stringent requirements shall govern.
- B. When compliance with such specifications is specified for materials or a manufactured or fabricated product, the Contractor, if requested, shall furnish an affidavit from the manufacturer or fabricator, certifying that the materials or product delivered to the job meets the requirements specified. However, such certification shall not relieve the Contractor from the responsibility of complying with any added requirements specified herein.

PART II - PRODUCTS**MATERIALS**

- A. Lumber:
 - 1. Dimensions:
 - a. Specified lumber dimensions are nominal
 - b. Actual dimensions to conform to SP-20
 - 2. Surfacing: Surface four sides (S4S), unless specified otherwise
 - 3. End jointed lumber:
 - a. Structural purposes interchangeable with solid sawn lumber.
- B. Plywood:
 - 1. Exterior or graded plywood where edge or surface is permanently exposed to weather.
 - 2. Roof Sheathing:
 - a. Grade: C-C Ext., Structural I C-C Ext. Structural II C-C Ext.
 - b. Identification Index: 32/16, 42/20: 5/8" thickness
- C. Building paper:
 - 1. Asphalt-saturated felt: ASTM D 226, #15 nonperforated.
- D. Preservative Treated Wood Products:
 - 1. Water-borne salt preservatives for painted, stained, or exposed natural wood products:
 - a. AWPB LP-2, above ground application
 - b. Lumber redried to maximum moisture content of 19%, stamped "DRY"
 - 2. Untreated lumber: All heartwood grades of Western Red Cedar or Redwood.
- E. Rough Hardware:
 - 1. Nails and staples: FS FF-N-106, steel wire, common nails.
 - 2. Ply clips: Extruded 6063-T6 aluminum alloy: Simpson "PSC", sizes 5/8.

PART III - EXECUTION**INSPECTION**

- A. Verify that surfaces to receive rough carpentry are prepared to required grades and dimensions.
- B. Plumb & true-up the framing after initial installation, but before installation of wall board paneling or sheathing. The Contractor is responsible for a framing system that is plumb & true to line everywhere.
- C. Provide bracing, shoring & miscellaneous work as required.

INSTALLATION

- A. Roof Sheathing:
1. Plywood sheathing:
 - a. Install plywood with face grain perpendicular to supports and with panel continuous over two or more spans. Panel end joints shall occur over framing. Stagger end joints of adjacent panels by one half length of the panels.
 - b. Allow minimum space 1/16", between end joints and 1/8", at edge joints for expansion and contraction of panels.
 - c. Support edge joints by use of solid lumber locking.
 - d. Nail 6", o.c., along panel edges and 12", o.c., at intermediate supports.
 - e. Nail 6", o.c., at all supports, for support spaced 4 ft., o.c.
 - f. Use 6d common, smooth, ring-shank, or spiral-thread shank nails for panels 1/2", thick or less and 8d common for greater thickness, except when panels are 1 1/8" or 1 1/4", use 8d ring-shank or 10d common.
- B. Preservative-Treated Wood Products:
1. Provide preservative-treated wood for all framing, blocking, furring, nailing strips built into exterior masonry or concrete walls, wood in contact with concrete and in conjunction with gravel stops, gutters, and built-up roofing.
 2. Re-dry and clean lumber, after treatment, to minimum moisture content of 19% stamped "DRY".
 3. Apply two brush coats of same preservative used in original treatment to all sawed or cut surfaces of treated lumber.

PROTECTION

- A. Protect wood decking with protective waterproof covering until roofing has been installed.
- B. Protect other rough carpentry as required.

END SECTION 06100

SCOPE: Furnish all labor, materials, & service, to complete millwork for trim, wall panels, frames, shelving, & other work as detailed on the drawings or specified herein. This work also includes all cabinet hardware installed.

RELATED DOCUMENTS:

The drawings, general provisions of the Contract, Division 1 Requirements, apply to the work specified in this section.

WORK IN OTHER SECTIONS:

- A. Items specified in ROUGH CARPENTRY, LUMBER
- B. Finish hardware not specified herein.
- C. Doors
- D. Painting and finishing

WORK INCLUDED IN THIS SECTION:

- A. Custom designed carpentry, paneling, cabinets and counters
- B. Installation of doors and frames
- C. Miscellaneous carpentry and trim
- D. Telephone and electrical backboards
- E. Shelving

STANDARD SPECIFICATIONS: Conform to Quality Standards of the Architectural Woodwork Industry, latest edition, published by the Architectural Woodwork Institute hereinafter called AWI, as modified herein and on the drawings.

SHOP DRAWINGS: Show profiles of mouldings, details of joints, sequence of wall panels, and other pertinent items, show connections of casework to adjoining construction, whether or not all items are furnished by this subcontractor.

SAMPLES: Provide samples of any or all materials herein specified. No work is to be performed until such samples are approved by the Architect.

FIELD DIMENSIONS: The Contractor shall field measure all work and show all field measurements on shop drawings.

DELIVERY AND PROTECTION: Woodwork shall be delivered dry and protected at all times from damage and dampness. Doors and interior finish shall not be stored or installed in any part of the building is thoroughly dry. The contractor shall maintain a temperature of at least 70 degrees F. in every part of the building where interior millwork finish is stored or installed, during such storage or installation, and until the completion of the contract. After millwork or trim is put in place, it shall be properly protected from damage by other trades and turned over to the Owner in perfect condition.

INTERIOR MILLWORK:

- A. The following interior woodwork shall be milled for paint finish:
 - 1. Douglas Fir Plywood, DFPA grade-marked, conforming to PS 1-66, Group I, A-D as determined by the number of exposed faces.

2. Softwood: AWI "Custom" grade, vertical grain. Use Douglas Fir, White Fir, Ponderosa Pine, or Sugar Pine for finish woodwork to receive opaque paint finish.
 3. Hardwood trim: AWI "Premium" grade Birch unless otherwise indicated or specified.
 4. Hardwood Plywood: AWI "Premium" grade Birch Veneer; lumber core, 1/4" thick and 3/4" thick, where indicated or detailed, 3/4" plywood to be finished 2 sides.
- B. Rough Hardware: Nails, bolts, screws, washers, shields, insets and other items, or sizes as required; American Commercial Standard types, galvanized for use at interior areas exposed to moisture and at all exterior locations.
- C. Wood Glue: Non-staining, waterproof, "Weldwood", "Casco", "Borden"
- D. Interior millwork listed for paint finish or plastic laminate surfaces:
1. Douglas Fir Plywood: DFPA grade-marked, conforming to PS 1-66, Group I, A-A or A-B as determined by number of exposed faces, "Interior" type.
 2. Softwood lumber AWI "Custom" grade, vertical grain. Use Douglas Fir, White Fir, Ponderosa Pine, or Sugar Pine for finish woodwork to receive opaque paint finish.
 3. Grades: Conform to AWI Quality Standards, Economy grade for paint finish work and premium grade for transparent finish, as specified herein and on the drawings.

STANDING AND RUNNING TRIM:

- A. Work Included: This includes cut-to-length and lineal type wood trim of all kinds, including door and glass framing members.
- B. Grade and Species: All trim for door frames, window frames, mail-slots, base, handrails and any miscellaneous trim to be Birch, Premium grade.

CLOSET AND STORAGE SHELVING:

- A. Grades and Species: All janitor shelving shall be ECONOMY grade as defined in AWI Quality Standards, Section 600. All other shelving shall be CUSTOM grade. Shelving shall be made of paintable fir plywood, or glued for width softwood lumber at the Manufacturers option. Sizes etc., as detailed on the drawings.
- B. Shelves and Finish: All shelving shall be paint grade finish. All adjustable shelving shall be on Knappe and Vogt, # 255 surface mounted standard with # 256 supports. Adjustable shelving shall have all four edges (exposed edges only on fixed shelves) hardwood edge banded for custom grade and filled and sanded for economy grade.

GENERAL: The work covered by this section consists of performing all operations in connection with the installation of complete insulation system for exterior and interior walls, ceiling spaces, etc. complete as specified and shown on the Drawings. The insulation of mechanical work is not covered under this section.

RELATED DOCUMENTS: Drawings and general provisions of contract, including General Conditions and Division-1 specification sections, apply to this work.

SCOPE AND MATERIALS:

INTERIOR WALLS: Provide 2 1/2" thick Owens/Corning fiberglass R 11 or equal. Noise barrier batt insulation (faced) between studs. Install insulation to height 24" above ceiling system or as indicated on drawings. (Flame spread 10, smoke developed 10).

UNDERNEATH ROOF DECKS: Provide 6 1/4" thick (Owens/Corning or equal) fiberglass insulation slung under the roof deck with poultry wire; paintable surface, R-30; Flame spread 25; (F.R.K. faced).

FASTENING: Securely fasten flanges of the batts to framing members using only the fastening system recommended by the manufacturer of the insulation material and observing all recommended spacing of fasteners. Set vapor barrier faced units with barrier forwards inside of construction. All insulation shall be full height of walls and horizontally cover fully the underside of the roof areas.

PROTECTION: Protect insulation from becoming wet or soiled. Comply with manufacturer's recommendations for storage, delivery and handling. Cut and fill as required to produce new and complete smooth wall surface, and underside roof surface.

- NOTES: 1. No asbestos nor toxic materials are allowed.
2. See Mechanical Sections for mechanical insulation

END OF SECTION 07200

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Composite wall cladding of rigid insulation and applied coating .

1.02 RELATED SECTIONS

- A. Section 07620 - Sheet Metal Flashing and Trim: Perimeter flashings.
- B. Section 07900 - Joint Sealers: Perimeter sealant seal.

1.03 REFERENCES

- A. ASTM C578 - Preformed Cellular Polystyrene Thermal Insulation.
- B. ASTM D2842 - Water Absorption of Rigid Cellular Plastics.
- C. EIMA (Exterior Insulation Manufacturers Association) - Guideline Specification For Exterior Insulation and Finish Systems, Class PB and Class PM.
- D. NFPA 255 - Test of Surface Burning Characteristics of Building Materials.
- E. UL 723 - Tests for Surface Burning Characteristics of Building Materials.

1.04 SYSTEM DESCRIPTION

- A. Exterior Insulation and Finish System: EIMA Class PB Type A system. High Impact resistance system at all exterior walls below 6 feet and at column covers.

1.05 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Provide data on system materials, product characteristics, performance criteria, limitations.
- C. Samples: Submit two, 12 x 12 inch size samples illustrating coating color and texture range for selection.
- D. Manufacturer's Installation Instructions: Indicate preparation required, installation techniques, jointing requirements.

1.06 QUALIFICATIONS

- A. Applicator: Company specializing in performing the work of this section with minimum five years documented experience and as approved by manufacturer.

1.07 REGULATORY REQUIREMENTS

- A. Conform to applicable code for system fire resistance ratings for finish system.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products under provisions of Section 01600.
- B. Protect adhesives and finish materials from freezing by storing in an environment recommended by manufacturer.

1.09 ENVIRONMENTAL REQUIREMENTS

- A. Do not install finish when ambient temperature is below 40 degrees F.
- B. Maintain this temperature during and 24 hours after installation of finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Thoro System Products
- B. Dryvit Systems, Inc.
- C. ISPO, Inc.
- D. Senergy Inc.
- E. Substitutions: Under provisions of Section 01600.

2.02 MATERIALS

- A. Polystyrene Board Insulation Type B: To be used at decorative entrance as indicated on the drawings. ASTM C578 Type VI; cellular type, conforming to the following:
 - 1. Thermal Resistance: R of 5.0
 - 2. Thickness: Thickness indicated.
 - 3. Thickness Tolerance: 1/32 inch maximum.
 - 4. Board Size: 24 x 48 inch
 - 5. Board Size Tolerance: 1/16 inch from square and dimension.
 - 6. Compressive Strength: Minimum 25 psi
 - 7. Water Absorption: In accordance with ASTM D2842 0.3 percent by volume maximum.
 - 8. Edges: Square edges.
 - 9. High impact resistance.

- B. Primer/Adhesive: Recommended by manufacturer.
- C. Coating Reinforcement: Glass fiber mesh type, woven, treated for improved bond with coating.
- D. Base coat: Recommended by manufacturer for high impact applications.
- E. Coating: Synthetic composition, containing color as selected.

2.03 ACCESSORIES

- A. Sealant Materials: Recommended by coating manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify site conditions under provisions of Section 01039.
- B. Verify that substrate and adjacent materials are dry.
- C. Verify substrate surface is flat, free of fins or irregularities.

3.03 INSTALLATION - INSULATION

- A. Install insulation in accordance with manufacturer's instructions - at areas noted on the drawings only.
- B. Install boards on wall surface horizontally.
- C. Place boards in a method to maximize tight joints. Stagger vertical joints. Butt edges and ends tight to adjacent board and to protrusions.
- D. Secure boards to substrate by 1/8 inch thick beads of adhesive to achieve a continuous flush insulation surface.

3.04 INSTALLATION - COATING

- A. Install primer/adhesive, coating and glass fiber mesh reinforcement in accordance with manufacturer's instructions. Install directly to prepared existing surface or new CMU, plywood, or gypsum board surface.
- B. Apply primer/adhesive to a minimum thickness per manufacturer recommendation and fully embed reinforcement, wrinkle free.
- C. Lap reinforcement edges and ends 2 inches.
- D. Install trim and control joints.
- E. Install trim in full lengths only to minimize moisture intrusion; cut horizontal trim tight to vertical trim.
- F. Apply finish to a total minimum thickness recommended by manufacturer. Finish to a uniform texture and color.
- G. Rout surface finish to pattern as indicated.
- H. Apply sealant at finish perimeter and control joints in accordance with Section 07900.

3.05 PROTECTION OF FINISHED WORK

- A. Protect finished Work under provisions of Section 01500.
- B. Do not permit finish surface to become soiled or damaged.

3.06 SCHEDULES

- A. Provide EIFS at all exterior walls, parapets, and column covers as indicated on the drawings.
- B. Provide Hi-Impact system at all column covers and at all exterior walls up to 6'-0" and as noted on plans.

END OF SECTION 07241

PART1 – GENERAL

SUMMARY

Provide the following:

Weather Resistant Membrane Barrier on exterior side of exterior wall sheathing.

REFERENCES

Standard test for Water transmission of materials – ASTM E-96-90.

Standard specification for an Air Retarder (AR) material or System for Low- Rise Framed Building Walls- ASTM E-1677-95.

Hydrostatic Head Test – AATCC – 127.

SUBMITTALS

Submit copies of test results showing performance characteristics equally or exceeding those specified.

QUALITY ASSURANCE

Installer shall be trained by manufacturer and have recent experience on similar Projects.

Provide membrane barrier on the Mock-up panel, using the materials specified, to demonstrate the product and characteristics.

WARRANTY

Provide Manufacture Warranty.

PART 2 – PRODUCTS

MANUFACTURERS

Available Manufacturer's: The following manufacturer's products may be incorporated into the Work, subject to compliance with requirements, but are not limited to the following: Refer to Section "Product Substitution"

Tyvek Commercial Wrap by DuPont Company – stone Veneer Walls.

MATERIALS

Water Resistant Barrier:

Spun-bounded olefin, Non-woven, Non-perforated.

Performance Characteristics:

ASTM E-1667 Type I Air Barrier: Air leakage at 25 mph (75pa) wind pressure of less than .06 cfm/sq.ft.

Water Vapor Transmission of greater than 20 perms in accordance with ASTM E-96-90, Method B.

Water penetration resistance of 200 cm minimum in accordance with AATCC-127.

Sealing Tape: Fasteners:

DuPont Contractor Tape or equal.

Fasteners:

Screws with washers, install at recommended intervals.

PART 3 – EXECUTION

INSTALLATION

Install in accordance with Manufacturer's instructions over exterior sheathing. Seal joints and penetrations through weather resistant barrier with specified tape and fasteners prior to installation of finish system.

The Membrane Barrier shall be air-tight and free from holes, tears, and punctures.

All window and door penetrations are to be taped per manufacturer's instructions.

END OF SECTION 07272

SECTION 07420 – MANUFACTURED METAL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY.

- A. Work described in this section includes concealed clip, lap-seam pre-formed metal wall panel system complete with clips, perimeter and penetration flashing and closures.
- B. Related work specified elsewhere:
 - 1. Structural steel.
 - 2. Steel girts and furring.
 - 3. Wood sheathing.
 - 4. Rough carpentry.
 - 5. Flashing and sheet metal. (Not wall panel related).
 - 6. Air barrier and vapor retarder.
 - 7. Thermal insulation.
 - 8. Sealants.

1.3 DEFINITIONS

- A. American Architectural Manufacturer Association (AAMA):
 - 1. AAMA 621-96: Voluntary/Standard Specifications for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) & Zinc-Aluminum Coated Steel Substrates
- B. American Iron and Steel Institute (AISI):
 - 1. S100-07: 2007 Edition of the North American Specification for the Design of Cold-Formed Steel Structural Members.
- C. American Society of Civil Engineers (ASCE):
 - 1. ASCE 7-05: Minimum Design Loads for Buildings and Other Structures.
- D. American Society for Testing and Materials (ASTM):
 - 1. A653-03: Specification for Steel Sheet, Zinc-coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

2. A755-03: Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.
 3. A792-03: Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 4. B209-02a: Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 5. D1056-00: Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.
 6. D3575-00e1: Standard Test Methods for Flexible Cellular Materials made from Olefin Polymers.
 7. E283-04: Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 8. E330-02(2010): Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
 9. E331-00(2009): Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
 10. E1886-02: Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Storm Shutters Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.
 11. E1996-09 Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.
- E. Building Code (IBC):
1. TAS 114-95.1: Test Procedure for Roof Assemblies in High Velocity Hurricane Jurisdiction.
 2. TAS 201-95.1: Impact Test Procedures.
 3. TAS 203-95.1: Criteria for Testing Products Subject to Cyclic Wind Pressure Loading.
- F. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):
1. Architectural Sheet Metal Manual, 6th edition.
- G. National Association of Architectural Metal Manufacturers (NAAMM)
1. Metal Finishes Manual for Architectural and Metal Products

1.4 DESIGN AND PERFORMANCE CRITERIA.

- A. General Performance: Metal wall panel assemblies shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Thermal Expansion and Contraction.
 - 1. Completed metal wall panel and flashing system shall be capable of withstanding expansion and contraction of components caused by changes in temperature without buckling, or reducing performance ability.
 - 2. The design temperature differential shall be not less than 220 degrees Fahrenheit.
 - 3. Interface between panel and clip shall provide for unlimited thermal movement in each direction along the longitudinal direction.
- C. Uniform Wind Load Capacity.
 - 1. Installed wall system shall withstand negative wind pressures complying with the following criteria.
 - a. Design Code: ASCE 7, Method 2 for Components and Cladding.
 - b. Safety Factor: The tested failure load, as determined by physical testing according to the ASTM E330 method, shall be reduced by a factor 1.67 to determine the allowable wind load on the system.
 - 2. The ultimate capacity of the panel system shall be determined based on performance testing in accordance with ASTM E330. The allowable load carrying capacity shall be calculated by reducing the ultimate test load at failure by the safety factor listed herein.
- D. 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: 1.57 lbf/sq. ft.
- E. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:
 - 1. Test-Pressure with no leakage: 5 Gal/Hr per S.F. and Static Air Pressure of 12.0 psf for 15 min.
- F. Missile Impact Test and Cyclic Wind Pressure Test. Demonstrate performance in accordance with one of the following test methods:
 - 1. ASTM E1886: The anchor clip spacing for this project shall be based on E330 requirements, but shall not exceed that of the E1886 test report.
 - 2. FBC Test Protocols TAS 201 and TAS 203: The anchor clip spacing for this project shall be based on E330 requirements, but shall not exceed that of the TAS 201 test reports.
 - 3. The tested system shall be of identical profile and material type as the specified panel for this project; thicker gauge and/or narrow width panels than those tested will be acceptable.

4. The tested system shall be of identical profile as the specified panel for this project. Testing conducted on panels of any material or width shall be considered acceptable for demonstration of the performance characteristics of the system.

1.5 SUBMITTALS.

- A. Shop drawings: Show wall panel system with flashings and accessories in elevation, sections, and details. Include metal thicknesses and finishes, panel lengths, joining details, anchorage details, flashings and special fabrication provisions for termination and penetrations. Indicate relationships with adjacent and interfacing work. Shop drawings to be prepared by metal wall panel manufacturer and sealed by a professional engineer registered in the state of the project location.
- B. Financial Certification: Provide the building owner with a signed and notarized (sealed) affidavit by an officer of the panel system manufacturer which confirms a current minimum corporate asset-to-liability ratio of not less than 3:1 for the panel manufacturer, or its parent corporation. Financial support information and affidavit must be dated within 30 days prior to the product submittal.
- C. Design Test Reports.
 1. Submit copies of design test reports for each of the performance testing standards listed in specification article 1.4.
 2. Test reports shall be performed by independent, accredited testing laboratories, and shall bear the seal of a registered professional engineer.
- D. Warranty: Provide unexecuted specimen warranty documents for each warranty as required in specification article 1.10.
- E. Samples.
 1. Submit sample of panel section, at least 6" x 6" showing seam profile, and also a sample of color selected.
 2. Submit sample of panel clip, foam closures, and field applied sealants.

1.6 QUALITY CRITERIA/INSTALLER QUALIFICATIONS.

- A. Engage an experienced metal wall panel contractor (erector) to install wall panel system who has a minimum of three (3) years experience specializing in the installation of metal wall systems.
- B. Contractor must be certified by manufacturer specified as a supplier of the metal wall system and obtain written certification from manufacturer that installer is approved for installation of the specified system.
- C. Successful contractor must obtain all components of wall system from a single manufacturer. Any secondary products that are required which cannot be supplied by the specified manufacturer must be recommended and approved in writing by primary manufacturer prior to bidding.
- D. Fabricator/Installer shall submit work experience and evidence of adequate financial responsibility. Architect reserves the right to inspect fabrication facilities in determining qualifications.

1.7 DELIVERY, STORAGE, AND HANDLING.

- A. Inspect materials upon delivery.
- B. Handle materials to prevent damage.
- C. Store materials off ground providing for drainage; under cover providing for air circulation; and protected from any debris.

1.8 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit metal wall panel work to be performed according to manufacturer's written instructions and warranty requirements.
- B. Field Measurements: Verify actual dimensions of construction contiguous with metal wall panels by field measurements before fabrication.

1.9 COORDINATION

- A. Coordinate sizes and locations of windows, doors, and wall penetrations with actual equipment provided.
- B. Coordinate metal wall panels with rain drainage work, flashing, trim, and construction of other adjoining work to provide a leak proof, secure, and noncorrosive installation.

1.10 WARRANTIES

- A. Endorse and forward to owner the following warranties:
 - 1. Manufacturer's standard 10 year wall system weathertightness warranty, jointly signed by the installer and manufacturer. The warranty shall not place any limitations on wind speed, up to a maximum design wind speed as given in Article 1.4 of this specification.
 - 2. Manufacturer's standard 20 year finish warranty covering checking, crazing, peeling, chalking, fading, and adhesion of the prepainted sheet metal materials.
 - 3. Installer's 3 year warranty covering wall panel system installation and watertightness.
- B. Warranties shall commence on date of substantial completion.

PART 2 - PRODUCTS

2.1 PANEL MATERIALS

- A. Painted, 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 A755/A755M.
 - 1. Recycled Content: Provide steel sheet with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is at least 70 percent.

2. 22 gauge, Zinc-Coated (Galvanized) Steel Sheet, as per ASTM A653: G90 coating designation; structural quality, grade 40 ksi .
 3. Texture: Smooth surface.
 4. 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. Manufacturers' approved applicator to prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - b. Coating system shall provide nominal 1.0 mil dry film thickness, consisting of primer and color coat.
 - c. Color shall be selected from IMETCO's Standard Colors.
 5. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil .
 - a. Color shall be selected from IMETCO's Standard Colors
 6. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil .
- B. Panel Sealants:
1. Seam Sealant: Field Applied Butyl-Based, Solvent-Release, One-Part Sealant.
 2. Sealant Tape: Non-curing, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1-inch wide and 1/16-inch thick.
 3. Exposed Sealant: ASTM C 920; elastomeric tripolymer, polyurethane, or other advanced polymer sealant; of type, grade, class, and use classifications required to seal joints in metal wall panels and remain weathertight; and as recommended in writing by metal wall panel manufacturer.
 4. Concealed Sealant: ASTM C 1311: Butyl-Based, Solvent-Release, One-Part Sealant.

2.2 FIELD-INSTALLED THERMAL INSULATION

- A. Refer to Division 07 Section "Thermal Insulation."

2.3 MISCELLANEOUS METAL FRAMING

- A. Miscellaneous Metal Framing, General: ASTM C 645, cold-formed metallic-coated steel sheet, ASTM A 653,
- B. Base or Sill Channels: 0.068-inch (14 gauge)

C. Hat-Shaped, Rigid Furring Channels:

1. Nominal Thickness: As required to meet performance requirements
2. Depth: As indicated on drawings.
3. Top flange: 1-1/8 inches Minimum

D. 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.

2.4 SUBSTRATE BOARD

A. Glass-Mat Gypsum Sheathing Board: ASTM C 1177/C 1177M.

1. Type and Thickness: Regular, 5/8 inch .
2. The top surface of the substrate board shall be pre-primed to provide for adhesion of the self-adhering underlayment material.
3. Product: Subject to compliance with requirements, provide Dens Glass Gold by Georgia-Pacific Corporation.

B. 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 structure.

2.5 UNDERLAYMENT MATERIALS

A. Mechanically Attached, Vapor Permeable Sheet: 20-mils- thick, minimum, consisting of multiple layers of UV stabilized spun-bonded polypropylene.

1. Water Vapor Permeance, ASTM E 96 Method B: 200 perms , minimum.
2. Water Resistance, AATCC 127, 22-inch hydrostatic head for 5 hours: No leakage.
3. Seams shall be lapped in accordance with manufacturer's recommendations.
4. Fasteners: Manufacturer's recommended corrosion-resistant, cap-headed steel or stainless steel nails, staples, or screws used in conjunction with manufacturer's spray adhesive, as appropriate for substrate.
5. Underlayment shall be approved for 270 days (minimum) of exposure to UV and weather penetrations.

2.6 MISCELLANEOUS MATERIALS

A. Concealed fasteners: Corrosion resistant steel screws, #10 minimum diameter x length appropriate for substrate, hex washer head or pancake head. Use self-drilling, self-tapping for metal substrate or A-point for plywood substrate.

2.7 METAL WALL PANELS

A. General: Provide factory-formed metal wall panels designed to be field assembled by interlocking seams incorporating concealed anchor clips, allowing thermal movement.

- B. Concealed clip, lap-seam wall panels with ribs at 4 inches on center.
1. Panel shall be IMETCO LATITUDE Wall system as manufactured by Innovative Metals Company, Inc. (IMETCO), Norcross, Georgia, telephone 1-800-646-3826.
 2. Alternate manufacturers are subject to full compliance with specification requirements, and shall be submitted for approval as follows.
 3. Material: Zinc-coated (galvanized) steel sheet, 0.023-inch nominal thickness. See 2.1 for finishes and color selection.
 4. Characteristics.
 - a. Fabrication: Panels shall be factory formed from specified metal.
 - b. Profiles shall be as indicated project drawings.
 - 1) The standard profile shall provide ribs at 4 inches on center.
 - 2) The angle of the web elements of the ribs shall be symmetrical.
 - c. Panel orientation: Vertical.
 - d. Configuration: Panel shall be 16" wide (nominal) with interlocking seams incorporating concealed anchor clips allowing thermal movement.
 - e. Panel Depth (Concealed Leg Height): 7/8 inches , nominal.
 - f. Anchor clips: Clips shall be 18 gauge galvanized steel designed to allow thermal movement of the panel in each direction along the longitudinal dimension.
 - g. Panel length: Up to 21 feet maximum length.

2.8 ACCESSORIES

- A. Wall Panel Accessories: Provide components approved by panel manufacturer and as required for a complete metal wall panel assembly including trim, corner units, closures, clips, flashings, sealants, gaskets, fillers, and similar items. Match material and finish of metal wall panels unless otherwise indicated.
1. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips meeting ASTM D1056 and/or D3575; cut or pre-molded to match metal wall panel profile. Provide closure strips as necessary to ensure weathertight construction.
 2. Corner Units: For horizontally oriented panel installations only, provide factory fabricated mitered corner units of the same profile(s) as specified. Corner units shall be furnished for outside and inside corner conditions.
- B. Flashing and Trim: Formed from same material and gauge as wall panels, prepainted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, head, sill, corners, jambs, framed openings, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal wall panels.

2.9 FABRICATION

- A. Fabricate and finish metal wall 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. Form flashing components from full single width sheet in minimum 10'-0" sections. Provide mitered trim corners, joined using closed end pop rivets and butyl-based, solvent released one-part sealant.
- 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.
 - 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. Sealed Joints: Form nonexpanding but movable joints in metal to accommodate butyl-based sealant to comply with SMACNA standards.
 - 3. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
 - 4. Fabricate cleats and attachment devices of size and metal thickness recommended by SMACNA's "Architectural Sheet Metal Manual" or by metal wall panel manufacturer for application, but not less than thickness of metal being secured.

2.10 FINISHES

- 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 adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - PREPERATION & EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal wall panel supports, and other conditions affecting performance of the Work.

- B. Examine primary and secondary wall framing to verify that girts, studs, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal wall panel manufacturer.
- C. Examine solid wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.
- D. Examine roughing-in for components and systems penetrating metal wall panels to verify actual locations of penetrations relative to seam locations of metal wall panels before metal wall panel installation.
- E. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances harmful to insulation, including removing projections capable of interfering with insulation attachment.
- B. Substrate Board: Install substrate boards over wall structure on entire wall surface. Attach with substrate-board fasteners.
 - 1. Install substrate board with long joints in continuous straight lines, horizontally oriented with end joints staggered between courses. Tightly butt substrate boards together.
 - 2. Comply with UL requirements for fire-rated construction.
- C. Miscellaneous Framing: Install sub-framing, furring, and other miscellaneous wall panel support members and anchorage according to metal wall panel manufacturer's written instructions.
- D. Establish straight, side and crosswise benchmarks
- E. Use proper size and length fastener for strength requirements. Approximately 5/16 inch is allowable for maximum fastener head size beneath the panel.
- F. All walls shall be checked for square and straightness. Inside and outside corners may not be plumb; set a true line for the corner units and flashing with string line.
- G. Measure the wall lengthwise to confirm panel lengths and verify clearances for thermal movement.

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 (reference 2.2.C-G): Extend insulation in thickness indicated to cover entire wall. Comply with installation requirements in Division 07 Section "Thermal Insulation."

1. Erect insulation and hold in place with hat channels or Z-shaped furring. Securely attach narrow flanges of furring members to wall framing with screws spaced 24 inches o.c.

3.4 UNDERLAYMENT INSTALLATION

A. Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply over entire wall surface, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 90 days.

3.5 METAL WALL PANEL INSTALLATION

- A. All details will be shown on in accordance with approved shop drawings and manufacturer's product data, within specified erection tolerances.
- B. Directly over the completed wall substrate, install one piece clips. All anchor clips will be fastened into the structural wall substrate based on the following spacing pattern:
- C. Installation of Wall Panels: Wall panels can be installed by starting from one end and working towards the opposite end (vertical orientation), or from the bottom of wall working towards the top of the wall (horizontal orientation).
- D. Isolate dissimilar metals and masonry or concrete from metals with bituminous coating. Use gasketed fasteners where required to prevent corrosive action between fastener, substrate, and panels.
- E. Limit exposed fasteners to extent indicated on contract drawings.
- F. Seal laps and joints in accordance with wall panel system manufacturer's product data.
- G. Coordinate flashing and sheet metal work to provide weathertight conditions at wall terminations. Fabricate and install in accordance with standards of SMACNA Manual.
- H. Provide for temperature expansion/contraction movement of panels at wall penetrations and wall mounted equipment in accordance with system manufacturer's product data and design calculations.
- I. Installed system shall be true to line and plane and free of dents, and physical defects. In light gauge panels with wide flat surfaces, some oil canning may be present. Oil canning does not affect the finish or structural integrity of the panel and is therefore not cause for rejection.
- J. At joints in linear sheet metal items, set sheet metal items in two 1/4-inch- beads of butyl sealant. Extend sealant over all metal surfaces. Mate components for positive seal. Allow no sealant to migrate onto exposed surfaces.
- K. Remove damaged work and replace with new, undamaged components.

- L. Touch up exposed fasteners using paint furnished by the panel manufacturer and matching exposed panel surface finish.
- M. Clean exposed surfaces of wall panels and accessories after completion of installation. Leave in clean condition at date of substantial completion. Touch up minor abrasions and scratches in finish.

3.6 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align metal wall panel units within installed tolerance of 1/4 inch in 20 feet at location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.7 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect metal wall panel installation, including accessories. Report results in writing.
- B. Remove and replace applications of metal wall panels where inspections indicate that they do not comply with specified requirements.
- C. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.8 CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as metal wall panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal wall panel installation, clean finished surfaces as recommended by metal wall panel manufacturer. Maintain in a clean condition during construction.
- B. Replace metal wall panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07420

PART 1 – GENERAL**1.01 SCOPE:**

- A. Related Documents: Drawings and general provisions of contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to the work in this section.
- B. Provide the flashing and sheetmetal system, complete.

1.02 SUMMARY:

- A. This Section includes the following:
 - 1. Metal counter flashing and base flashing (if any).
 - 2. Metal wall flashing and expansion joints.
 - 3. Built-in-metal valleys, gutters, and scuppers.
 - 4. Miscellaneous sheet metal accessories.
- B. Roofing accessories installed integral with roofing membrane are specified in roofing system sections as roofing work.
- C. Roof accessory units of premanufactured, set-on-type are specified in Division 7 Section "Roof Accessories".

1.03 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contractor and Division 1 Specification Sections.
- B. Product data, Flashing, Sheet Metal, and Accessories: Manufacturer's technical product data, installation instructions and general recommendations for each specified sheet material and fabricated product.
- C. Samples of the following flashing, sheet metal, and accessory items.

1.04 PROJECT CONDITIONS

- A. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of work and protection of materials and finishes.

PART 2 – PRODUCTS**2.01 SHEET METAL FLASHING AND TRIM MATERIALS**

- A. Zinc-coated Steel: Commercial quality with 0.20 percent copper, ASTM A 526 except ASTM A 527 for lock-forming, G90 hot-dip galvanized, mill phosphatized where indicated for painting; 0.0359-inch thick (20 gage) except as otherwise indicated.

- B. Miscellaneous materials and Accessories:
- C. Solder: For use with steel copper, provide 50-50 tin/lead solder (ASTM B 32), with rosin-flux.
- D. Fasteners: Same metal as flashing/sheet metal or other non-corrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.
- E. Bituminous Coating: SSPC – Paint 12, solvent-type bituminous mastic, nominally free of sulfur, compounded for 15 mil dry film thickness per coat.
- F. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, non-drying, nonmigrating sealant.
- G. Elastomeric Sealant: Generic type recommended by manufacturer of metal and fabricator of components being sealed and complying with requirements for joint sealants as specified in division 7 Section "Joint Sealers".
- H. Epoxy Seam Sealer: 2-part noncorrosive metal seam cementing compound, recommended by metal manufacturer for exterior/interior nonmoving joints including riveted joints.
- I. Adhesives: Type recommended by flashing sheet manufacturer for waterproof/weather-resistant seaming and adhesive application of flashing sheet.
- J. Paper Slip Sheet: 5 lb. Rosin-sized building paper.
- K. Polyethylene Underlayment: Minimum 6-mil carbonated polyethylene film resistant to decay when tested in accordance with ASTM E 154.
- L. Reglets: Metal or plastic units of type and profile indicated, compatible with flashing indicated, noncorrosive.
- M. Metal Accessories: Provide sheet metal slips, straps, anchoring devices, and similar accessory units as required for installation of work, matching or compatible with material being installed, noncorrosive, size and gage required for performance.
- N. Elastic Flashing Filler: Closed cell polyethylene or other soft closed-cell material recommended by elastic flashing manufacturer as filler under flashing loops to ensure movement with minimum stress on flashing sheet.
- O. Roofing Cement: ASTM D 2822, asphaltic.

2.02 FABRICATED UNITS

- A. General Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with details shown and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance, with expansion provisions for running work, sufficient to permanently prevent leakage, damage, or deterioration of the work. Form work to fit substrates, comply with material manufacturer instructions and recommendations for forming material. Form exposed sheet metal work without excessive oil-canning, buckling, and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.
- B. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. For metal other than aluminum, tin edges to be seamed, form seams, and solder. Form aluminum seams with epoxy seam sealer; rivet joints for additional strength where required.
- C. Expansion Provisions: Where lapped or bayonet-type expansion provisions in work cannot be used or would not be sufficiently water/weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).
- D. Sealant Joints: Where movable, nonexpansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.
- E. Separations: Provide for separation of metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/ fabricator.

PART 3 – EXECUTION**3.01 INSTALLATION REQUIREMENTS**

- A. General: Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations and with SMACNA "Architectural Sheet Metal Manual". Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal 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 weatherproof. Cement where required for waterproof performance.
- B. Install-elastic flashing in accordance with manufacturer's recommendations. Where required, provide for movement at joints by forming loops or bellows in width of flashing. Locate cover or filler strips at joints to facilitate complete drainage of water from flashing. Seam adjacent flashing sheets with adhesive, seal and anchor edges in accordance with manufacturer's recommendations.

- C. Nail flanges of expansion joint units to curb nailers, at maximum spacing of 6 inches o.c. Fabricate seams at joints between units with minimum 3-inch overlap, to form a continuous, waterproof system.

3.02 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.
- B. Protection: Advise Contractor of required procedures for surveillance and protection of flashing and sheet metal work during construction to ensure that work will be without damage or deterioration other than natural weathering at time of Substantial Completion.

END OF SECTION 07600

PART 1 – GENERAL

1.01 SCOPE:

- A. Scope: Furnish all labor, materials, and services in connection with caulking and sealant systems, complete. Use competent workmen.
- B. Work included: Caulking and sealing shall include, but shall not be limited to joints between windows, doors, louvers, and exterior walls; thresholds, and all joints between dissimilar materials. All interior and exterior joints shall be caulked with appropriate sealant for area, and materials. Fill all voids of all joints.
- C. Refer to Division-15 and 16 section for joint sealers in mechanical and electrical work; not work of this section except as listed on schedule of this section.
- D. Related Documents: Drawings and general provisions of Contract, including General, Supplementary and Special Conditions, and Division 1 Specifications, apply to work of this Section.

1.02 SUBMITTALS:

- A. Submit manufacturer's specifications including data for joint preparation and joint sealer application for each joint sealer required.

PART 2 – PRODUCTS

2.01 GENERAL:

- A. Compatibility: Provide joint sealers, joint fillers, and other related materials that are compatible with each other and with joint substrates under conditions of service and application, as demonstrated by testing and experience.
- B. Color of joint sealer will be selected by Architect from mfr.'s standard to match adjacent materials.

2.02 ELASTOMERIC JOINT SEALANTS:

- A. Elastomeric Sealant Standard: Provide manufacturer's standard chemical curing, elastomeric sealant of polymer indicated, complying with ASTM C 920 requirements.
- B. Multi-Part Nonsag Urethane Sealant: Type M; Grade P; Class 25; Uses NT, M, G, A, and O.
- C. Two-Part Pourable Urethane Sealant: Type M; Grade p; Class 25; Uses T, M, A, and as applicable for substrates indicated O.

- D. Two-Part Nonsag Low-Modulus Urethane Sealant: Type M; Grade NS; Class 25; Uses NT, M, A as applicable to joint substrates indicated, O; with additional capability to withstand an increase and decrease 50% of joint width as measured at time of application and remain in compliance with other requirements ASTM C 920, based on manufacturer's recommendations and testing.
1. Product: Subject to compliance with requirements, provide following:
"Vulken 922"; Mameco International, Inc.
- E. Two-Part Water Immersion Polysulfide Sealant: Type M; Grade NS; Class 12-½; Uses T, M, A as applicable to joint substrates indicated O; with a history of successful field experience in sealing joints immersed intermittently or continuously in water.
1. Product: Subject to compliance with requirements, provide following:
"Chem-Caulk 400"; Bostik Construction Products Div.

2.03 MISCELLANEOUS JOINT SEALANTS:

- A. Acrylic-Emulsion Sealant: Manufacturer's standard, one part, nonsag acrylic, mildew resistant, emulsion sealant complying with ASTM C-834, formulated to be paintable and recommended for applications on interior involving joint movement of not more than ±7.5%.
- B. Butyl-Polyisobutylene Tape Sealant: Manufacturer's standard, solvent free, butyl-polyisobutylene tape sealants with a solids content of 100%; comply with AAME 804.1; formulated to be nonstaining, paintable, and nonmigrating in contact with nonporous surfaces; package on rolls with a release paper on one side; with or without reinforcement thread to prevent stretch.
- C. Two-Part Jet Fuel (Diesel)-Resistant Cold-Applied Sealant: Manufacturer's standard pourable, chemically-curing, elastomeric sealant complying with FS SS-S-200 and of urethane formulation for base polymer complying with FS SS-S-00227, with maximum movement capability of 12 ½ %.
1. Product: Subject to compliance with requirements, provide one of the following:
"Vullkem 202"; Mameco International, Inc.
"Gardox"; W.R. Meadows, Inc.
"Urexpan NR-300"; Pecora Corp.

D. Fire Resistant Joint Sealers:

1. General: Provide Manufacturer's standard sealant and accessory materials with fire-resistance rating indicated which are identical to those assemblies whose fire endurance has been determined by testing per ASTM E814 by Underwriters Laboratory, Inc. or other testing and inspecting agency acceptable to authorities having jurisdiction.
2. Foamed-In-Place Fire-Stopping Sealant: Two-part, Foamed-in-place, silicone sealant formulated for use as part of thorough-penetration fire-stop system for filling openings around cables, conduit, pipes, and similar penetration through walls and floors.
3. One-Part Fire-Stopping Sealant: One part elastomeric sealant formulated for use as part of thorough-penetration fire-stop system for sealing openings around cables, conduit, pipes, and similar penetrations through walls and floors.

2.04 MISCELLANEOUS MATERIALS:

- A. Bituminous Fiber Joint Filler for Concrete Paving: Performed strips of asphalt saturated fiberboard complying with ASTM D 1751; full thickness and width joint.
- B. Joint Sealant Backing: Provide sealant backing of material and type which are nonstaining and 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.
- C. Elastomeric Tubing Joint-Fillers: Neoprene, butyl, or EPDM tubing complying with ASTM D1056, nonabsorbent to water and gas, capable of remaining resilient at temperatures down to -26 deg. F. (-15 deg. C.). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.
- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing bond between sealant and joint filler or other materials at back (3rd) surface of joint. Provide self-adhesive tape where applicable.
- E. Primer: Provide type recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from pre-construction joint sealer substrate and field tests.
- F. Cleaners for Nonporous Surfaces: Provide nonstaining chemical cleaner of type acceptable to manufacturer of sealant and sealant backing materials which are not harmful to substrates and adjacent nonporous materials.

- G. Masking Tape: Provide nonstaining, nonabsorbent tape compatible with sealants and to surfaces adjacent to joints.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Inspection: Contractor must inspect joints indicated to receive joint sealers for compliance with requirements for joint configurations, installation tolerances, and other conditions affecting joint sealer performance. Obtain installer's written report listing any conditions determined to performance of joint sealer work. Do not allow joint sealer work to proceed until satisfactory conditions have been corrected.
- B. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealers to comply with recommendations of the joint sealant manufacturer.
- C. Joint Priming: Prime joint substrates where recommended by joint sealer manufacturer based on pre-construction 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 to adjoining surfaces.
- D. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces which otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.02 INSTALLATION OF JOINT SEALERS

- A. General: comply with joint sealer manufacturer's printed installation instructions Applicable to products and applications indicated, except where more stringent requirements apply.
- B. Elastomeric Sealant Installation Standard: ASTM C 962.
- C. Latex Sealant Installation Standard: ASTM C 790.
- D. Installation of Sealant Backings: Install sealant backing to comply with the following requirements:
 - 1. Install joint-fillers 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 end 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, or back of joints where required to prevent third-side adhesion sealant to back of joint.
- E. 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.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads to eliminate air pockets and to ensure contact and adhesion of sealant with sides of joints. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents which discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.
- G. Installation of Fire-Stopping Sealant: Install sealant, including forming, packing, and other accessory materials to fill openings around mechanical and electrical services penetrating floors and walls to provide fire-stops with fire resistance ratings indicated for floor or wall assembly in which penetration occurs.

3.03 PROTECTION AND CLEANING

- A. Protect joint sealers during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes. If damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealers immediately and reseal joints with new material to produce joint sealer installations with repaired areas indistinguishable from original work.
- B. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by mfr.'s of joint sealers and products in which joints occur.

JOINT SEALERS SCHEDULE

CONDITIONS

Perimeter of exterior openings where frames meet exterior facade of building (i.e. windows, doors, sidelights, etc.). Provide where frames have been moved or replaced in existing construction and at all applicable locations in new construction.

PRODUCT

Multi-Part Nonsag Urethane Sealant

JOINT SEALERS

SECTION 07900

PAGE 6

Vertical joints between similar materials (i.e. concrete panels, masonry, etc.)	Two-Part Nonsag Polyurethane Sealant
Isolation joints between sidewalks or pavements and building at new construction.	Two-Part Pourable Urethane Sealant
Flashing joints, reglets, and receivers; sealant cavity in roof clamping devices at new construction.	Two-Part Pourable Urethane Sealant (except provide two-part Jet-Fuel (Diesel) Resistant cold-applied sealant where associated with bituminous waterproofing, damp-proofing, or roofing)
Thresholds: Provide under new thresholds. Refer to Section 08110	Butyl-Polyisobutylene Tape
Vertical joint between dissimilar materials at new and existing remodeled construction	Multi-Part Nonsag Urethane Sealant
Perimeter of penetrations of exterior facade (i.e. pipes, conduits, etc.) at new construction	Multi-Part Nonsag Urethane Sealant
Joints submerged continually or intermittently in water (i.e. storm drains, roof drains, etc.)	Two-Part Water Immersion Polysulfide Sealant
Vertical joints in plaster	Two-Part Nonsag Low Modulus Urethane Sealant
Joints in glass unit masonry	Multi-Part Nonsag Urethane Sealant
Glass and glazing joints	As specified in Division 8
Miscellaneous locations not listed above at flashings, between dissimilar materials which require filling for first-class workmanship and to prevent storm water from entering the building.	Multi-Part Nonsag Urethane Sealant

INTERIORS

Perimeters of exterior openings in exterior walls where frames meet interior finish. Provide where frames have been moved or replaced on existing construction and at all applicable locations in new construction.	Acrylic-Emulsion Sealant
---	--------------------------

JOINT SEALERS

SECTION 07900
PAGE 7

Vertical joints between similar materials (i.e. concrete panels, masonry, etc.)	Two-Part Nonsag Polyurethane Sealant
Thresholds and saddles: Provide under new Thresholds, refer to Section 08110.	Butyl-Polyisobutylene Tape
Sleeved penetrations through floors and Ceilings at new construction.	Two-Part Pourable Urethane Sealant, or, where required by condition: Multi-Part Nonsag Urethane Sealant
Control, isolation joints in gypsum board Construction, including perimeter joints.	As specified in Division 9
Interior side perimeters of penetrations through exterior walls (i.e. pipes, conduits, etc.) at new construction.	Multi-Part Nonsag Urethane Sealant
Joints between dissimilar materials at new, existing, and remodeled construction.	Acrylic-Emulsion Sealant
Joint in glass unit masonry	Acrylic-Emulsion Sealant
Glass and glazing joints	As Specified in Division 8
Miscellaneous locations, not listed above, at all voids between materials which require filling for first-class workmanship and painting.	Acrylic-Emulsion Sealant

SPECIAL NOTE

Substitute fire-stopping sealants noted above on interior or fire side(s) of any of above conditions where above conditions occur in fire-rated construction (walls, floors, or ceilings).

Provide foamed-in-place fire-stopping sealant at conditions involving multiple pipes, conduits, etc., where joint widths are wide or not uniform in joint width.

Provide one-part fire-stopping sealant at conditions involving single pipes, conduits, etc., or where joint widths are narrow and of uniform width.

FINAL NOTE

Leave all joint caulking neat and smooth (as a baby's cheek), no wrinkles, no voids, no bulges, no sags.

END OF SECTION 07900

SECTION 08110 - STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes hollow-metal work.
- B. Related Requirements:
 - 1. Section 08700 "Door Hardware" for door hardware for hollow-metal doors.

1.2 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.3 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.
- B. Shop Drawings: Include the following:
 - 1. Elevation of each door type.
 - 2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 4. Locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.
 - 6. Details of anchorages, joints, field splices, and connections.
 - 7. Details of accessories.
 - 8. Details of moldings, removable stops, and glazing.
 - 9. Details of conduit and preparations for power, signal, and control systems.
- C. Schedule: Provide a schedule of hollow-metal work prepared by under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.5 INFORMATIONAL SUBMITTALS

- A. Oversized Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements of this specification, provide products by one of the following:
 - 1. Steelcraft
 - 2. Ceco Door Products
 - 3. Commercial Door Manufacturing
 - 4. Security Metal Products
- B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 REGULATORY REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
- B. Fire-Rated, Borrowed-Light Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

2.3 STANDARD HOLLOW METAL DOORS

- A. General: Provide 1-3/4 inch doors of design indicated, fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.

B. Exterior Doors: Face sheets fabricated of commercial quality 16 gauge hot dipped zinc coated steel that complies with ASTM A924 A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model, ANSI/SDI A250.4 for physical performance level, and HMMA 867 for door construction.

1. Design: Flush panel.
2. Core Construction: Supplier option furnish one of the following;
 - a. Honeycomb: Reinforced, stiffened, sound deadened and insulated with impregnated Kraft honeycomb core completely filling the inside of the doors and laminated to inside faces of both panels using contact adhesive applied to both panels and honeycomb core.
 - b. Polystyrene: Reinforced, stiffened, sound deadened and insulated with a rigid polystyrene core bonded to the inside faces of both panels with contact adhesive. Fills voids around the perimeter of the door with honeycomb. Acceptable products:
 - c. Steel Stiffened: Vertically stiffened with steel stiffeners and sound deadened with fiberglass batt insulation. Fabricate hat shaped stiffeners from 20 gage (.8 mm) steel located 6" (152 mm) on center, welded to the inside of the face sheets 4" (101.6 mm) on center. Weld the hat shape stiffeners together at the top and bottom of the door. Fill areas between stiffeners with fiberglass.
3. Vertical Edges: Vertical edges to be mechanically interlocked with hairline seam. Beveled Lock Edge, 1/8 inch in 2 inches.
4. Top and Bottom Edges: Reinforce tops and bottoms of doors with continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9".
6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

C. Interior Doors: Face sheets fabricated of commercial quality 18 gauge cold rolled steel that complies with ASTM A 1008/A 1008M. 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, and HMMA 867 for door construction.

1. Design: Flush panel.
2. Core Construction: Supplier option furnish one of the following;
 - a. Honeycomb: Reinforced, stiffened, sound deadened and insulated with impregnated Kraft honeycomb core completely filling the inside of the doors and laminated to inside faces of both panels using contact adhesive applied to both panels and honeycomb core.
 - b. Polystyrene: Reinforced, stiffened, sound deadened and insulated with a rigid polystyrene core bonded to the inside faces of both panels with contact adhesive. Fills voids around the perimeter of the door with honeycomb.
2. Vertical Edges: Vertical edges to have the face sheets joined by a continuous weld extending the full height of the door. Welds are to ground, filled and dressed smooth. Beveled Lock Edge, 1/8 inch in 2 inches.

3. Top and Bottom Edges: Reinforce tops and bottoms of doors with continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
4. Hinge Reinforcements: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
5. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from

2.4 STANDARD HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.
 1. Fabricate frames with mitered or coped corners.
 2. Fabricate frames as face welded joints.
 3. Frames for Steel Doors: Minimum 16 gauge (0.053 inch) thick steel sheet.
- C. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.
 1. Fabricate frames with mitered or coped corners.
 2. Fabricate frames as face welded.
 3. Frames for Steel Doors: Minimum 16 gauge (0.053 inch) thick steel sheet.
 4. Frames for Wood Doors: Minimum 16 gauge (0.053 inch) thick steel sheet.
 5. Frames for Borrowed Lights: Minimum 16 gauge (0.053 inch) thick steel sheet.
- D. Fire rated frames: Fabricate frames in accordance with NFPA80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.
- E. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

- A. Jamb Anchors:
 1. Masonry Type: Manufactures standard wire anchors or 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 (254 mm) long, or wire anchors not less than 0.177 inch thick.
 2. Stud-Wall Type: Manufactures standard adjustable metal anchors or designed to engage stud, welded to back of frames, not less than 0.042 inch thick.
 3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
 4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

- B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch, and as follows:
1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
 2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.6 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM 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. Power-Actuated Fasteners in Concrete: Fasteners system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- G. Grout: ASTM C476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M, by frame installer as directed by the Architect. Grout furnished and installed by frame installer.
- H. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing), consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, passing ASTM E 136, for combustion characteristics, if required install as directed by the Architect, furnished and installed by frame installer.
- I. Install glazing in accordance with requirements in Section 08800 "Glazing".

2.7 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.

C. Hollow-Metal Doors:

1. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape where specified.
2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit.
3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.
4. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
5. Electrical Raceways: Provide hollow metal doors to receive electrified hardware with concealed wiring harness and standardized Molex plug connectors on both ends to accommodate up to twelve wires. Coordinate connectors on end of the wiring harness to plug directly into the electrified hardware and the through-wire transfer hardware or wiring harness specified in hardware sets in Division 08 Sections "Door Hardware". Wire nut connections are not acceptable.

D. **Hollow Metal Frames:** Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames. Frames shall be field assembled, welded, detailed, complete and prepared for painting by the local hollow metal distributors as directed by the Architect.

1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 - a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.
2. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding. All mullions sections shall be continuous three (3) piece sections equal to Steelcraft TSF-16 Sections.
3. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise/butt type hinges at top hinge locations.
4. Continuous Hinge Reinforcement: Provide welded continuous 12 gage straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
5. Provide countersunk flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
6. Grout Guards: Weld guards to frame at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
7. Electrical Thru-Wiring: Provide hollow metal frames receiving electrified hardware with loose wiring harness (not attached to open throat components or installed in closed mullion tubes) and standardized Molex plug connectors on one end to accommodate up to twelve (12) wires. Coordinate connectors on end of the wiring harness to plug directly into the electric through-wire transfer hardware or wiring harness specified in hardware sets in Division 08 Sections "Door Hardware".
 - a. Provide electrical knock out boxes with dual 1/2-inch and 3/4-inch knockouts.

- b. Conduit to be coordinated and installed in the field (Division 26) from middle hinge box and strike box to door position box.
 - c. Electrical knock out boxes to comply with NFPA requirements and to fit electrical door hardware as specified in hardware sets in Division 08 Section "Door Hardware".
 - d. Electrical knock out boxes for continuous hinges should be located in the center of the vertical dimension on the hinge jamb.
- 8 Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor. Manufactures standard screw on clips are acceptable.
9. 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 above 42 inches wide and mounted in metal-stud partitions.
 - c. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
10. Door Silencers: Except on weather-stripped or gasketed doors, drill stops to receive door silencers as follows. Keep holes clear during construction. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
- a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according the Door Hardware Schedule, and templates furnished as specified in Division 08 Section "Door Hardware".
- 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 - 2. Reinforce doors and frames to receive non-templated, 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 or electrical connections with Division 26 Sections.

2.8 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.9 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work .
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

3.2 PREPARATION

- A. Frame installer remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

3.3 INSTALLATION

- A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
- B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
 - 1. Set frames accurately in position, plumb, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously, grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable stops located on secure side of opening.
 - d. Install door silencers in frames before grouting.
 - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.

2. The general contractor shall inspect and approve the installation of all hollow metal frames that are installed by others trades. Inspections shall be made prior to the commencement of the installation of the wood and hollow metal doors. The general contractor shall advise the responsible installer of any pre-existing conditions, which shall pre-empt the proper installation of the wood doors and hollow metal doors. The responsible installer of the hollow metal frames shall take all corrective actions to maintain the construction schedule. All frames shall be set plumb and square and properly anchored. Acceptance of the installed frames by the general contractor does not relieve the responsible frame installer of any correction necessary to insure the proper installation of the wood and hollow metal doors. The hardware installer shall inform the general contractor of any frames that are not installed in the best industry standards, and is not to install wood and hollow metal doors in any frames that do not comply with the industry standards.
 3. 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 power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 4. Metal-Stud Partitions: If required frame installer shall solidly pack mineral-fiber insulation inside frames.
 5. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout, by frame installer.
 6. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation, by frame installer.
 7. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush and invisible on exposed faces.
 8. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.
 9. 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 jamb 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.
- C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
1. Non-Fire Rated Steel Doors:
 - a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
 - c. At Bottom of Door: 5/8 inch plus or minus 1/32 inch.
 - d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.
 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
 3. Smoke-Control Doors: Install doors and gaskets according to NFPA 105.

D. Glazing: Comply with installation requirements in Section 08800 "Glazing" and with hollow-metal manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each other.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable
- B. Remove grout and other bonding material from hollow-metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- E. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
- F. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

SECTION 08211 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Solid core veneer-faced doors.
2. High Pressure Decorative Laminate faced doors if required for this project.
3. Fire-resistant composite core doors if required for this project.
4. Acoustic (STC) rated wood doors if required for this project.
5. Radiation shielded wood doors if required for this project.
6. Factory finishing.
7. Factory Glazing for fire rated doors only.
8. Sizing by manufacturer.
9. Machining by manufacturer.

B. Related Requirements:

1. Section 08800 "Glazing" for glass view panels in flush wood doors for field installation.
2. Section 09900 "Interior Painting" and "Staining and Transparent Finishing" for field finishing doors.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction, louvers, and trim for openings. Include factory-finishing specifications. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:

1. Dimensions and locations of blocking.
2. Dimensions and locations of mortises and holes for hardware.
3. Dimensions and locations of cutouts.
4. Undercuts.
5. Requirements for veneer matching.
6. Doors to be factory finished and finish requirements.
7. Fire-protection ratings for fire-rated doors.

- B. Samples for Initial Selection: For high pressure decorative laminate door faces and factory-finished doors.

- C. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches (200 by 250 mm), for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical examples of color and grain to be expected in finished work.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body when FSC Certified wood is specified.
2. A qualified manufacturer that is a member in good standing of the Window and Door Manufacturers Association.

B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body when FSC Certified wood is specified

C. Product Performance: Provide documents showing compliance to the following WDMA attributes, validating the specified WDMA Performance Duty Level:

1. Adhesive Bonding Durability: WDMA TM-6
2. Cycle Slam: WDMA TM-7
3. Hinge Loading: WDMA TM-8
4. Screw Holding: WDMA TM-10
 - a. Door Face
 - b. Vertical Door Edge
 - c. Horizontal Door Edge (applies when hardware is attached)

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package factory-finished doors individually in manufacturer's standard plastic bags, stretch wrap, or cardboard cartons.
- C. Mark each door on top rail with opening number used on Shop Drawings. Include manufacturer's order number and date of manufacture.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weather tight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 25 and 55 percent during remainder of construction period.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
 - a. Warping (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
 - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 76.2-mm) span.
2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Marshfield DoorSystems, Inc. flush wood doors or a comparable product by one of the following:

1. Algoma Hardwoods, Inc.
2. Eggers Industries.
3. Marshfield DoorSystems
4. Graham Wood Doors.

B. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A-11, "Architectural Wood Flush Doors."

B. Regional Materials: Where available based on inclusive list of approved manufacturers, flush wood doors shall be manufactured within 500 miles (800 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

C. Certified Wood: Flush wood doors shall be certified according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and to FSC STD-40-004, "FSC Standard for Chain of Custody Certification." FSC claims are to be based on "new" wood contribution only. All recycled, reclaimed, and recovered material, even if it is FSC Recycled, must be applied towards the MR 4 credit.

D. Low-Emitting Materials: Fabricate doors with adhesives and composite wood products that do not contain added urea formaldehyde.

E. WDMA I.S.1-A Performance Grade: **Heavy Duty**

1. All doors must meet specified WDMA Performance Duty Level, including face screw holding requirement. Surface applied hardware shall be installed with screws or through bolts as shown in the hardware sets. All doors must meet specified WDMA Performance

Duty level. Surface applied hardware shall be installed with through bolts as shown in the hardware sets.

- F. WDMA I.S.1-A Performance Grade:
 - 1. Heavy Duty unless otherwise indicated.
- G. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
 - 1. Cores: Provide core specified or fire-resistant composite core as needed to provide fire-protection rating indicated.
 - 2. Blocking: Provide composite blocking approved for use in doors of fire-protection ratings indicated as needed to maintain WDMA performance level.
 - 3. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals.
- H. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control, based on testing according to UL 1784.
- I. Dutch Doors:
 - 1. Provide Dutch doors with internal wood blocking, flush cut as required with shelf. Shelf width shall be 8 inch as shown.
 - 2. Provide 20 minute fire rating where indicated on door schedule.
- J. Acoustic Rated Wood Doors – STC 30-47: If required for this project, see door schedule.
 - 1. Provide core indicated or special construction core as required to meet STC rating indicated on door schedule. All STC ratings must be tested as operable.
 - 2. Provide gasketing and door sweep or mortise door bottom as required to meet manufacturers tested acoustic rating.
 - 3. Hollow metal frames shall be fully grouted or packed with mineral wool where acoustic rated wood doors are installed.
 - 4. The Sound Transmission Class (STC) specified shall be certified by the manufacturer to be based on tests conducted at an independent testing agency in accordance with ASTM E90-90 and E413-87.
- K. Radiation Shielded Wood Doors if required for this project see door schedule.
 - 1. Provide manufacturer's standard construction radiation shielded doors with lead thickness of 1/16 inch (1.6 mm) or 1/8 inch (3.2 mm) as indicated in door schedule.
 - 2. Provide wood/lead astragals on radiation shielded pairs in lead thickness indicated. Finish astragals to match face of the door.
- L. Wood-Based Particleboard-Core Doors: as required for this project, see door schedule.
 - 1. Provide wood-based particleboard core doors with a minimum density per ANSI A208.1, Grade LD-2 as required to meet WDMA Performance Duty level specified without added blocking.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors

1. Basis-of-Design Product: Subject to compliance with requirements, provide Marshfield DoorSystems; "Signature Series" or a comparable product by one of the following:
 - a. Algoma Hardwoods.
 - b. Eggers Industries.
 - c. Graham Wood Door.
2. Veneer Grade: A
3. Options in "Species" Subparagraph below are examples only; revise or insert another species.
4. Species: as shown on the door schedule elevations furnish one of the following: African Mahogany, Select White Ash, Select White Birch, Cherry, Select White Maple, Red oak, White Oak, Sapele, Walnut.
5. Cut: Plain Sliced
6. Match between Veneer Leaves: Book match.
7. Assembly of Door Leaves on Door Faces: Running match
8. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions. Provide sets up to four doors.
9. Transom Match: Continuous match.
10. Exposed Vertical Edges: Veneer of the same species as face, bonded to structural composite lumber, concealing edges for crossband. Veneer banded edges shall be used in lieu of hardwood edges.
11. Unless otherwise shown in the schedule all transparent finish doors are factory prefinished.

2.4 DOORS FOR OPAQUE FINISH

A. Interior Solid-Core Doors if shown on the door schedule to be painted

1. Basis-of-Design Product: Subject to compliance with requirements, provide Marshfield DoorSystems; "Signature Series" or a comparable product by one of the following:
 - a. Algoma Doors
 - b. Eggers Industries
 - c. Graham Wood Doors
2. Grade: Premium
3. First option in "Faces" Subparagraph below is highest quality; last is most economical and may require additional jobsite preparation prior to painting. Coordinate with requirements of door grade selected.
4. Faces: MDO.
 - a. Apply MDO directly to high-density fiberboard crossbands.
5. composite, or specialty core as required per Article 2.2 and door schedule.
6. Construction: Five plies. Stiles and rails are bonded to core, and then entire unit is abrasive planed before veneering.
7. WDMA I.S.1-A Performance Grade: As specified in Article 2.2.

2.5 HIGH PRESSURE DECORATIVE LAMINATE-FACED DOORS if required for this project see door schedule.

A. Interior Solid-Core Doors

1. Basis-of-Design Product: Subject to compliance with requirements, provide Marshfield DoorSystems, "Signature Series" or a comparable product by one of the following:
 - a. Algoma Hardwoods
 - b. Eggers Industries
 - c. Graham Wood Doors
2. Grade: Premium
3. HPDL Faces: High-pressure decorative laminates complying with NEMA LD 3, Grade HG3. Vertical and post formable grade laminates are not acceptable.
4. Colors, Patterns, and Finishes: As selected by Architect from laminate manufacturer's full range of products or [as selected from Wilson Art full range of products.
5. Exposed Vertical Edges: High-pressure decorative laminate that matches faces, applied to structural composite lumber stile after faces] [1/8 inch (3.2 mm) impact-resistant edging, applied after faces, color selected from manufacturer's standard offering.
6. Horizontal Edges: Structural composite lumber.
7. Core: , Wood-based Particleboard, Structural composite lumber, fire-resistant composite or specialty core as required per Article 2.2 and door schedule.
8. Construction: Three plies. Stiles and rails are bonded to core, and then entire unit is abrasive planed before faces are applied.
9. WDMA I.S.1-A Performance Grade: As specified in Article 2.2.

2.6 LIGHT FRAMES AND LOUVERS

- A. Factory Glazing: Refer to Section 088000 "Glazing" for glass view panels in flush wood doors. Factory install glass as required in fire rated doors only. Factory shall furnish correct fire rated glass for fire protection rating indicated for the doors. Fill glazing bead nail holes in factory finished doors.
- B. Metal Kits for Light Openings in Wood Doors: Manufacturer's standard frame formed of 0.048-inch- (1.2-mm-) thick, cold-rolled steel sheet; with baked-enamel- or powder-coated finish.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Air Louvers, Inc.
 - b. Anemostat; a Mestek company.
 - c. National Guard
- C. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch- (1.2-mm-) thick, cold-rolled steel sheet; with baked-enamel- or powder-coated finish; and approved for use in doors of fire-protection rating indicated.
- D. Metal Louvers: Unless otherwise shown on the door schedule or door elevations all louvers shall be metal louvers.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Air Louvers, Inc.

- b. Anemostat; a Mestek company.
 - c. National Guard
 - 2. Blade Type: Vision-proof, inverted Y.
 - 3. Metal and Finish: 18 gauge cold rolled steel, with manufacturer's standard color baked-enamel- or powder-coated.
- E. Louvers for Fire-Rated Doors: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire-protection rating of 1-1/2 hours and less.
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Air Louvers Inc.
 - b. Anemostat; a Mestek company.
 - c. National Guard
 - 2. Metal and Finish: 18 gauge cold rolled steel, with manufacturer's standard color baked-enamel or powder-coated.

2.7 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
- 1. Comply with NFPA 80 requirements for fire-rated doors.
- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.
- 1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
 - 2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.
- C. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.
- 1. Fabricate door and transom panels with full-width, solid-lumber[, rabbeted,] meeting rails. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.
- D. Openings: Factory cut and trim openings through doors.
- 1. Light Openings: Trim openings with moldings of material and profile indicated.
 - 2. Glazing: **Factory install glazing only in fire rated doors, glass shall be for fire rating indicated for the doors.** Comply with applicable requirements in Section 088000 "Glazing."

3. Louvers: Factory install louvers in prepared openings.

2.8 PRIMING, OPAQUE DOORS

A. Doors for Opaque Finish: Field prime faces and vertical edges by the Division 099123 subcontractor with one coat of wood primer specified in Section 099123 "Interior Painting."

2.9 FACTORY FINISHING

A. General: Unless otherwise shown all transparent stain finish doors shall be factory prefinished. Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces and vertical edges, seal top and bottom edges as required for warranty purposes

B. Factory finish doors.

C. Factory finish doors that are indicated to receive transparent finish.

D. Factory finish doors where indicated in schedules or on Drawings as factory finished.

E. Transparent Finish:

1. Grade: Premium

2. Finish: Manufacturer's standard UV cured polyurethane, equal to WDMA TR-6 catalyzed polyurethane.

3. Staining: Match Architect's sample or as selected by Architect from manufacturer's full range.

4. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.

1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs. Any deficiencies must be corrected prior to door installation.

2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Section 087100 "Door Hardware.

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

1. Install fire-rated doors according to NFPA 80.
 2. Install smoke- and draft-control doors according to NFPA 105.
- B. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
- C.
1. Clearances: Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch (6.4 mm) from bottom of door to top of threshold unless otherwise indicated.
 - a. Comply with NFPA 80 for fire-rated doors.
 2. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
 3. Trim bottom rail only to extent permitted by labeling agency.
- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- E. Factory-Finished Doors: ~~Do not trim factory finished doors for width.~~
- 3.3 ADJUSTING
- A. Operation: Correct any deficiency that prohibits the door from swinging or operating freely. Do not remove hinge screws after initial insertion. Shims used for alignment purposes must be inserted between hinge and frame. Do not insert shims between hinge and door.
- B. To prevent stile failure, insure that door closers are properly adjusted and do not limit the door opening swing. Limit door opening swing only with a properly located stop.
- C. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

SECTION 087100 – DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawing and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 SCOPE

- A. Furnish and deliver all finish hardware required for adequately and satisfactorily equipping all doors and other movable parts throughout the building whether specifically mentioned herein or not, unless specifically excluded herein below. Any hardware required to complete the work, but not specifically mentioned herein, shall be provided of the same quality and type as specified for similar parts adjacent thereto.
 1. Hardware subcontractor shall cooperate with other Contractors engaged in the work.
 2. Each item of hardware shall be packed separately, complete with all trim, screws, bolts, nuts, washers, etc., and clearly numbered. The Hardware Contractor shall store the hardware in a safe place under lock and key and shall be responsible for it until final completion and acceptance. Protect all knobs, levers, handles, etc., against soiling or damage, with tough paper or cloth wrappers.
 3. Finish hardware must be neatly and properly installed in accordance with the best practices as approved by the Architect. All hardware must be thoroughly cleaned when it is turned over to the Owner.
 4. While the following hardware schedule is intended to cover all doors, excluding hardware for aluminum doors. The hardware schedule is intended to establish a type and quality standard for all finish hardware required for all openings in this project whether listed or not. It is the specific duty of the hardware hardware supplier to examine the plans and specifications and furnish proper hardware for all openings whether listed or not. This shall include any and all necessary hardware to comply with the ADA and local and national building codes applicable at the time the project is bid. If there are any omissions in the hardware groups in regards to regular doors, they shall be called to the attention of the Architect prior to bid opening. For instructions: otherwise the list will be considered complete. **No extras will be allowed**

1.3 HANDICAPPED ACCESSIBILITY STANDARDS

- A. American's with Disabilities Act of 1990 Elimination of Architectural Barriers, shall apply to all items of hardware furnished for this project:
 1. Exterior hinged doors shall not exceed except as approved by the Architect) 8.5lbs. Slight increases in opening force shall, be allowed where 8.5 lbs. is insufficient to compensate for air pressure differentials. Interior hinged doors shall not require a force exceeding 5 lbs. Fire doors may be adjusted to meet the minimum opening force allowed by the governing authority or applicable bulding code.
 2. All doors shall have lever handles (except as otherwise noted in hdw set #).

1.4 SPECIFIC REQUIREMENTS

- A. Thresholds: Thresholds shall be of the type and design listed in the hardware sets. The hardware subcontractor shall examine the plan and sill detail of all openings requiring thresholds and furnish and install thresholds that are compatible with the actual construction details. The materials listed in the hardware sets shall establish a quality of threshold materials to be used. All thresholds shall comply with ADA requirements. All thresholds shall be caulked or furnished with a factory built in seals.
- B. Hardware shall be furnished with each unit marked or numbered in accordance with the hardware schedule submitted.

1.5 EXPERIENCE

- A. The subcontractor for Builders Hardware shall have available, at all times, a member of the Door and Hardware Institute, or one of equal competence, to supervise the handling of work under this heading. He shall be a specialist in this work of long and satisfactory experience, with adequate local storage and service facilities. All finish hardware under this contract shall be furnished and installed by a Supplier who has been established in the contract hardware business for a period of at least five (5) years in El Paso County, Texas. There shall be available, at all times, a qualified hardware consultant to service and supervise the handling of hardware under this contract. The supplier shall maintain an adequate local warehouse stock of contract hardware and locksmith keying facilities for servicing in the project as required and for owners continued service after the project is complete.

1.6 MASTER KEYING:

- A. The Hardware Subcontractor shall meet with the Owner's Representative to establish keying requirements.
- B. Furnish two (2) keys for each lock and number of masterkeys requested. All keys shall be properly tagged and turned over to the Owner after completion of the work.

1.7 TEMPLATE HARDWARE

- A. All hardware applied to metal doors, and jambs shall be made to template and secured by machine screws. Furnish templates and hardware schedule to metal door and frame manufacturer.

1.8 FASTENINGS:

- A. Finish hardware shall be furnished with all necessary screws, bolts, or other fastenings of suitable size and type to anchor the hardware in position for heavy use and long life, and shall harmonize with the hardware as to material and finish. These fastenings shall be furnished where necessary with expansion shields, sex bolts, toggle bolts, or other approved anchors according to the material to which it is applied and as recommended by the manufacturer. All hardware fastened to concrete shall be furnished with machine screws and expansion bolts for drilled holes.

1.9 SUBMITTALS

- A. Hardware Schedule: Submit six (6) copies of hardware schedule, listing numbers specified for all items. Obtain Architect's approval before proceeding. If accepted, one (1) approved copy will be returned to the Contractor. Approval of schedule does not relieve Contractor of responsibility for furnishing all necessary hardware.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Requirements for design, grade, function, finish, size and other, distinctive qualities of each type of finish hardware are indicated in the hardware schedule at the end of this section. Products are identified by using hardware designation numbers of the following.
- B. Manufacturer's Product Designations: One manufacturer is listed for each hardware type required. Provide the product designated or provide an equal product of one of the other listed manufacturers.
- C. Locksets:

Approved Manufacturers: Schlage
Sargent

Locksets shall be heavy-duty locks, and latches and shall be type as listed with lever trim to comply with ADA standards. Keying and cylinders: ASSA Twin Max

- D. HINGES:

Approved Manufacturers: PBB
McKinney
Ives

Shall be specified to hardware sets.

- E. FLUSH BOLTS:

Approved Manufacturers: Trimco
Ives
Rockwood

Flush bolts shall have their operating mechanism approximately 12 inches from the top and bottom of the inactive leaves of pairs of doors, where specified.

Manual Flush Bolts are not to be utilized except where a pair of non-rated doors serving a room not normally occupied is needed for the movement of equipment.

Provide dust proof strikes for bottom bolts, Dust proof strikes shall meet BHMA A156.16.

F. PUSH PLATES AND DOOR PULLS:

Approved Manufacturers: Rockwood
 Trimco
 Ives

Shall be as specified in the hardware sets. Where deadlocks are specified, plates shall be installed below deadlocks.

G. DOOR STOPS:

Approved Manufacturers: Ives
 Rockwood
 Trimco

Suitable stops shall be furnished as required for all doors, even if they are not listed, in all cases, in the hardware sets. Furnish proper fastenings to suit wall condition.

H. SILENCERS:

Provide silencers for metal and wood frames - three (3) each for single doors, two (2) each for pairs of doors.

I. DOOR CLOSERS:

Approved Manufacturers: LCN
 Sargent

All door closers shall be size and type as shown in the hardware sets. All closers shall comply with ADA standards. Closers shall be fully adjustable with sweep speed, latch speed and back check position valves. Arm selection shall follow the requirements of the manufacturer's recommendations with brackets, drop plates and miscellaneous accessories provided as necessary.

Provide closers with arms designed to permit openings of doors as far as job conditions will permit; unless otherwise indicated closers with arms restricting opening of door will not be acceptable. Surface closers on exterior doors without building overhang protection shall be primed with rust inhibitive primer before finish application.

J. PANIC DEVICES:

Approved Manufacturers: Von Duprin
 Sargent

K. FINISH:

The finish of all hardware shall be as specified hereinafter.

PART 3 - EXAMINATION

- 3.1 Examine doors and frames for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- 3.2 Examine rough in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- 3.3 Proceed with installation only after unsatisfactory conditions have been corrected.

PART 4 - INSTALLATION

- 4.1 All hardware shall be installed by a County of El Paso, Texas factory authorized hardware supplier/subcontractor. Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations, and except as may be otherwise directed by Architect.

Hardware Sets

SET #01.00

Doors: 02, 11, 12

2 Aluminum Continuous Hinge	CH31L 83"	628	PBBI
2 Deadbolt MS	1850S-210-628	628	ADRI
2 ASSA Mortise Cylinder	8852IC MORTISE	26D	ASSA
2 Push/Pull Combo PR	9190HD-33-0	US32D	IV
2 Closer	4040 XP SCUSH 4040-18G	AL	LC
2 Door Sweep	198 NA 36"		NA
1 Saddle Threshold	425 E 72"	AL	NA

NOTE: Seals by Aluminum Frame Supplier.

SET #02.00

Doors: 05

1 Aluminum Continuous Hinge	CH31L 83"	628	PBBI
1 Deadbolt MS	1850S-210-628	628	ADRI
1 ASSA Mortise Cylinder	8852IC MORTISE	26D	ASSA
1 Push/Pull Combo	PR 9190HD-33-0	US32D	IV
1 Closer	4040 XP SCUSH 4040-18G	AL	LC
1 Door Sweep	198 NA 36"		NA
1 Saddle Threshold	425 E 36"	AL	NA

SET #03.00

Doors: 07

3 Hinge	BB81 4 1/2 X 4 1/2	652	PBBI
1 Deadlock	60 484	26D	SA
1 ASSA	I/C Core 89060IC	26D	ASSA
1 Pull Plate	1015-3	630	TR
1 Closer	4040 XP REG/PA TBWMS	AL	LC
1 Push Plate	1001-3	630	TR
1 Protection Plate	K1050 10" x 34"	US32D	RO
1 Wall Bumper	409	US26D	RO
1 Gasketing	2525 B-17 17'		NA

SET #04.00

Doors: 09

3 Hinge	BB81 4 1/2 X 4 1/2	652	PBBI
1 Deadlock	60 484	26D	SA
1 ASSA I/C Core	89060IC	26D	ASSA
1 Pull Plate	1015-3	630	TR
1 Closer	4040 XP EDA/62G TBWMS	AL	LC
1 Overhead Stop	9-336	652	RX
1 Push Plate	1001-3	630	TR
1 Protection Plate	K1050 10" x 34"	US32D	RO
1 Gasketing	2525 B-17 17'		NA

SET #05.00

Doors: 04, 08, 10

3 Hinge	BB81 4 1/2 X 4 1/2	652	PBBI
1 Lockset	60 8204 LNL	26D	SA
1 ASSA Mortise Cylinder	8852IC MORTISE	26D	ASSA
1 Closer	4040 XP REG/PA TBWMS	AL	LC
1 Protection Plate	K1050 10" x 34"	US32D	RO
1 Wall Bumper	409	US26D	RO
1 Gasketing	2525 B-17 17'		NA

SET #06.00

Doors: 06

3 Hinge	BB81 4 1/2 X 4 1/2	652	PBBI
1 Lockset	60 8237 LNL	32D	SA
1 ASSA Mortise Cylinder	8852IC MORTISE	26D	ASSA
1 Closer	4040 XP REG/PA TBWMS	AL	LC
1 Protection Plate	K1050 10" x 34"	US32D	RO
1 Heavy Duty Door Stop	481	US26D	RO
1 Gasketing	2525 B-17 17'		NA

Opening List

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
02	01.00			
04	05.00			
05	02.00			
06	06.00			
07	03.00			
08	05.00			
09	04.00			
10	05.00			
11	01.00			
12	01.00			

I. GENERAL

1. SCOPE: Furnish all labor, materials, and services to satisfactorily complete all glass and glazing as shown on the Drawings and specified herein. Provided tempered glass at all glazed doors and sidelights.
2. RELATED DOCUMENTS: The general provisions of the contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this section.
3. MANUFACTURER'S DATA: For information only, submit copies of manufacturer's specifications and installation instructions for each type of glass, glazing sealant, and compound, gasket and associated miscellaneous materials required.
4. SAMPLES, GLASS: Submit 2, 12" square samples of each type of glass required. Architect's review of samples will be for color, texture and pattern only. Compliance with other requirements is the exclusive responsibility of the contractor.
5. MANUFACTURER: ASG Industries Libby-Owens-Ford Co.
PPG Industries, Inc. C-E Glass Div.
Fourco Glass Co.
6. JOB CONDITIONS: The Glazier must examine the conditions under which the glazing is to be performed, and notify the Contractor of conditions detrimental to completion of the work. Do not proceed with the glazing until unsatisfactory conditions have been corrected.

II. PRODUCTS

1. PLATE GLASS: Polished plate glass; FS DD-G-451, Type I, Class 1, Quality c3: 1/4" thick, solar bronze.
2. TEMPERED GLASS: Plate glass (FS DD-G-451, Type I) which has been heat tempered by manufacturer's standard process (after cutting to final size), to achieve a flexural strength of 4 times normal glass strength; clear.
3. GLAZING SEALANTS/COMPOUNDS
 - a. General: Provide black exposed glazing materials, unless other color is selected by Architect. Provide only compounds which are known (proven) to be fully compatible with surfaces contacted.
 - b. 2-Part Polysulfide Glazing Sealant (Interior): Emulsion of acrylic, with or without latex rubber modification, compounded specifically and tested to show minimum of 20 year's resistance to deterioration in normal glazing applications.

Optional Sealant: "Dymeric" by Tremco, Inc.
 - c. Acrylic-Latex Glazing Sealant (Interior): Emulsion of acrylic, with or without latex rubber modification; compounded specifically for glazing; nonhardening, nonstaining and nonbleeding.
5. MISCELLANEOUS GLAZING MATERIALS:
 - a. Molded Neoprene Glazing Gaskets: Molded or extruded neoprene gaskets of profile and hardness required for watertight construction; comply with ASTM D 2000 designation 2BC 415 to 3BC 620, Black.

- b. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.
- c. Setting Blocks: Neoprene, 70-90 duro-meter hardness, with proven compatibility with sealants used.
- 6. SPACERS: Neoprene, 40-50 duro-meter hardness, with proven compatibility with sealants used.
- 7. COMPRESSIBLE FILLER ROD: Closed-cell or waterproof jacketed rod stock of synthetic rubber or plastic foam, proved to be 5-10 psi compression strength for 25% deflection.
- 8. GLASS TYPES
 - G-1 1" insulated Tempered glass combination of 1/4" tinted outside 1/2" air space and 1/4" clear tempered glass inside
 - G-2 1/4" Clear tempered glass

III. EXECUTION

- 1. STANDARD AND PERFORMANCE:
 - a. Watertight and airtight installation: of each piece of glass is required. Each installation must withstand normal temperature changes, wind loading, impact loading (for operating sash and doors) without failure.
 - b. Comply with "Glazing Manual" and other applicable publications by Flat Glass Marketing Association except as shown and specified otherwise and except as specifically recommended otherwise by the manufacturers of the glass and glazing materials.
 - c. Inspect each piece of glass immediately before installation, and discard pieces which have damage or imperfections.
 - d. Protect glass from edge damage.
 - e. Comply with combined recommendations of glass manufacturer and manufacturer of sealants and other materials used.
- 2. PREPARATION FOR GLAZING
 - a. Clean glazing channel, and other framing members to receive glass, immediately before glazing.
 - b. Apply primer or sealer to joint surfaces where recommended by sealant manufacturer.
- 3. GLAZING:
 - a. Install setting blocks or proper size at quarter points in sill rabbet located 1/4th of glass width from each corner.
 - b. Provide spacers inside and out, of proper size and spacing, for glass sizes larger than 50 united inches, except where gaskets 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. Verify all window and door sizes prior to installation, in the field. Failure to do so shall ~~not~~ constitute an extra should glass be cut to the wrong size.
 - d. Voids and Fillers Rods: Prevent oxidation of sealant or compound by forming voids or installing filler rods in the channel at heel of jambs and head (do not leave voids in the sill channels), except as otherwise indicated and depending on light size, thickness and type of glass, and complying with manufacturer's recommendations.
 - e. Do not attempt to cut, seam, nip or abrade glass which is heat-treated as a result of a coating process.
 - f. Force sealants into channel to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel surfaces.
 - g. Tool exposed surfaces of glazing liquids and compounds to provide a substantial "wash" away from glass. Install pressurized tapes and gaskets to protrude slightly out of the channel, so as to eliminate dirt and moisture pockets.
 - h. Clean and trim excess glazing materials from the glass and stops or frames promptly after installation, and eliminate stains and discoloration.
 - i. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage to ensure that gasket will not "walk" out when installation is subjected to movement. anchor gasket to stop with matching ribs, or by proven adhesives, including embedment of gasket tail in cured heel bed.
 - j. Gasket Glazing: Miter out and bond ends together at corners where gaskets are used for channel glazing, so that gaskets will not pull away from corners and result in voids or leaks in the glazing system.
4. CURE, PROTECTION AND CLEANING:
- a. Cure glazing and sealants and compounds in compliance with manufacturer's instructions.
 - b. Remove and replace glass which is broken, chipped, cracked, abraded or damaged during the construction period, including natural causes, accidents and vandalism.
 - c. Maintain glass in a reasonably clean condition during construction.
 - d. Wash and polish glass on both faces for inspection to establish date of substantial completion.

IV. SPECIAL NOTE

Comply with manufacturer's instructions and the City Code in all operations.

END SECTION 08800

RELATED DOCUMENTS:

The drawings, general provisions of the Contract, Division 1 Requirements, apply to the work specified in this section.

PART 1 - GENERAL

- 1.00 SCOPE: Furnish all labor, materials & service to do the Gypsum Drywall System, complete.
- 1.01 SUBMITTALS
 - A. Product Data: Submit manufacturer's product specifications and installation instructions for each gypsum drywall components, including other data as may be required to show compliance with these specifications.
- 1.02 QUALITY ASSURANCE
 - A. Metal Support Standard: ASTM C 754.
 - B. Gypsum Board Standard: ASTM C 840.
 - C. Fire-Resistance Ratings: Provide gypsum drywall construction fire-resistance ratings indicated, conforming to assemblies tested per ASTM E 119 by inspecting and testing organization acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

- 2.01 STEEL FRAMING FOR WALLS AND PARTITIONS
 - A. Comply with ASTM C754 and the following:
 - 1. Steel Studs and Runners: ASTM C 645, 0.0179" base metal thickness, except provide 0.0359" base metal thickness for runners and door jamb studs.
 - 2. Steel Rigid Furring Channels: ASTM C 645, 0.0179 inch base metal thickness, hat-shaped.
- 2.02 DRYWALL MATERIALS
 - A. Exposed Gypsum Board: ASTM C 36, standard tapered edge, 5/8" thick except where indicated otherwise.
 - 1. Provide Type X for all locations.
 - B. Trim Accessories: Provide mfr's. standard metal trim accessories, of the beaded type with face flanges for concealment in joint compound except where semi-finishing or exposed type is indicated. Provide corner beads, L-type edge trim beads, U-type trim beads, special L-kerf-type edge trim-beads, and one piece control beads.
- 2.03 MISCELLANEOUS MATERIALS
 - A. Fasteners for Furring Members: Type and size recommended by furring manufacturer for substrate and application indicated.

- B. Gypsum Board Fasteners: Screws, complying with ASTM C 646.
- C. Concealed Acoustical Sealant: Nondrying, nonhardening, nonskinning, nonstaining, nonbleeding, gunnable sealant for concealed applications per ASTM C 919.
- D. Sound Attenuation Blankets: Semi-rigid mineral fiber without membrane, FS HH-1-521, Type I, thicknesses as shown.
- E. Joint Tape: ASTM C 475, paper reinforcing tape.
- F. Joint Compound: ASTM C 475, of the type indicated.
 - 1. Provide ready-mixed vinyl-type for interior work.
 - a. Provide 2 separate grades of compound; one specifically for bedding tape and one for topping.
- G. Texture Finish Materials: Provide the following:
 - 1. Patched Areas: Match existing effect using currently available materials free of asbestos compounds.
 - a. Also match existing effect for areas of new work which are contiguous to or adjacent to existing textured painted surfaces.
 - 2. Wall Texture: For painted walls not required to match existing, provide factory blended and packaged non-asbestos compound formulated for either hand tool or spray application; provide orange peel finish texture.
 - 3. Primer: Type recommended by manufacturer of texture finish.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Fire Resistant and/or Acoustical Assemblies: Wherever fire rated and/or acoustical gypsum drywall construction is indicated, provide fire rated and/or acoustical assembly in accordance with the specifications contained in referenced Standard (UL Fire Resistance Directory of FM Building Materials Guide, etc.). Contractor has option to submit any assembly, tested and certified by manufacturer and testing laboratory for compliance with fire rating and/or acoustical rating indicated.
 - 1. Provide all materials and application methods, including types and spacing of fasteners, in accordance with the specifications contained in the referenced Standard.

3.02 FRAMING INSTALLATION, GENERAL

- A. Install steel framing to comply with ASTM C 754 and ASTM C 840.
 - 1. Install steel studs with bottom and top runner tracks anchored to substrates. Isolate system from building structure to prevent transfer of loading and deflections into metal support system, both vertically and horizontally.

2. Install supplementary framing, runners, furring, kickers, blocking and bracing at all openings and terminations in gypsum drywall and where required for support of other work which cannot be adequately supported on gypsum board alone.

3.03 GENERAL GYPSUM BOARD INSTALLATION REQUIREMENTS

- A. Gypsum Board Application and Finishing Standards: ASTM C 840 and GA 216.

3.04 DRYWALL INSTALLATION AND FINISHING

- A. Install gypsum boards in lengths and directions which will minimize number of end joints. Install walls and partitions with exposed gypsum boards vertical, with joints offset on opposite sides of partitions. Otherwise, install boards with edges perpendicular to supports, with end joints staggered over supports, except where recommended in a different arrangement by mfr.
- B. Isolate drywall work from abutting structural; provide edge trim and acoustical sealant as recommended by mfr.
- C. Install sound attenuation blankets and thermal insulation blankets where indicated, without gaps; and mechanically support where necessary to prevent movement or dislocation.
- D. Insert gypsum board into hollow metal frames.
- E. Screw gypsum board to metal supports and to wood supports.
- F. Where sound-rated drywall work is indicated (STC rating), seal the work at openings and penetrations with a continuous bead of acoustical sealant. Close off sound-flanking paths around or through the work, including sealing of partitions above acoustical ceilings.
 1. Provide sealant and backer rod to seal around all duct penetrations in all drywall work in all walls. All edges must be made air-tight with sealant.
 2. Provide sealant around all penetrations in all walls. Completely seal joints left between cut-outs and electrical boxes; cover sides and backs of all electrical boxes solidly with sealant to seal them.
- G. Drywall Finishing: Except as otherwise indicated, apply joint tape and joint compound at joints (both directions) between gypsum boards. Apply compound at accessory flanges, penetrations, fasteners heads and surface defects.
 1. Install compound in 3 coats (plus prefill of cracks where recommended by mfr.); sand after last 2 coats.
- H. Other Work: Coordinate with electrical and mechanical subcontractors. Provide access panels where required. Lack of coordination between subcontractors will not be a reason to demand extra compensation for this work.
- I. Install metal nosed corner reinforcements at all exterior corners, full metal trim at all edges of gypsum board abutting dissimilar or when edges or joints remain exposed.

- J. Water proof gypsum board shall be installed on walls as follows:
 - a. Behind toilets
 - b. Behind lavatories
 - c. Behind sinks
 - d. Behind other wet areas
- K. The point of intersection between the wall and floor and wall and ceiling shall be caulked, continuously at party and exterior walls.
- L. Except in spaces where no Work under this Contract is required, enclose existing and new conduits, ducts, pipes, and similar items in furring where such items pass through finished spaces whether or not furring is indicated.

3.05 APPLICATION OF TEXTURE FINISH

- A. Surface Preparation and Primer: Prepare and prime drywall and other surfaces in strict accordance with texture finish manufacturer's instructions. Apply primer to all surfaces to achieve texture finish.
- B. Finish Application: Mix and apply finish to drywall and other surfaces indicated to receive finish in strict accordance with manufacturer's instruction to produce a uniform texture without spots or other evidence of thin application, and free of application patterns.
- C. Remove any texture droppings or overspray from door frames, windows and other adjoining work.
- D. Care shall be taken when sanding compound to avoid any roughing of the paper.
- E. Texture shall be rolled on; no orange peel texture allowed.
- F. Do this with bright lights in rooms being sheetrocked. Do not work in the dark.

3.06 PROTECTION OF WORK

- A. Provide final protection and maintain conditions in a manner suitable to Installer, which ensures gypsum drywall work being without damage or deterioration at time of substantial completion.

END OF SECTION 09250

PART 1 GENERAL:

General: Provide all labor, materials and service to install all ceramic tile, quarry tile and trim for wall and floors to match existing conditions at each restroom. Include all tile, trim, base and cap, setting materials, grout, etc., and everything necessary to produce a first class job in every respect. All materials, dimensions, patterns, textures and colors shall match existing tile, or as directed by architect. Wainscots may extend to full wall height.

Related Documents: The general provisions of the contract, including General Conditions and General Requirements, apply to this section.

All packages of tile shall be delivered to the job site in sealed cartons bearing grade seals in conformance with ANSI A137.1-19 Standard Specifications for Ceramic Tile and Interim Federal Specification SS-1-0038c.

Before setting any tile, furnish the Architect with the Standard Form of Master Grade Certificate signed by the Contractor and manufacturer stating grade and kind of tile.

PART 2 MATERIALS: (as listed or equal)

- A. Glazed Porcelain Wall Tile: Shall be equal items as listed below:
 - 1. Men's Restrooms: Interceramic - Trio Pietra - Graphite 12" x 24"
 - 2. Women's Restrooms: Trio Pietra Sand 12" x 24"
- B. Unglazed Porcelain Floor Tile: Shall be equal to items as listed below:
 - 1. Men's Restrooms: Interceramic - Dome - Graphite 12" x 24"
 - 2. Women's Restrooms: Interceramic - Dome - Marrone 12" x 24"
- C. Accent Interlocking Mosaic Wall Tile: Shall be equal to items as listed below:
 - 1. Men's Restrooms: Cityscape Interlocking tile 12" x 12"
 - 2. Women's Restrooms: Madison Avenue Interlocking tile 12" x 12"

Adhesives:

On floor concrete; install a two component, room temp. time cured epoxy adhesive specifically for ceramic shear bond strength of 1500 psi to tile after 28 days and have a 1/32" penetration into concrete

Walls, Gypsum: Adhesive for the installation of wall tile over gypsum wall board, etc., shall be a solvent type, virgin rubber, based ceramic tile adhesive, and shall conform to ANSI 135.1- 1976. The adhesive shall have a minimum average shear bond strength to tile of 100 psi after 100 years of indoor use and 100 psi after 10 years of outdoor exposure.

Walls, Masonry: Adhesive for the installation of wall tile over brick, cinder block or other masonry surface shall be Dry-Set or latex-Portland cement mortar and shall conform to ANSI 118-1-1976 specification. This material shall have a minimum average shear bond strength of 300 psi to non-vitreous tile and 150 psi to vitreous tile at 28 days. In the event a thin leveling coat is used, adhesive used to install tile over such surface shall be as for gypsum wall board herein above listed.

Certificate of Adhesive: A notarized certificate from the adhesive manufacturers will be presented to the Architect upon request before the installation of tile is begun, stating that the adhesive meets the above requirements.

PART 3 INSPECTION, PREPARATION, & PROTECTION:

This tile subcontractor will be required to inspect, accept or reject the concrete slabs furnished him for his tile work. He is therefore directed and required to inspect all slabs as it is leveled and finished, and to assist in the proper finishing of same to receive this work. No tile finish will be permitted until satisfactory slabs have been filled or ground level and smooth, to his satisfaction.

Examine all surfaces to receive tile, including inserts, accessories, etc. All shall be dry, clean, and free of oily or waxy films, firm, level, and plumb true to 1/8 inch in 8 feet. Corners must be square, straight and plumb.

This contractor shall not start tile surfacing until above requirements are met, nor before required grounds, anchors, plugs, hangers, bucks and electrical-mechanical work is ready, nor until satisfactory protection of adjoining surfaces has been provided. Start of tile work will imply acceptance of surfaces to receive tile.

Close all traffic and other work spaces in which tile is being set and shall remain closed until tile is firmly set. Use manufacturers directions for specific temperatures allowed for setting and grouting. Provide and operate safety spark-proof fan when natural ventilation is inadequate. Smoking is prohibited when using adhesives containing inflammable volatile solvents.

PART 4 CUTTING, FITTING & SETTING ACCESSORIES:

Cut and drill tile for proper fitting around all equipment in place without damaging tile. Rub down with abrasive stone all exposed sharp edges of cuts. Grind and fit carefully at intersections, against trim finish, built-in fixtures and accessories. Fit tile closely around outlets, pipes, fixtures and fittings, so that plates, escutcheons, and collars will overlap cut.

PART 5 INSTALLATION:

NOTE: WORK IN WELL-LIGHTED AREAS ONLY!

All material, labor and processes for the completion of the tile work required shall conform to the herein above material standards and to the appropriate setting specification established by the Tile Council of America in its publication "Handbook for Ceramic Tile Installation", latest edition, herein listed as ANSI A108 as applicable.

Tile shall be set plumb and true, in register.

Inorganic Bonding Coat Application: In the event a thin leveling coat is used on cinder block or concrete surfaces, by choice of tile Contractor, such shall be applied by this contractor, to the minimum depth, and to the specifications of the Tile Council of America.

Laying Out Work: Center the fieldwork in both directions to permit the pattern to be laid with minimum of cut tiles. Floors shall be laid from the center lines outward and adjustments made at the walls.

Adhesive Application: The adhesive shall be applied uniformly over the area to receive tile, using quantities recommended by the manufacturer of the adhesive and using a notched trowel held at the proper angle to insure a uniformly spread coating of the proper thickness. Thin or bare spots shall be touched up by an additional coating of adhesive. The area coated at one time shall not be larger than recommended by the manufacturer of the adhesive.

Setting Tile: After the adhesive or bonding coat has been properly applied, the sheets of tile or individual tiles shall be pressed firmly into the fresh adhesive or bonding coat and carefully aligned along previously established lines. After the adhesive or bonding coat has partially set, the individual tiles shall be re-aligned where necessary. Broken or defective tiles shall be removed and replaced.

PART 6 GROUTING:

The adhesive or bond coat shall be allowed to set for 24 hours before grouting. Joints shall be cleaned of dust, dirt, and excessive adhesive from joints. Tile shall be thoroughly dampened with water prior to grouting. Ceramic tile floors shall be filled with Portland Cement, lime and sand grout or with an approved ready-mix grout for floors. Ceramic tile walls shall be a factory blended latex grout. The grout shall be water-resistant and non-staining to the tile. Joints shall be tooled slightly concave and excess mortar shall be cut off and wiped from the face of the tile.

PART 7 CLEANING & PROTECTION:

All surfaces will be carefully cleaned after pointing is completed. Remove all rubbish, materials, etc., from the premises, daily.

PART 8 GUARANTEE:

The contractor shall guarantee his work for a period of ten years from the date of final acceptance of the entire project. Tiles loosened or broken during the period from any cause, shall be replaced without costs to the Owner.

END OF SECTION 09300

SECTION 09305

TILE SETTING MATERIALS AND ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Setting materials: adhesives, mortars, grouts, and sealants.

1.2 RELATED SECTIONS

- A. Section 03300 - Cast-in-Place Concrete.

1.3 SUBMITTALS

- A. Submit under provisions of Section 01 30 00.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) long, representing actual product, color, and finish.
- D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum five years experience.
- B. Source Limitations for Setting Materials and Accessories: Obtain product of a uniform quality for each application condition from a single manufacturer.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Finish areas designated by Architect.
 - 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
 - 3. Refinish mock-up area as required to produce acceptable work.
- D. Preinstallation Conference: Conduct conference at the Project site.
 - 1. Convene one week prior to commencing work of this section.
 - 2. Require attendance of installation material manufacturer, tile supplier, tile installer and installers of related work. Review installation procedures and coordination required with related work.
 - 3. Meeting agenda includes but is not limited to:
 - a. Surface preparation.
 - b. Paver and installation material compatibility.
 - c. Edge protection, transition and pre-fabricated movement joint profiles.
 - d. Waterproofing techniques.
 - e. Crack isolation techniques.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.

- B. Protect materials from exposure to moisture. Do not deliver until after wet work is complete and dry.
- C. Store materials in a dry, warm, ventilated weathertight location.

1.6 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.7 COORDINATION

- A. Coordinate Work with other operations and installation of floor finish materials to avoid damage to installed materials.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Schluter Systems, L.P., Ditra - Ditra plus

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SCOPE: The work under this section of the specifications shall include furnishing all supervision, labor, materials, tools and equipment and performing all operation necessary for the complete execution of the acoustical ceiling system as described in the drawings and specifications in a first class workmanship manner.

RELATED DOCUMENTS: Drawings and general provisions of contract, including General Conditions and Division - 1 Specification Sections, apply to this work.

GENERAL REQUIREMENTS: THE NEW CEILING SYSTEM SHALL BE 1 HOUR U.L. RATED WHERE INDICATED ON THE PLANS - ONLY. REMAINING AREAS SHALL HAVE UN-RATED CEILINGS.

- A. Job conditions: Installation of acoustical units must not begin until the conditions comply with those stated in the current Acoustical and Board Products Association (ABPA) Bulletin, installation recommendation section, "Job Conditions", and as stated the Ceiling and Interior Systems Contractor Association Handbook," (CISCA).
- B. Receiving and storing materials: All materials must be delivered in original unopened packages with manufacturer's name and contents legibly indicated and stored in a safe enclosed area protected from damage until ready for use.
- C. Preparatory Work: The acoustical contractor shall be responsible for inspecting and accepting all areas to receive acoustical treatment as to proper job conditions and coordination of work or other trades. All work of other trades in the plenum space to be concealed by the acoustical ceiling must be inspected and approved by those having jurisdiction, and execution of the ceiling installation shall not proceed until so authorized.
- D. The General Conditions of this specification from an integral part of the contract for the work specified in this section and all conditions contained therein shall be binding upon the contractor and shall govern the work.
- E. The installation of all suspension systems and acoustical materials by a qualified acoustical subcontractor.
- F. It is the responsibility of the acoustical subcontractors to obtain all required licenses and permits necessary for installation of the acoustical work specified herein.

MATERIALS

- A. Ceiling Grids:
 - 1. The suspended ceiling system shall be equal to 1 hour USG Donn LXL "Fire-Rated" Grid System as manufactured by Donn Corporation, or equal, Westlake, Ohio and listed in the Underwriters' Laboratories, Inc., Fire Resistance Directory, Roof or Floor, and Ceiling Construction and Beam Protection. Components shall be formed from commercial quality cold-rolled steel, electro-galvanized coated and pre-painted.
 - 2. The non-rated areas shall have a grid system equal to USG Donn DX Class "A".
- B. Acoustical Panels:
 - 1. FIRED RATED Acoustical lay-in panels shall be equal to Armstrong's MINABOARD Fire Guard; 24" x 48" x 5/8" panels. The design shall be Fissured 895, white.

1 Hr. UL labeled: Flame Spread Class = 25

NCR Range = .55 - .65

STC Range = 35 - 39

LR - 1

2. NONRATED Acoustical lay-in panels shall be equal to Armstrong's MINABOARD 24" x 5/8" (or 24" x 48") panels fissured 755, white.
- C. Suspension System: All components shall be equal to Donn's Suspension System with a design assembly tested and given at least a one-hour fire resistance classifications by the Underwriter's Laboratories for this type of construction.
1. Main Runners: Approximately 24 ga. x 1-1/2x15/16 steel tees painted white. Gross tees shall be listed U.L., Inc. (Building Materials List, Build No. 40 018 18).
 2. Main runner Splice: Approximately 24 ga. x 1-1/4x6" calumniated steel. Main runner splices shall be listed U.L., Inc., (Building Materials List, Guide No. 40 018.18).
 3. Cross Tees: Approximately 24 ga. x 1-1/2x15/16 steel tees painted white. Cross tees shall be listed by U.L., Inc. (Building Materials List, guide No. 40 018.18).
 4. Hanger Wire: No. 21 ga. S.W.G. galv. wire or heavier.
 5. Wall Molding: 15/16 x 1/16 "L" shaped No. 25 ga., steel painted white.
 6. Hold Down Devices: No. 28 ga., spring steel, 5/8" wide x 1-1/8" high/1-5/8" deep.

INSTALLATION OF EXPOSED GRID SYSTEM: (NOTE: SEE REFLECTED CEILING PLANS)

- A. General: The suspension system and acoustical panels shall be installed in accordance with the manufacturer's instructions and exactly as tested by underwriters Laboratories, using all components and exact size in test.
- B. Suspension System: Hangers shall be secured to ceiling structure not less than 4'-0" o.c. in either direction. Add additional supports where necessary for light fixtures, grilles, etc. All angles shall be installed on a straight and level plane. Plumb the whole ceiling.
- C. Ceiling Panels: Install ceiling panels under temperature and humidity conditions closely approximating those which will exist when the building is occupied and in closed rooms only. Use two hold down clips uniformly spaced along each 48" cross tee.
- D. Contractor shall coordinate all electrical and mechanical work within the field. All lights and grilles shall be symmetrical in a panel, or as shown on the Plans.

END SECTION 09510

SECTION 09511 – ACOUSTICAL PANEL CEILINGS

PART1 – GENERAL

SUMMARY

Provide acoustical lay-in panel ceilings, trim, and exposed metal suspension system.

SUBMITTALS

Submit Product data, color selection charts, textures and installation details for selection of the products used on this Project. Submit actual samples showing the construction of each type of product indicated.

QUALITY ASSURANCE

Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers who have completed acoustical panel ceilings similar in material, design and extent to this project with a record of successful in-service performance.

Obtain each type of acoustical ceiling panel and suspension system from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the work.

Deliver, handle, and store materials in accordance with manufacturer's instructions.

Performance: Fire, structural, and seismic performance meeting requirements of building code and local authorities. Acoustical performance based on project requirements.

WARRANTY

Provide the Manufacturer's Standard warranty against defects in the finishes and the operation of components. Refer to Division 1 Section "Warranties" for additional requirements.

EXTRA MATERIALS

Deliver extra materials to the Owner, at a location as directed, that match the products used in the work as follows:

Acoustical Ceiling tiles of the size used on this project, equal to 2.0 percent of the amount installed.
Ceiling grid (each type) and hanger wires equal to 0.5 percent of the amount installed.

PART 2 – PRODUCTS

MANUFACTURERS

Available Manufacturer's: The following manufacturer's products may be incorporated into the Work, subject to compliance with requirements, but are not limited to the following:

Armstrong World Industries
Celotex and Capaul – Division of BPB America Inc.
Chicago Metallic
USG Interiors

MATERIALS

Available Products: The following products are a list of the materials that are to be incorporated into the Work. The manufacturer products listed here is to be used for guideline standards and other approved manufacturer's products are to meet or exceed the products listed.

Acoustical Ceiling Panels: Mineral Fiber Panels: by BPB – Celotex

Size: 24 by 48 inches by 5/8 inch.

Edge Detail: Square edge.

Pattern: Baroque BET – 197, non-directional fissured

Type and Finish: Factory applied vinyl latex paint.

ASTM E 1264 classification: Type III, Form: 2, Pattern: CD

Acoustical Ceiling Panels – Vinyl faced: Gypsum Panel: BPB – Capual

Size: 24 by 48 inches by 1/2 inch.

Edge Detail: Square edge

Pattern: Vinylrock X, 1140-CRF-1

Type and Finish: Washable vinyl film facing (UV protected)

ASTM E 1264 classification: Type XX,, Pattern: G

Ceiling Grid Suspension System – Manufacturers: Chicago Metallic 1200 non-rated Double Web Suspension System or approved equal:

Suspension System Components:

Main Runners:

Manufactured from 0.015 inch thick steel 15/16 inch wide by 1-1/2 inches high by 120 inches long with factory punched cross tee slots, hanger holes, and intergral bayonet-style end couplings.

Capped with steel capping affixed to 15/16 inch wide by 1-1/2 inches high by 60 inches long with factory punched cross tee slots and hanger holes.

Capped identical to main runners.

Coated identical to main runners.

Perimeter Treatment Components:

Angle Moldings: Manufactured from 0.020 inch thick steel 3/4 inch wide by 15/16 inch high by 120 inches long with hemmed edges finished identical to main runners and cross tees.

PART 3 – EXECUTION

INSTALLATION

Install materials and suspension systems in accordance with manufacturer's instructions and recommendations, and ASTM C636. Coordinate installation with location of mechanical and electrical work to ensure proper locations.

Measure each ceiling area and establish the layout of acoustical panels to balance border widths at opposite ends of each ceiling area. Avoid using less than half-width panels at borders. Conform to the direction shown on the reflected ceiling plan.

Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise shown, and provide hangers not more than 8 inches from ends of each member.

Install edge moldings and trim of type indicated at perimeter of ceiling area and where necessary to conceal edges of acoustical panels.

Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent or kinked members.

Level ceiling to within 1/8" in 10' in both directions. Scribe and cut panels to fit accurately.

Adjust, clean, and touch-up all system components.

Provide wrapped and labeled maintenance stock of new material equal to 2 percent of ceiling panels and suspension grid installed.

END OF SECTION 09511

SECTION 09 62 00

SPECIALTY RUBBER FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Interior Rubber Flooring.
- B. Exterior Rubber Surfacing.

1.2 RELATED SECTIONS

- A. Section 03300 - Cast-in-Place Concrete.

1.3 REFERENCES

1.4 DESIGN / PERFORMANCE REQUIREMENTS

- A. Provide recycled rubber flooring products that are FloorScore certified under the criteria developed by the Resilient Floor Covering Institute (RFCI) and certified by Scientific Certification Systems (SCS), Inc.

1.5 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. MSDS: Material Safety Data Sheets for specified adhesives/sealers
 - 3. Storage and handling requirements and recommendations.
 - 4. Installation methods.
 - 5. Maintenance recommendations.
- B. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- C. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.
- D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- E. Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for periodic cleaning and maintenance and precautions against cleaning materials and methods detrimental to finishes and performance.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum of 10 years documented experience in the fabrication of such products, and of types equivalent to those specified.
- B. Installer Qualifications: Minimum two years documented experience and completed at least three projects of similar magnitude, material and complexity.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and

application workmanship.

1. Finish areas designated by Architect.
2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
3. Refinish mock-up area as required to produce acceptable work.
4. Accepted mock-ups shall be comparison standard for remaining Work

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials in manufacturer's original, unopened, undamaged wrapping and/or containers with identification labels intact clearly marking edge type, thickness, percentage of speckle and shade of color(s).
- B. Inspection: Inspect all deliveries to ensure undamaged goods, and for accurate product type for thickness, edge type, color and speckle. Contact manufacturer immediately if product is damaged or inconsistent with order specifications.
- C. Storage and Protection: Carefully handle all materials and store protected from exposure to harmful weather and at temperature conditions recommended by the manufacturer. Remove pallet banding if long term storage is required, but leave other packaging intact until acclimation is to be started.
- D. Flooring material and adhesive (if required) shall be acclimated to the installation area for a minimum of 24 hours prior to installation. See manufacturer's installation guidelines for details on proper acclimation procedures. Longer acclimation may be required if product has been stored for extended time periods.
- E. Lay out all the tiles to be installed the next day on or near the sub-surface. Allow tiles to equalize to average ambient temperature for about 12 hours. Protected from weather extreme temperatures, solvents, and sources of damage prior to and during installation.
- F. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.8 SEQUENCING

- A. Ensure that locating templates and other information required for installation of products of this section are furnished to affected trades in time to prevent interruption of construction progress.
- B. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.9 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- B. Interior areas to receive flooring shall be clean, level, dry, fully enclosed, weather tight with the permanent HVAC set at a uniform temperature of at least Maintain 68F/20C degrees and less than 85F/30C degrees continuously prior to, during and after installation, but for not less than 48 hours prior to and during, and for not less than 48 hours after installation. Flooring material shall be conditioned in the same manner prior to installation.

- C. Close spaces to traffic during rubber flooring installation and for a period of time after installation as recommended in writing by the manufacturer.
- D. Install rubber flooring materials and accessories after all other finishing operations, including painting, have been completed.
- E. Where demountable partitions and other items are indicated for installation on top of sheet resilient flooring material, install flooring material before these items are to be installed.
- F. Concrete substrates for interior applications should not exceed 80 percent RH and/or 5 lbs by 24 hrs by 1000 sf moisture vapor emissions rate tested in accordance to ASTM F 2170 and ASTM F 1869.

1.10 WARRANTY

- A. Provide Manufacturer's standard 10 Year Limited Warranty for Evolution, Sport Mat, Nature's collection and Play tiles against manufacturing defects.
- B. Provide Manufacturer's standard 5 Year Limited Warranty against manufacturing defects.

1.11 EXTRA MATERIALS

- A. Provide extra material of each tile type and color in the same manufactured lot, in quantities not less than 2 percent of total area installed for each product. Delivery, storage and protection of extra materials shall comply with manufacturers standard requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Dinoflex Group
- B. Requests for substitutions or equal

2.2 INTERIOR RUBBER PRODUCTS

- A. Sports Flooring - NEXT STEP High Impact / High Impact Extreme:
 - 1. Material shall be a non-vulcanized, laminated tile product with homogeneous color top layer, composed of post-consumer recycled SBR (styrene butadiene rubber) combined with low odor EPDM (ethylene propylene diene monomer) rubber granules, bound with a proprietary slow-cured MDI water-based polymer. (Essential for superior elasticity and long term durability.) Backing layer composed of post-consumer recycled SBR (styrene butadiene rubber) bound with a proprietary slow-cured MDI water-based polymer. Layers to be bonded together with proprietary bonding system.
 - 2. All tiles shall be produced in block form (not cut from rolled material) sliced and precision cut using computerized numerically controlled (CNC) water-based equipment. Thickness tolerance is a maximum of +/- 0.5 mm.
 - 3. Edge finish and product size shall be (Enter specified selection)
 - a. Square (Glue Down) 38 inches by 38 inches (96.5 cm x 96.5)
 - b. Interlocking (Loose Lay) 37 inches by 37 inches (94 cm x 94 cm).
 - 4. High Impact Thickness: Tolerance of +/- 0.5 mm

- a. 12 mm (1/2 inch), 4 mm top surface with 8 mm regrind backing
- 5. Color:
 - a. Color as selected from manufacturers list of standard colors.
 - 1) Sport Mat Line.
- 6. Adhesives And Sealers: Provide one of the following adhesives according to manufacturer' recommendations and installation guidelines for specific substrate: OR EQUAL
 - a. DinoGrip Adhesive, one-component urethane, volatile organic compound (VOC) compliant.
 - b. Chemrex CX-941 Adhesive, one-component urethane, volatile organic compound (VOC) compliant.
 - c. DinoCoat Recycled Rubber Floor Treatment, volatile organic compound (VOC) compliant.
 - d. Portland based cementitious base leveler. Gypsum based not acceptable.

B.

2.3 EXTERIOR RUBBER SURFACING

- A. Exterior Rubber Tiles - NuVista: Tiles are a composite product made from a combination of post-consumer recycled SBR (styrene butadiene rubber), EPDM (ethylene propylene diene monomer) rubber, and polyurethane binder. Colored toppings are made from either EPDM granules or SBR granules mixed with pigment. All colored toppings are approximately 1/2 inches (12 mm) thick. Tile backing is made from 100% recycled pre-consumer SBR and EPDM.
 - 1. Nominal Size:
 - a. 24 inches by 24 inches (61 cm x 61 cm)
 - 2. Thickness / Fall Height:
 - a. 1-3/4 inches (44 mm)
 - b. Finishing Kits: Provide as required to fill in cuts around posts and play structure mounts.
 - 3. Interlocking Pins are included, four per tile:
 - a. 4 inches (101 mm) long and 5/8 inches (6.25 mm) in diameter.
 - 4. Half Tiles for use in a staggered layout.
 - 5. Colors:
 - a. As selected from standard color palette
 - 6. Physical properties shall conform to the requirements of the following minimum criteria for standard colors, 50 percent plus EPDM (Subject to nominal variation):
 - a. ASTM C 1028-89: Static Coefficient of Friction, Pigment Color 0.68, Wet 0.75, 50 percent EPDM 0.74, Wet 0.78
 - b. ASTM E 303: Surface Friction, Wet: .56
 - c. ASTM D 573: Aging and Weathering, No Change (75% EPDM color)
 - d. Water Drainage: Porosity, 4 liters of water drained in 306.71 sec

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.

- B. Inspect installation surface immediately upon arriving at job site; perform a moisture test for indoor installations.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- B. Ensure that substrate is free of depressions, raised areas or other defects that might telegraph through installed surface.
- C. Ensure that concrete or plywood substrate is flat and uniformly sloped. Allowable variations in substrate levels are +/- 1/8 inches in 10'-0 inches and 1/4 inches total maximum variation from levels shown.
- D. Concrete Substrates: The Contractor shall verify to the Owner and installer a minimum of 30 days prior to the scheduled resilient flooring installation the following substrate conditions. All substrate testing shall be documented and submitted to the Architect and Owner before commencement of the flooring installation.
 - 1. Verify that substrates are dry, free of debris, and that all curing compounds, sealers, and hardeners have properly cured.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
 - 4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing
- E. Do not proceed with installation until all applicable site work, including substrate preparation, painting, equipment installation and other relevant work by trades affecting the installation area, has been completed.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

3.4 CLEANING

- A. Remove any adhesive residue on the rubber flooring as recommended by the manufacturer. Do not use mineral spirits to clean adhesive off the tiles.
- B. After completion of installation and before acceptance by Owner, perform the cleaning operations as prescribed in the manufacturer's Installation/Maintenance Guidelines.

3.5 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.
- C. If recommended for this project, apply recommended sealer following manufacturer's guidelines.

SECTION 09900- PAINTING

PART 1 GENERAL

1.01 DESCRIPTION:

- A. The surfaces to be painted in this Work are indicated on the Drawings (in the Room Finish Schedule, List of Finishes, and as specifically noted) and in the Painting Schedule in this Section of these Specifications.
- B. Surfaces to be painted: Except for surfaces specified or scheduled not to be painted and except for factory-finished items, job-paint all surfaces, interior and exterior, exposed to view or weather. Examine other sections of these specifications to determine other items which are factory-finished or prime-coated. Prime-coated items shall be job-finished under this section. Special attention must be given to the painting of all doors. All required finishes must be applied to all surfaces - See Section 3.04 N.
- B2. **Note: In all areas having an "open interior structure" (no ceiling), all exposed elements and construction shall be painted. Such elements include, but are not limited to, ductwork, metal roof deck, steel joists, bridging, etc. steel beams, and other structural components. Different elements shall be painted in different colors. Refer to the Drawings for specific information.**
- C. Surfaces not to be painted: Surfaces not to be finished under this Section: non-ferrous metals, acoustical ceilings, floor coverings, wallcoverings, and roofing. In mechanical and electrical equipment rooms and similar spaces used by maintenance personnel only, do not paint conduit, piping, structural steel or steel joists except for touch-up, unless scheduled otherwise.
- D. Related work in other sections: Hollow Metal Work and Gypsum Drywall.

1.02 SUBMITTALS:

- A. Painting materials scheduled are products of **SHERWIN-WILLIAMS Co.**, unless indicated otherwise. Substitutions may be requested in accordance with Shop Drawings and Submittals. Approved manufacturer's specifications must be adhered to. The following are acceptable, subject to specification compliance; first line products as selected by Architect:
Possible substitute colors must be exact computer match to the specified colors.
 - 1. Sherwin-Williams
 - 2. Pittsburgh
 - 3. Comex/Kwal Paint
 - 4. Benjamin Moore
 - 5. Dunn Edwards
- B. Submittals: Before starting work, submit a schedule in triplicate showing the name of paint manufacturer, type of paint to be used on each different surface in building.

- C. Color selections: Color schedules will be issued prior to beginning of painting work. In general, color schemes will be repeated so excessive number of colors are generally not required. However, for pricing purposes, the contractor, shall not base his bid on a color limit. No additional funds will be granted for multiple color and/or texture selections. Colors; factory mixed, but Contractor shall tint samples at job as required until the colors, textures are satisfactory.
 - D. Color samples: Prepare samples of each kind of painted work and each color for approval sufficiently in advance of beginning of work to permit adequate time for consideration of materials, colors. Prepared samples minimum 12" squares.
 - E. Provide certificates stating fire hazard classification of each material furnished for this project under any specification provision related to fire resistance or surface burning characteristics.
- 1.03 PRODUCT HANDLING:
- A. Deliver sealed containers with labels legible, intact.
 - B. Store and mix materials only in such rooms as may be assigned for this purpose and take all necessary precautions to prevent fire. Comply with health, fire regulations.
 - C. Cover or otherwise protect finished work of other trades and surfaces not being painted concurrently or not to be painted.
 - D. In the event of damage, immediately make all repairs and replacements necessary at no additional cost to the Owner.
- 1.04 QUALITY ASSURANCE:

All paint products used for interior spaces, must comply with "EPA Method 24", meaning it must contain less than 450 grams of VOC/VOS per liter of coating (3.8 pounds per gallon).

PART 2 PRODUCTS

2.01 PAINT MATERIALS:

- A. Where necessary to thin any oil vehicle paint materials, use either pure linseed oil or turpentine unless manufacturer of material calls for other types of thinners.
- B. Use one brand of materials insofar as possible. In any case, primers and sealers shall be same brand as finish coats.
- C. Paint, varnish, fillers: Of type, brand hereinafter specified under "Schedule of Painting Materials" such as linseed oil, shellac, turpentine, etc. shall be of highest quality, with identifying labels on containers.

PART 3 EXECUTION

3.01 ENVIRONMENTAL REQUIREMENTS:

- A. Comply with manufacturer's recommendations as to environmental conditions under which coating, coating systems, can be applied.
- B. Do not apply finish in area where dust is being generated.

3.02 EXAMINATION OF SURFACES:

Carefully inspect surfaces to be painted, covered or otherwise finished, and notify in writing of any defects, improper materials, workmanship or other defects which will affect satisfactory execution and permanency of work. Absence of such notification shall be construed as acceptance by this subcontractor of surfaces, and later claims of defects in surfaces will not relieve this subcontractor from responsibility under his guarantee.

3.03 PREPARATION OF SURFACES:

NOTE: The complete and proper preparation, including but not limited to, cleaning, sanding, stripping, patching, and leveling of all surfaces which have existing and old finishes, shall be part of this contract. It shall be the contractor's responsibility to examine all existing surfaces, prior to Bid. Requests for additional funding at a later time will not be granted.

- A. Wood: Sandpaper to smooth, even surface, then dust off. Prime knots, pitch streaks, with two coats shellac before priming. After priming has been applied, thoroughly fill nail, other holes, cracks, with plastic wood or putty. Sandpaper, dust off between coats.
- B. Steel and iron: Remove grease, rust scale, dust; touch up any chipped or abraded places on shop-coat. Remove heavy coating of scale from ferrous metal by wire-brushing or sandblasting as necessary to produce a satisfactory surface for painting.
- C. Galvanized metal: Wash untreated surfaces with solution of chemical phosphoric metal etc., allow to dry at least 12 hours, dust off. All exposed galvanized surfaces shall be painted except at structural steel.
- D. Gypsum board and plaster: Before painting, test with moisture testing device, apply no paint or sealer when moisture content exceeds 8%. Test sufficient areas in each space as often as necessary, to determine proper moisture content for painting. Gypsum board and plaster used as backing for wall fabric shall receive one coat of size.
- E. New and Previously Painted Concrete Tilt-up Surfaces:
 - Surface to be painted should be free of all dirt, chalk, grease/oil, loose and

flaking paint, etc., in accordance with SSPC-SP-2 (Hand-Tool Cleaning), SSPC-SP-3 (Power-Tool Cleaning), or NACE RF-01-72 ("Water-Blast Cleaning").

- In severe cases, all old paint shall be removed.
 - New concrete surfaces must be allowed to cure no less than 30 days.
 - All surface imperfections need to be filled with appropriate patching material.
- F. General: Before painting, remove hardware, accessories, plates, similar items or provide ample protection of such items. Upon completion of each space, replace. Remove doors to paint top and bottom edges.
- G. Provide scaffolding, drop cloths and other equipment necessary to execute work, and which is not specifically mentioned to be provided by others.

3.04 APPLICATION:

- A. Apply to highest standards by skilled mechanics.
- B. Surfaces to be painted shall be clean, dry smooth, protected from dampness. Each coat of paint shall be well brushed on, worked out evenly. Comply with recommendations of product manufacturer for drying time between succeeding coats. Except as specifically approved otherwise by the Architect, confine spray application to metal frame work and similar surfaces where brush work would be obvious and undesirable.

NOTE: Where spray application is used, back rolling of prime coat on gypsum board is required. Do not double back with spray equipment to build up film thickness of two coats in one pass.

- C. Vary slightly the color of successive coats. Secure approval of each coat before proceeding with next coat.
- D. Finish coats shall be smooth, free of brush marks, streaks, laps or pile-up of paints, skipped or missed areas.
- E. Make edges of paint adjoining other materials or colors clean, sharp with no overlapping.
- F. Paint prime-coated hardware, grilles and registers same color surrounding material.
- G. Back-priming shall be of same material as specified for front side; required for all wood cabinets, millwork, trim, except where finish is plastic laminate. Back primed concealed parts before erection. Take care that back painting does not contact exposed finish surface.
- H. Do not paint sealant unless directed.
- I. Fire and smoke rated partitions as identified on plans shall be permanently

identified on both sides above ceilings and in concealed spaces by red-painted stenciled notices spaced not over 10 feet apart. Lettering shall be not less than one (1) inch high. Wording at corridors shall be "CORRIDOR PARTITION - PROTECT OPENINGS". At smoke compartment boundaries, wording shall be "SMOKE PARTITION-PROTECT OPENINGS". At horizontal exit walls, exit enclosures, hazard enclosures and other fire walls wording shall be "ONE-HOUR FIRE BARRIER - PROTECT OPENINGS" (or TWO-HOUR, as indicated on plan).

- J. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only before final installation of equipment.
- K. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint.
- L. Paint back sides of access panels, and removable or hinged covers to match exposed surfaces.
- M. Prime faces of wood doors, except where plastic faced, with one coat of clear alkyd sealer as soon as doors are delivered to job site.
- N. Scheduled door finish (paint or stain with sealer - not only sealer!) must be applied to all door surfaces, including tops, bottoms, and all sides. Non-Compliance with this requirement will be subject to rejection of the installed doors. DO NOT REMOVE OR PAINT OVER DOOR LABELS INDICATING FIRE RATING!!!
NOTE: Prior to commencing the painting work, the painting contractor must provide a written statement to the Architect via the Construction Manager wherein they acknowledge that the content of the above requirements are completely understood, and will be fully implemented.
- O. Re-coat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.
- P. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage.
- Q. Transparent (Clear) Finishes: Use multiple coats to produce glass-smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections.
- R. Provide satin finish for final coats, unless otherwise indicated.
- S. Complete Work: Match approved samples for color, texture, and coverage. Remove, refinish or repaint work not in compliance with specified requirements.
- T. Paint all cover plates for electrical, plumbing, mechanical, telephone, computer, etc. regardless when these items get installed. At project completion all these items must be painted to match adjacent surface.

- U. Wherever paint is used on metal deck to receive fireproofing, it shall be the responsibility of the contractor to determine compatibility with spray-applied fire resistive material.

3.05 CLEANING:

- A. At the completion of work of other trades touch-up and restore all damaged or defaced painted surfaces.
- B. Remove spilled, splashed or splattered paint from all surfaces.
- C. Leave unfinished space clean, in condition required for equivalent spaces in project.

3.06 PAINTING SCHEDULE:

(NOTE: Schedule is based on " Sherwin-Williams" Products, equal products from different manufacturer's may be approved by the Architect.) Substitutions would require exact computer match to the specified colors.

3.06.1 EXTERIOR PAINT SCHEDULE:

- A. Concrete, Stucco, Brick and Masonry (other than Concrete Unit Masonry): Provide the following finish systems over exterior concrete, stucco, and brick masonry substrates:
1. 100% Acrylic Flat Finish **Two finish coats** over a primer.
 - a) Primer: S-W Loxon Masonry Primer, A24W8300 masonry acrylic primer undercoat. Applied at a dft of not less than 3.2 mils.
 - b) Finish Coats: S-W A-100 Exterior Latex Flat, A6 Series 100% acrylic flat finish. Applied at a dft of not less than 1.2 mils.
 2. Texture Coating: **One finish coat** over a properly prepared substrate. (used for concrete tilt-ups when textured finish is desired, higher costs)
 - a) Primer: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 100% acrylic primer. Applied at a dft of not less than 3.2 mils, or self-priming after power washing.
 - b) Finish Coat: S-W UltraCrete Textured Masonry Topcoat, A44-800 Series Texture Coating. Applied at 50-80 sq ft/gal.
- B. Concrete Unit Masonry: Provide the following finish systems over exterior concrete unit masonry:
1. 100% Acrylic Flat Finish: **Two finish coats** over block filler.
 - a) Block filler: S-W PrepRite Block Filler, B25W25 latex block filler.

Applied at 75-125 sq ft/gal.

- b) Finish Coats: S-W A-100 Exterior Latex Flat, A6 Series 100% acrylic flat finish. Applied at a dft not less than 1.2 mils.
- B-1. Concrete Unit Masonry Clear Sealer: Provide the following finish systems over exterior concrete unit masonry:
- 1. 40% Silane Clear Finish: **1 finish coat**.
 - a) Finish Coat: S-W Loxon 40% Silane Water Repellant, A31T40. Applied per manufacturers recommendations.
- C. Exterior Gypsum Soffit Board: Provide the following finish systems over exterior gypsum soffit board: (Flat Finish is the standard)
- 1. 100% Acrylic Flat Finish: **Two finish coats** over an exterior alkali-resistant primer:
 - a) Primer: S-W Exterior Latex Wood Primer, B42W8041 100% acrylic primer undercoat. Applied to a dft no less than 1.4. mils.
 - b) Finish Coats: S-W A-100 Exterior Latex Flat, A6 Series 100% acrylic flat finish. Applied to a dft not less than 1.2 mils.
 - 2. 100% Acrylic Satin enamel Finish: **Two finish coats** over a primer.
 - a) Primer: S-W Exterior Latex Wood Primer, B42W8041 acrylic primer undercoat. Applied to a dft not less than 1.4 mils.
 - b) Finish Coats: S-W A-100 Exterior Latex Satin, A82 Series 100% acrylic satin enamel. Applied to a dft of not less than 1.5 mils.
- D. Ferrous Metal and Non-Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items (spot prime as needed).
- 1. 100% Acrylic Semi-Gloss Enamel Finish: **Two finish coats** over a rust-inhibitive primer.
 - a) Primer: S-W Pro Industrial™ Pro-Cryl® Universal Primer, B66-310 Series latex metal primer. Applied at a dft of not less than 2.0 mils.
 - b) Finish Coats: S-W Pro Industrial Semi-Gloss Acrylic, B66-650 Series semi-gloss enamel. Applied at a dft of not less than 2.5 mils.
 - 1a. Full-Gloss Alkyd-enamel: **Two finish coats** over a glvanized metal primer. (For High Performance areas, such as hand rails and canopies)
 - a) Primer: S-W Pro Industrial™ Pro-Cryl® Universal Primer, B66-310 Series latex metal primer. Applied at a dft of not less than 2.0 mils.
 - b) Finish Coats: S-W Pro Industrial Alkyd Enamel, B54-150 Series. Applied to a dft not less than 2.0 mils.

3.06.2 INTERIOR PAINT SCHEDULE:

A. Concrete and Masonry (other than Concrete Unit Masonry): Provide the following paint systems over interior and brick masonry substrates: (Egg-shell standard)

1. Flat Acrylic Finish: **Two finish coats** over a primer.
 - a) Primer: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300. Applied at a dft of not less than 3.2 mils.
 - b) Finish Coats: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series. Applied to a dft of not less than 1.6 mils.
2. Low-Luster Acrylic-enamel Finish: **Two finish coats** over a primer.
 - a) Primer: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300. Applied at a dft of not less than 3.2 mils.
 - b) Finish Coats: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series. Applied to a dft of not less than 1.7 mils.
3. Semi-Gloss Acrylic-enamel Finish: **Two finish coats** over a primer.
 - a) Primer: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300. Applied at a dft of not less than 3.2 mils.
 - b) Finish Coats: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series. Applied to a dft of not less than 1.7 mils.
4. Waterborne Polyamide Semi-Gloss Epoxy: **Two finish coats** over a primer. (Use for High Performance such as Bathrooms)
 - a) Primer: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300. Applied at a dft of not less than 3.2 mils.
 - b) Finish Coats: S-W Pro Industrial Pre-Catalyzed Water Based Epoxy Semi-Gloss K46 Series. Applied to a dft of not less than 2.0 mils.

B. Concrete Unit Masonry: Provide the following finish systems over interior concrete unit masonry: (Egg-shell standard)

1. Flat Acrylic Finish: **Two finish coats** over block filler.
 - a) Block Filler: S-W PrepRite® Block Filler, B25W25. At 75-125 sq ft/gal.
 - b) Finish Coats: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series. Applied to a dft of not less than 1.6 mils.
2. Low-Luster Acrylic enamel Finish: **Two finish coats** over block filler.

- a) Block Filler: S-W PrepRite® Block Filler, B25W25. At 75-125 sq ft/gal.
 - b) Finish Coats: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series. Applied to a dft of not less than 1.7 mils.
3. Semi-Gloss Acrylic Enamel Finish: **Two finish coats** over block filler.
- a) Block Filler: S-W PrepRite® Block Filler, B25W25. At 75-125 sq ft/gal.
 - b) Finish Coats: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 enamel. Applied to a dft of not less than 1.6 mils.
4. Waterborne Polyamide Semi-Gloss Epoxy: **Two finish coats** over a primer. (Use for High Performance such as Bathrooms)
- a) Block Filler: S-W PrepRite® Block Filler, B25W25. At 75-125 sq ft/gal.
 - b) Finish Coats: S-W Pro Industrial Pre-Catalyzed Water Based Epoxy Semi-Gloss K46 Series. Applied to a dft of not less than 2.0 mils.
- C. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces: (Egg-shell standard)
1. Flat Acrylic Finish: **Two finish coats** over primer.
- a) Primer: S-W ProMar 200 Zero VOC Latex Primer, B28W2600. Applied at a dft of not less than 1.5 mils.
 - b) Finish Coats: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series. Applied to a dft of not less than 1.6 mils.
2. Low-Luster Acrylic Enamel Finish: **Two finish coats** over primer.
- a) Primer: S-W ProMar 200 Zero VOC Latex Primer, B28W2600. Applied at a dft of not less than 1.5 mils.
 - b) Finish Coats: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series. Applied to a dft of not less than 1.7 mils.
3. Semi-Gloss Acrylic Enamel Finish: **Two finish coats** over primer.
- a) Primer: S-W ProMar 200 Zero VOC Latex Primer, B28W2600. Applied at a dft of not less than 1.5 mils.
 - b) Finish Coats: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 enamel. Applied to a dft of not less than 1.6 mils.
4. Waterborne Polyamide Semi-Gloss Epoxy: **Two finish coats** over a primer. (Use for High Performance such as Bathrooms)

- a) Primer: S-W ProMar 200 Zero VOC Latex Primer, B28W2600. Applied at a dft of not less than 1.5 mils.
 - b) Finish Coats: S-W Pro Industrial Pre-Catalyzed Water Based Epoxy Semi-Gloss K46 Series. Applied to a dft of not less than 2.0 mils.
- D. Interior Concrete Floors: Provide the following paint finish system over interior concrete floors:
- 1. Water-Based Gloss Epoxy; Abrasive blast followed by **two finish coats** over a Sealer coat. (Not LEED, use Acrylic 2. Or Clear 3. If LEED)
 - a) Seal Coat: ArmorSeal Floor-Plex® 7100 Primer, B70W410.
 - b) Finish Coats: ArmorSeal Floor-Plex 7100 Water Based Epoxy, B70-400 Series. Applied not less than 1.5 to 2.0 dry per coat.
 - 2. Acrylic Primer/ Acrylic System: **Two finish coats.**
 - a) Finish Coats: ArmorSeal Tread-Plex B90. Apply per manufacturer's recommendations.
 - 3. Clear Gloss Sealer and Finish: **Two finish coats.**
 - a) Finish Coats: S-W H&C Wet Look Clear. Apply per manufacturer's recommendations.
- E. Wood and Hardboard: Provide the following paint finish systems over new interior wood surfaces:
- 1. Semi-Gloss Alkyd-Enamel finish: **Two finish coats** over a primer.
 - a) Primer: S-W Premium Wall & Wood Primer, B28W8111. Applied to a dft of not less than 1.8 mils.
 - b) Finish Coats: S-W ProMar 200 Waterbased Acrylic-Alkyd Semi-Gloss, B34-8200 Series. Applied to a dft of not less than 1.7 mils.
- F. Ferrous Metal and Non-Ferrous Metal: Provide the following finish systems over metal. Primer is not required on shop-primed items (spot prime as needed).
- 1. 100% Acrylic Semi-Gloss Enamel Finish: **Two finish coats** over a rust-inhibitive primer.
 - a) Primer: S-W Pro Industrial™ Pro-Cryl® Universal Primer, B66-310 Series latex metal primer. Applied at a dft of not less than 2.0 mils.
 - b) Finish Coats: S-W Pro Industrial Semi-Gloss Acrylic, B66-650 Series semi-gloss enamel. Applied at a dft of not less than 2.5 mils.
- G. Exposed Metal Ceilings: Provide the following finish systems over metal.

Primer is not required on shop-primed items (spot prime as needed).

1. Dryfall Flat Finish: One finish coat over a rust-inhibitive primer.
 - a) Primer: S-W Pro Industrial™ Pro-Cryl® Universal Primer, B66-310 Series latex metal primer. Applied at a dft of not less than 2.0 mils.
 - b) Finish Coat: S-W Pro Industrial Waterborne Acrylic Dryfall Flat, B42-80 Series. Applied at a dft of not less than 1.7 mils.

3.06.3 INTERIOR STAIN AND NATURAL-FINISH WOODWORK SCHEDULE:

A. Stained Woodwork and Wood Doors: Provide the following stained finishes over new interior woodwork and wood doors:

1. Alkyd/Water-Based Stain Satin-Varnish Finish: Two finish coats of water-based clear satin polyurethane over a sealer coat and interior wood stain.
 - a) Stain coat: S-W Wood Classics 250 VOC g/L Interior Oil Stain, A49 Series.
 - b) Sealer Coat: S-W Wood Classics WB Polyurethane, Satin, A68 Series.
 - c) Finish Coats: S-W Wood Classics WB Polyurethane, Satin, A68 Series.

NOTE 1. All exposed wood surfaces of any kind within the project shall be covered under this provision, unless they are specifically and clearly excluded. If in doubt, the sub-contractor must obtain clarification, prior to submitting a proposal.

NOTE: 2: Approximately six, 8" x 12" different color samples (on maple veneer) are required for the Architect's final selection.

3.07 MATERIAL COMPLIANCE:

Work in this section of the specifications shall be governed by General Requirements, Section 01000 - Codes and Standards. If conflict exists between products and methods herein specified and the Section noted above, notify Architect via the Construction Manager 10 days prior to submitting a proposal.

END OF SECTION

SCOPE: This section includes metal partitions and doors, and related items required to complete the work indicated on the drawings and as specified herein.

RELATED DOCUMENTS: The conditions of the contract, including General Conditions and General Requirements, apply to this section.

GENERAL: Toilet & shower partitions as specified herein shall be 1st line (Headrail braced) as shown and/of scheduled, with baked enamel finish and shall be complete with all required items of fittings, hardware, fastenings, etc., see manufactured by Knickerbockers, of approved equal.

Install all accessories to strict conformance with the manufacturer's recommendations and requirements, securely and as specified herein. Mount accessories for handicapped in conformance with applicable handicapped codes.

SIZE: Unless otherwise indicated on the drawings, the dimensions of the partitions shall not be less than:

TOILET

ENCLOSURE:	width	3'- 0"
	height	5'- 10"
	width (clear)	3'- 4" at handicap stalls 5'- 0"
	depth (clear)	5'- 9"

DOORS	width	1'- 0"
	height	4'- 10"
	width	5'- 0" at handicap stalls

FLOOR	Clearance	1'- 0"
-------	-----------	--------

MATERIALS: Doors and partitions: Doors and partitions shall be 1 inch thick made of two sheets of galvanized bonderized sheet steel, pan formed, assembled over and cemented under pressure to a dense sound-deadening core insulation. The two face plates on electrically welded together and sealed with continuous oval crown locking strips; interlocking strips on doors and partitions mitered and welded at corners. Doors shall be a minimum of 22 gauge, partitions a minimum of 20 gauge.

PILASTERS: Shall be 1-1/4" thick, made of 2 sheets of 18 gauge galvanized bonderized steel, welded together and finished as specified for partitions and doors.

HARDWARE AND FITTINGS: Dividing partitions and pilasters shall be attached to one another and to the walls with brackets made of heavy extruded aluminum alloy, heat treated, polished and anodized finish. Attachment of pilasters to floor or ceiling shall be concealed with a one-piece 3" high polished stainless steel trim made theft-proof by securing in place with concealed spring anchor clips without the use of exposed screws. Provide soap dishes & robe hooks at shower stalls.

Doors shall be equipped with concealed, controlled, gravity of torsion rod type hinge. Doors shall be mounted on upper and lower hinge bracket of high tensile alloy, factory mounted on the pilasters in position, and shall be finished to match on the pilaster. Top hinge pivot door bracket shall be recessed and inset into edge of door. Hinge to be adjustable to permit the door to come to rest at any angle, or to hold the door open or closed when not latched. All moving parts to be self-lubricating and to be completely concealed within the 1" thickness of the door. Top and bottom door hinge casting shall be heavy one-piece cast non-ferrous alloy and top and bottom hinge corner of door sheets shall be so formed that when the door castings are applied, the outer face of the casting is flush with the face plates of the door plates. The corner door castings shall be interlocked with an over crown locking strip around the perimeter of the door.

Each door shall be equipped with a cast alloy chrome-plated coat hook and bumper applied with one-way head screws, a concealed latch with face mortised flush with edge locking strip and all working parts completely concealed within the thickness of the door. Latch bolts shall be stainless steel and exposed plate and handle polished chrome-plated cast alloy non-ferrous metal. Unit shall be designed to permit exterior access.

There shall be provided a one-piece heavy cast non-ferrous alloy stop and keeper, polished chrome-plated finish with 3/4" diameter rubber bumper locked in place and made theft-proof. Stop and keeper shall be through-bolted with one-way head shoulder screw and hex units to pilaster.

Provide shower curtains & curtain rods at shower units, rods to be anchored firmly.

SCREENS: Urinal screens shall be same construction, pilaster mounted & overhead braced, as for toilet stalls.

FINISH: All units shall be mechanically cleaned by means of automatic vapor degreasing and finish shall consist of a prime coat and finish color coat of thermosetting acrylic enamel applied electrostatically and baked on to produce a uniform, smooth lustrous protecting finish. Color shall be selected by the Architect.

Uncrating and inspection of stalls and accessories shall be done upon receipt at the job. Damaged stall & door panels shall be immediately re-ordered, not repaired. Fiber shields shall be destroyed and the above specified anchorage items secured in time to avoid delay to the job. THIS WILL BE STRICTLY ENFORCED WITH NO EXCEPTION.

ERECTION: The enclosures and partitions shall be erected in a rigid and substantial manner, straight and plumb with all horizontal lines level. All evidence of drilling, cutting, and fitting on walls and floor finish shall be concealed by the finish work. The clearance at vertical edges of doors shall be uniform from top to bottom and shall not exceed 3/16 inch. Doors and left in perfect working order. Finish surfaces shall be cleaned and left free from imperfections.

All items shall be anchored into 3/16" x 3" square steel concealed back-up plates welded to studs and steel angles. This is an absolute requirement.

Attachment to hollow masonry shall be by adequate toggle bolts. All grab bars must sustain a load of 250 pounds. **FIBER SHIELDS SHALL NOT BE USED AT ANY POINT** and discovery of such use will require complete removal of **ALL** work and reinstallation as specified.

Nothing but a first-class installation will be accepted. Panels, posts, doors or any other parts lost or damaged in any way will be rejected, and must be replaced by shipment from the factory.

ADJACENT WORK & SURFACES: Damage done during erection to floors, walls, ceilings tile work and other parts of the building must be repaired to the Architect's satisfaction of completely replaced. All finishes & accessories adjacent to this work must be in excellent condition at the completion of partition installation.

SUBMITTALS: Color samples and shop drawing shall be submitted for information only to the Architect.

SPECIAL NOTE: The finished installations of toilet partitions and H/C appliances shall be installed plumb, true and solidly.

END OF SECTION 10160

CONDITIONS OF THE CONTRACT and DIVISION I, as indexed, apply to this section.

PART 1 – GENERAL

SUBMITTALS: Submit manufacturer's technical data to the Architect for information only. Indicate methods of construction and finishes.

DESCRIPTION OF WORK: Provide and install steel lockers as shown on the drawings and schedules.

DELIVERY, STORAGE AND HANDLING

- A. Deliver steel lockers cartoned or crated to provide during transit and job storage.
- B. Inspect upon delivery for damage. Minor damage may be repaired provided the finish items are equal in all respects to new work and acceptable to the Owner; otherwise, remove and replace damage items as directed.

PART II – PRODUCTS

Steel lockers shall be as Model STL – 242 double tier manufactured by Tennsco Corporation, Dickson, Tennessee, Tufftec Lockers, Hiney Hiders Solid Plastic or approved equal.

GENERAL DESIGN: To be 12" W x 18" D x 36" H Double Tier welded body construction, door and frame of 16-gauge and body parts of 24-gauge steel. Doors to be provided with recessed handle, flush decorative louvers and quiet latches. Provide filler spaces, ends and sloped tops as required.

Welded lockers are required. Contractor shall submit lockers which have welded body components.

Utilize the following:

- Door frames and locker sides 16 ga.
- Doors are 14 ga with center hinge.
- Sides, tops, and shelves are 16 ga.
- Back shall have 18 ga.

PART III – EXECUTION

Installation shall be in accordance with manufacturer's written recommendations. Furnish and install continuous sloped tops for the wall lockers. Color will be selected from the manufacture's standard colors.

END OF SECTION 10500

General:

Description:

Work Included:

Provide a system, complete with accessories, where shown on the drawings, as specified herein, and as needed for a complete and proper installation.

General:

Furnish and install fire extinguishers and cabinets as directed by Fire Marshall.

ULL-Listed Product:

Provide new portable fire extinguishers which are ULL-listed and bear ULL "Listing Mark" for type, rating and classification of extinguisher indicated.

SUBMITTAL:

Submit product data and installation instructions.

Products:

Manufacturer:

Subject to compliance with requirements, provide one of the following:

JL Industries.
Larsen's Mfg. Co.
Muckle Manufacturing, Division of Technic, Inc.

Provide fire extinguishers of types indicated for each extinguisher cabinet and other locations indicated.

Mult-Purpose Dry Chemical Type:

ULL-rated 4-A:60-B: C, 10 lb. nominal capacity, enameled steel container.

Mounting Brackets:

Manufacturer's standard units of sizes required for type and capacity of extinguisher indicated.

Provide brackets for extinguishers located in cabinets.

Fire Extinguisher Cabinets:

Manufacturer's standard units of suitable size for housing fire extinguishers of types and capacities indicated.

Construction:

Manufacturer's standard enameled steel box, with trim, frame, door and hardware to suit cabinet type, trim style, and door style indicated. Weld all joints and grind smooth. Miter and weld perimeter door frames.

Cabinet Type:

Suitable for mounting conditions indicated, of the following type:

Semi-Recessed:

Cabinet box (tub) partially recessed in walls of shallow depth.

Style:

Exposed Trim:

One piece combination and perimeter door frame overlapping surrounding wall surface.

Rolled-Edge Trim:

Rounded edges with 1.25" backbend

Door Material:

Enameled Steel:

Door Style:

Duo-panel with 1/8" float glass (break glass) slit window with locked door.

Door Hardware:

Provide manufacturer's standard door operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide concealed or continuous type hinge permitting door to open 180 degrees.

Factory Finishing of Fire Extinguisher Cabinets:

Comply with NAAMM "Metal Finishes Manual" to provide uniformly finished products. Apply finishes in factory after products are assembled. Protect cabinets with plastic or paper covering, prior to shipment.

Baked Enamel Finish:

Mfr's factory finish. Apply to interior of cabinet and to exterior. Color as selected by the Architect.

Execution:

Install items included in this section in locations and at mounting height to comply with applicable regulations of governing authorities.

Prepare recesses in walls for fire extinguisher cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.

Where exact location of surface-mounted cabinets with lettering spelling "FIRE EXTINGUISHER" applied to door by silk screen process. Provide lettering to comply with requirements indicated for Helvetica medium letter style, white color, size spacing and vertical layout.

END OF SECTION 10522

SECTION 10800 - TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

Provide and install toilet accessories and metal framed mirrors as indicated on drawings.

Product Data: Provide information on various required accessories including acceptable load data, finishes available, and installation requirements.

Manufacturer's installation Instructions: Indicate installation procedures and perimeter conditions requiring attention.

QUALITY ASSURANCE

Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with Manufacturer's instructions.

WARRANTY

Provide the Manufacturer's Standard warranty against defects in the finishes, rust-out of partitions and operation of components refer to Division 1, Section "Warranties" for additional requirements.

PART 2 - PRODUCTS MATERIALS

Manufacturers:

Bobrick Washroom Equipment
Bradley Corp.
GAMCO
or approved equal

Toilet Accessories: Provided and installed by the Contractor - Products listed below are as manufactured by Bradley or approved equal -

Grab Bars: Model No. 812-2, 36 inches on rear wall and 48 inches on side wall - refer to plans

Toilet tissue dispensers, double roll #5402

Soap dispensers, wall mounted -#655

Under sink pipe covers

Mirror and Frames: Model No. 781-1836
Size: 18 inches wide by 36 inches height
Glazing: Mirror glass, 1/4" thick, ASTM C 1036.
Frames: Stainless Steel

Hand Dryer : Model No.2902-287400 Satin Finish, ADA compliant

Feminine Disposal: Model No. 478-15 Satin Finish

Contractor shall provide backing material for all accessories.

PART 3 - EXECUTION

INSTALLATION

Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.

Clean and protect from damage.

END OF SECTION 10800

PART 1 - GENERAL

The work covered by this section of the specifications consists in furnishing all services, labor and materials in performing all operations in connection with the furnishing and installation of all equipment listed hereinafter, complete in strict accordance with this section of the specifications and the applicable drawings, and including the complete assembly, placing, fitting, joining and connection of same into units. It includes the furnishing of all items of fittings, trim rough ins, etc., required for complete and working installation.

1.01 SCOPE

1. Included herein is the following equipment:

Fire extinguishers and cabinets
Toilet Accessories

1.02 SHOP DRAWINGS - EQUIPMENT LISTS

- a. This Contractor shall furnish five (5) sets of shop drawings and equipment lists for approval by the Architect.

Those shall clearly state the type, quantity and quality of the offered equipment and full list of fittings included therewith. Two copies will be retained.

1.03 SAMPLES

- a. One sample of each accessory proposed for use shall be submitted to the Architect for approval. Approved samples may be installed in the work.

1.04 INSTALLATION

- a. Surfaces of fastening devices exposed after installation shall have chromium plated finish. Exposed screw heads shall be oval. Specified heights above floor are to be center to the necessary and are approximate.
- b. Surface Mounted Accessories: Except as hereinafter specified, surface-mounted accessories shall be installed with machine screws in metal shields, with molly anchors, or with toggle bolts, as required by the construction. Back plates for surface-mounted accessories shall be installed in the same manner or shall be provided with lugs or anchors and set in mortar, as required by the construction.

1.05 MISCELLANEOUS HARDWARE AND FITTINGS

- a. Miscellaneous hardware and fittings shall be of the type and manufacture noted on the drawings, or approved equal. All items shall be installed in a workmanlike manner and in accordance with the manufacturer's recommendations. Stock aluminum shapes used or finish pieces shall be aluminated aluminum.

1.06 FIRE EXTINGUISHERS: Provide where shown on plans and specified herein and as directed by the Fire Marshall:

- a. Provide and install 10 pound multi-purpose A: B: C: 10 dry chemical type fire extinguisher No. A-10A as manufactured by Larsens w/brackets mp10 Series, or approved equal manufacturer for all fire extinguishers.

- b. Cabinets for the NO. A-10A extinguishers shall be break glass type, 2712 RL ; all with locking door and full "Break Glass" panel, or approved equal. Box size shall be 27" x 8" x 12" inside.
- c. Fire extinguishers in the weight area shall be mounted on wall where shown with wall brackets.

1.07 Not Required**1.08 TOILET ACCESSORIES: (Bradley, or approved equal)**

This list of accessories will be provided and installed by the Contractor:

Paper Towel Dispenser – Bradley #250-15
Paper Towel Receptacle – Bradley # 346
Mirror – Bradley #7405 – 24" x 30" with shelf
Towel Hook – Bradley #9311 two at each shower location
Grab Bar – Bradley #817-001 48" & 24" x ½" diameter stainless steel, with concealed anchors and mounting kits for each wall condition provide 1 ea. at each handicapped shower.
Grab Bar – Bradley #812-1 48" & 36" x 1-½" diameter stainless steel, with concealed anchors and mounting kits for each wall condition provide 1 ea. at each handicapped toilet.
Napkin/Tampon Dispenser – Bradley #426-one at each women's toilet
Soap Dispenser – Bradley #660 – 2 total
Soap Dish – Bradley #900 one at each shower
Napkin/Tampon Disposal – Bradley #4721-15-one each women's room shared on center toilet partition - #4722-15 at single toilet.
Shower Rod – Bradley #9539 - as shown at each shower location
Shower Curtain- Bradley #9533 - as shown at each shower location
Shower Curtain Hooks – Bradley #9540 - as shown at each shower location
Folding Shower Seat – Bradley #9568 - one at each H/C shower location
Toilet Tissue Dispensers – Bradley #522 (2 roll) – Surfaced mounted stainless steel.
Provide 1 at each toilet
Under sink pipe covers
Mop Rack – Bradley #9953
Pedestal benches- Bradley # Lenoxpedestal 36"x12", 60"x 12", (2) 42"x20"

END OF SECTION 11001

PART 1 - GENERAL

1.01 SCOPE

- A. The scope of the work included under this Division of the specifications shall include a complete mechanical system as shown on the plans and as specified herein. The Architectural General Conditions of these specifications shall form a part and be included under this section of the specifications. The Mechanical Contractor shall provide all supervision, labor, material, equipment, machinery, plant and any and all other items necessary to complete the mechanical system. All other items of equipment are specified in the singular; however, the Mechanical Contractor shall provide and install the number of items of equipment as indicated on the drawings, and as required for complete systems.
- B. It shall be noted that work under this section of the specifications includes Mechanical General Conditions, 15000; Insulation for Mechanical Systems, 15180; Plumbing, 15400; Heating, Ventilating and Air Conditioning, 15800.

PART 2 - MATERIALS

2.01 CODES, RULES, PERMITS, FEES

- A. The Mechanical Contractor shall give all necessary notices, obtain all permits and pay all government and state sales taxes, fees, and other costs, including utility connections or extensions, in connection with his work; file all necessary plans, prepare all documents and obtain all necessary approvals of all governmental departments having jurisdiction; obtain all required certificates of inspection for his work and deliver same to the Architect before request for acceptance and final payment for the work. The Mechanical Contractor shall include in the work, without extra cost to the Owner, any labor, materials, services, apparatus, drawings, in order to comply with all applicable laws, ordinances, rules and regulations whether or not shown on drawings and/or specified.
- B. All materials furnished and all work installed shall comply with the National Fire Codes of the National Fire Protection Association, with the requirements of all governmental departments having jurisdiction. All materials and equipment for the electrical portion of the mechanical system shall bear the approval label, shall be listed by the Underwriters Laboratories, Inc. and bear the UL label. All mechanical equipment, electrical wiring, and devices shall be in accordance with the National Electric Code (NEC).

2.02 INTENT

- A. It is the intention of these specifications and drawings to call for finished work, tested, and ready for operation. Wherever the word "provide" is used, it shall mean "furnish and install complete and ready for use". Details not usually shown or specified, but necessary for the proper installation and operation, shall be included in the work, the same as if herein specified or shown.

2.03 SURVEYS AND MEASUREMENTS

- A. The Mechanical Contractor shall base all measurements, both horizontal and vertical from established benchmarks. All work shall agree with these established lines and levels. Verify all measurements at site and check corrections of same as related to the work. Should the Mechanical Contractor discover any discrepancy between actual measurements and those indicated, which prevents following good practice or the intent of the drawings and specifications, he shall notify the Architect, through the General Contractor, and shall not proceed with his work until he has received instructions from the Architect. The Contractor must carefully locate and verify all of the existing utilities to be used as a part of this contract.

2.04 DRAWINGS

- A. Drawings are diagrammatic and indicate the general arrangement of systems and work included in the contract. Drawings are not to be scaled. The architectural drawings and details shall be examined for exact locations of fixtures and equipment. Where they are not definitely located, this information shall be obtained from the Engineer, before he proceeds with the work. The Mechanical Contractor shall follow drawings in laying out work and check drawings of other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions at all points. Where headroom or space conditions appear inadequate the Architect shall be notified before proceeding with installation.

2.05 "OR EQUAL"

- A. Wherever the words "approved equal", "equal", or words to the same effect are used in connection with any specified material, it is to be understood that such words mean any material or work of any kind claimed to be an equal in quality to the work or material specified and shall be so approved in writing by the Engineer, except as noted. It is further understood that no material or work shall be presented to the Engineer as work or material equal to that specified without the full understanding on the part of the manufacturers and agents for the so-called "equal" material, and the full understanding on the part of the contractors, that the Engineer is to use his own judgment in the matter; that his decision is final, and that in the event of an adverse condition, no claim of any sort shall be made against the Owner or Architect or Engineer.

2.06 SHOP DRAWINGS

- A. The Mechanical Contractor shall submit for approval detailed shop drawings of all equipment and all material required to complete the project, and no material or equipment may be delivered to the jobsite or installed until the Mechanical Contractor has in his possession the approved shop drawings for the particular material or equipment. The shop drawings shall be complete as described herein. The Mechanical Contractor shall furnish the number of copies required by the General and Special Conditions of the contract, but in no case less than four (4) copies. Prior to delivery of any material to the jobsite, and sufficiently in advance of requirements to allow the Architect ample time for checking, submit for approval: detailed, dimensions, operating clearances, performance characteristics and capacity. Each item of equipment proposed shall be a standard catalog product of an established manufacturer and of equal quality, finish and durability to that specified.

2.07 EQUIPMENT DEVIATIONS

- A. Where the Mechanical Contractor proposed to use an item of equipment other than that specified or detailed on the drawings, which required any redesign of the structure, partitions, foundations, piping, wiring or any other part of the mechanical, electrical or architectural layout, all such redesign, and all new drawings and detailing required therefore, shall be prepared by the Mechanical Contractor at his own expense and approved by the Architect. Where such approved deviation requires a different quantity and arrangement of ductwork, piping, wiring, conduit and equipment from that specified or indicated on the drawings, the Mechanical Contractor shall furnish and install any such ductwork, piping, structural supports, insulation, controllers, motors, starters, electrical wiring and conduit, and any other additional equipment required by the system at no additional cost to the Owner.

2.08 COOPERATION WITH OTHER TRADES

- A. The Mechanical Contractor shall give full cooperation to other trades and shall furnish in writing to the Contractor, with copies to the Architect, any information necessary to permit the work of all trades to be installed satisfactorily and with the least possible interference or delay.

2.09 PROTECTION

- A. The Mechanical Contractor shall protect all work and material from damage by his workmen, and shall be liable for all damage thus caused and replace all damaged materials at no cost to the Owner. The Mechanical Contractor shall be responsible for work and equipment until finally inspected, tested and accepted. He shall protect work against theft, injury or damage, and shall carefully store material and equipment received on-site which is not immediately installed. He shall close open ends of work with temporary covers or plugs during storage and construction to prevent entry of obstructing material.

2.10 SCAFFOLDING, RIGGING, HOISTING

- A. The Mechanical Contractor shall furnish all scaffolding, rigging, hoisting and services necessary for erection and deliver onto the premises any equipment and apparatus furnished. The Contractor will remove the necessary equipment from the premises when no longer required.

2.11 EXCAVATION AND BACKFILLING

- A. Mass excavation to approximate building levels will be carried out under a section of the architectural specifications. The Mechanical Contractor shall; however, do all trench and pit excavation and backfilling required for work under this section of the specifications, inside and outside the building, including repairing of finished surfaces, all required shoring, bracing, pumping and all protection for safety of persons and property. Local or State Safety Codes shall be strictly observed. In addition, it shall be the responsibility of the Mechanical Contractor to check the indicated elevation of the utilities entering and leaving the building. If such elevations require excavations lower than the footing levels, the Architect shall be notified of such conditions and a redesign shall be made before excavations are commenced. It is also the responsibility of the Mechanical Contractor to make the excavations at the minimum required depths in order not to undercut the footing. Filling, backfilling and compaction shall be as specified under the architectural sections of these specifications.
- B. Backfill may be native material except that all material from six inches (6") below the pipe bottom to six inches above the top of the pipe must pass a 3/4" sieve. If the native material is determined to be too rocky by the Engineer, he may require imported material for pipe bedding.

2.12 MATERIALS AND WORKMANSHIP

- A. All materials and apparatus required for the work, except as specifically specified otherwise, shall be new, of first-class quality, and shall be furnished, delivered, erected, connected and furnished in every detail, and shall be so selected and arranged as to fit properly into the building spaces. Where no specific kind or quality of material is given a first-class standard article as approved by the Architect shall be furnished. The Mechanical Contractor shall furnish the services of an experienced superintendent, who shall be constantly in charge of the installation of the work, together with all skilled workmen, fitters, metal workers, welders, helpers, and labor required to unload, transfer, erect, connect, adjust, start, operate and test each system.
- B. Unless otherwise specifically indicated on the plans or specifications all equipment and materials shall be installed with the approval of the Engineer in accordance with the instructions of the manufacturer. This includes the performance of such tests as the Manufacturer instructs.

2.13 MOTORS

- A. Motors shall be built in accordance with the latest standards of NEMA and as specified. Motors shall be tested in accordance with standard of A.S.A., C50 and conform thereto for insulation resistance and dielectric strength. Provide motors manufactured by General Electric, Westinghouse, Allis Chalmers or Century designed for quiet continuous operation with forty (40) degrees C. rise at full load and rated speed as individually specified. Motors shall be of the same make except those incorporated in package units, and all, including those in package units, shall be provided with ball bearings and conduit connection boxes. Unless stated otherwise, motors 1 HP and smaller shall be suitable for operation of single phase, 60 cycle, and 120 volt current. All motors shall be provided with thermal overload protection. Motors 1 HP or larger shall be either 208 volt or 480 volt, three phase as scheduled. Two speed, three phase motors shall be dual winding.
- B. All motor starters shall be provided by the Mechanical Contractor if integral with the equipment. All three phase magnetic starters shall be furnished with three coil overload protection. All starters which are not integral with the equipment and other electrical control equipment installed in damp, moist or areas of special conditions, shall be designed and approved for the installation.

2.14 QUIET OPERATION AND VIBRATION

- A. All work shall operate under all conditions of load without any sound or vibration which is objectionable in the opinion of the Architect/Engineer. In case of moving machinery, sound or vibration noticeable outside its own room will be considered objectionable. Sound or vibration conditions considered objectionable by the Architect shall be corrected in an approved manner by the Mechanical Contractor at his expense. Vibration control shall be by means of approved vibration eliminators in a manner as recommended by the manufacturer of the eliminators.

2.15 ACCESSIBILITY

- A. The Mechanical Contractor shall be responsible for the sufficiency of the size of shafts and chases, the adequate clearance in double partitions and hung ceilings for the proper installation of his work. The Contractor shall cooperate with the General Contractor and all other contractors whose work is in the same space, and shall advise the General Contractor of his requirements. Such spaces and clearances shall; however, be kept to the minimum size required. The mechanical 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, traps, cleanouts, motors and controllers. If required or better accessibility, any change shall be approved by the Architect. The Mechanical Contractor shall provide the General Contractor the exact locations of access panels for each concealed valve, control, damper or other device requiring service. Access panels not shown in the architectural drawings shall be provided and installed by the Mechanical Contractor and as specified in architectural sections of the specifications.

Locations of these panels shall be submitted in sufficient time to be installed in the normal course of work

2.16 FOUNDATIONS, SUPPORTS, PIERS, ATTACHMENTS

- A. The Contractor shall furnish and install all necessary foundations, supports, pads and bases required for all equipment furnished under this contract, unless otherwise noted. All equipment where foundations are indicated, furnish and install concrete pads as shown. All pads shall be extended six inches (6") beyond equipment base in all directions with top edge chamfered. All equipment, unless otherwise shown, shall be securely attached to the building structure in an approved manner. Attachments shall be of a strong and durable nature and any attachments that are, in the opinion of the Architect, not strong enough shall be replaced as directed.

2.17 ELECTRICAL CONNECTIONS

- A. The Electrical Contractor shall furnish and install all power wiring except the following when rated at 25 VAC or less: (1) temperature control wiring; (2) equipment control wiring; and (3) interlocking wiring. The Electrical Contractor shall furnish and install all power wiring complete from power source to motor or equipment junction box, including power wiring through starters. The Electrical Contractor shall furnish and install all starters not factory mounted on equipment or otherwise noted. The Mechanical Contractor shall furnish and install all temperature control wiring, interlock wiring and equipment control wiring of 25 VAC or less for the equipment that he furnishes. The Mechanical Contractor shall furnish a starter to the Electrical Contractor, where scheduled on the drawings or integral with the equipment. The Mechanical Contractor shall provide and be responsible for the heater in all starters that the Mechanical Contractor furnishes.

2.18 CUTTING AND PATCHING

- A. The Mechanical Contractor shall be responsible for all framing, cutting and patching necessary to install the work specified in this section. Patching shall match adjacent surfaces and be performed by qualified workmen approved by the Architect. All work shall be in accordance with the applicable Architectural section of these specifications.

2.19 SLEEVES AND PLATES

- A. The Mechanical Contractor shall provide and locate all sleeves and inserts required before the floors and walls are built, or shall be responsible for the cost of cutting and patching required for pipes where sleeves and inserts were not installed, or where incorrectly located, or where they are to be installed in existing walls. Sleeves shall be provided for all mechanical piping passing through concrete floor slabs, masonry, concrete, tile and gypsum wall construction. Where sleeves are placed in

exterior walls below grade, the space between the pipe or conduit and the sleeves shall be sealed with link-seal rubber expansion sealers or equal and be made completely watertight. Sleeves shall be constructed of twenty-four (24) gauge galvanized sheet metal with lock seam joints for all sleeves set in concrete floor slabs terminating flush with the floor. All other sleeves shall be constructed of steel pipe unless otherwise indicated on the drawings.

2.20 ESCUTCHEON PLATES

- A. Escutcheon plates shall be provided for all exposed uninsulated pipes and all exposed conduit passing through walls, floors and ceilings. Plates shall be nickel-plated, of the split ring type, sized to match the pipe or conduit. Where plates are provided for pipes passing through sleeves which extend above the floor surface, provide deep recessed plates to conceal the pipe sleeves.

2.21 WATERPROOFING

- A. Where any work pierces waterproofing including waterproof concrete, the method of installation shall be as approved by the Architect before work is done. The Mechanical Contractor shall furnish all necessary sleeves, caulking and flashing required to make openings absolutely watertight.

2.22 GUARDS

- A. The Mechanical Contractor shall provide belt drivers and rotating machinery with readily removable guards. Guards not furnished with equipment requiring it shall consist of heavy angle iron frames, hinged and latched, with heavy galvanized iron wire crimped mesh securely fastened to frames.

2.23 OPERATING INSTRUCTIONS

- A. Upon completion of all work and all tests, the Contractor shall furnish the necessary skilled labor and helpers for operating this system and equipment for a minimum period of three (3) days of eight (8) hours each. During this period, instruct the Owner or his representative fully in the operations, adjustment, and maintenance of all equipment furnished. The Mechanical Contractor shall furnish to the Architect four (4) complete bound sets for delivery to the Owner of typewritten or blueprinted instructions for operating and maintaining all systems and equipment included in this contract. All instructions shall be submitted in draft, for approval, prior to final issue. Mount at a location determined by the Owner, a step-by-step procedure to operate the system in a frame covered with a glass front. The Mechanical Contractor shall include the maintenance schedule for the principal items of equipment furnished under this contract.

2.24 PIPING INSTALLATION

- A. All piping at one or more points shall be installed so that they can be easily drained. Provide means of drainage of low points of all piping without disconnecting pipe. If other than valves are contemplated, the Architect's permission shall be obtained. All installed pipelines shall be straight and remain straight against strains tending to cause distortion, noise, damage, or improper operation. Piping shall be installed square with the building construction and risers shall be plumb. All piping must be kept clean and free from scale or loose dirt when installed, and must be kept clean during the completion of the installation. All openings in the piping system shall be capped or plugged while awaiting further connection whenever there is a reasonable hazard of dirt entering the piping system. Soil, waste and drainage lines shall be properly graded. Cold water, domestic hot water and gas lines shall be slightly pitched toward drain points.

2.25 PIPE HANGERS AND SUPPORTS

- A. Horizontal piping shall be suspended from the overhead structure with Grinnell Co. pipe hangers and anchors and threaded rods. Perforated metal straps will not be allowed on the job. Hangers shall be installed to allow for continuity of insulation. Maximum hanger spacing shall be six feet (6').

2.26 VALVES

- A. Unless otherwise specified, all valves shall be Stockham, Nibco-Scott, Crane or Hammond suitable for 125 PSI working pressure. Gate valves shall be used on domestic water piping. Gate valves three inches (3") and smaller shall be brass equal to a Stockham figure B-100 or B-108. Gate valves larger than three inches (3") shall be equal to a Stockham figure G-613.
- B. Gate valves, ball valves or butterfly valves may be used on heating and cooling system water; gate valves shall be as previously stated. Ball valves shall be equal to Stockham figure S-214 soldered or threaded through two inch (2"). Butterfly valves shall be equal to a Stockham figure LD-712 arranged to that either side of the piping may be removed without draining the valves.
- C. Valve locations are either shown or covered by note on the plans. However, the Contractor shall be held responsible for furnishing and installing all valves inadvertently omitted from the drawings in locations where valves are customarily furnished for operation and maintenance without undue disruption of service.
- D. The Mechanical Contractor shall prepare and install in a suitable glazed frame, typewritten valve charts giving the number, location and function of each line and valve installed under this contract. Provide and install for

each valve a stamped brass tag, numbered to correspond to the number indicated on the valve chart. Tags shall be secured to valve stems by heavy, figure-eight hooks.

2.27 UNIONS

- A. Unions shall be provided at all equipment and wherever else necessary to allow for ease in making repairs or replacements. Furnish and install approved insulating couplings at all connections between dissimilar metals, steel to copper.

2.28 INSTALLATION OF THREADED PIPE

- A. Screw joints shall be made with lubricant applied to the male threads only; threads shall be full cut and not more than three (3) threads on the pipe shall remain exposed. All new cut ends must be deburred and reamed.

2.29 JOINTS IN COPPER WATER PIPING

- A. The pipe shall be cut square and true. The end shall be deburred, reamed, and/or sized as necessary. The pipe shall be cleaned with medium grit emery cloth and if the fitting socket is tarnished or shows oxidation, it shall be likewise cleaned. The pipe and fitting shall be fluxed with Nokorode Paste. Joints shall be made up with the type of solder as hereinafter specified. Reducing tees formed by extruding the larger pipe will not be acceptable for pipe two (2") inches or smaller. On pipe 2-1/2 inches and larger extruding the reducing tee will be acceptable provided flux is applied to both tee and pipe and the joint silver soldered with a torch using a mixture of oxygen and acetylene.

2.30 IDENTIFICATION OF PIPING

- A. All service piping which is accessible for maintenance operations will be identified with SETMARK semi-rigid plastic markers or equal. Direction of flow arrows are to be included on each marker, unless otherwise specified. For pipes under 3/4" OD, brass identification tags 1-1/2" in diameter will be fastened securely at specified locations.
- B. Locations for pipe markers to be as follows:
 - At each pipe passage through wall, floor and ceiling construction.
 - At each pipe passage to underground.
 - On all horizontal pipe runs - marked every 15 feet.
 - At each branch and riser take-off.
 - Adjacent to each valve and fitting (except on plumbing fixtures and equipment)

PART 3 - EXECUTION

3.01 SYSTEM TEST AND CLEANING

- A. Scope: Before the final air balance test, the heating, ventilating and air conditioning system shown on the drawings shall be tested to assure performance of all units. District personnel to be present during startup procedures.
- B. Heating System: The entire heating system shall be tested at the completion of the building and it shall be established that all controls are calibrated accurately and performing satisfactorily and that all units are heating satisfactorily. The system shall be checked for vibration and excessive noise and all such conditions corrected.
- C. Air Conditioning System: The entire air conditioning system shall be tested at the first summer weather next following the completion of the building; and it shall be established that all controls are calibrated accurately and performing satisfactorily and that all units are cooling satisfactorily. The system shall be checked for vibration and excessive noise and all such conditions corrected.
- D. Ventilating System: The entire ventilation system shall be tested at the completion of the project; and it shall be established that controls are performing satisfactorily and that all rooms are ventilating properly. The systems shall be checked for vibration and excessive noise and all such conditions corrected.
- E. Final Check-up: At the completion of all work all equipment on the project shall be checked and thoroughly cleaned including coils, plenums, pipes, plumbing fixtures, etc., and all other areas around or in equipment provided under this section. Any filters used during construction shall be replaced with new filters after final clean up. All start-up strainers shall be removed and replaced with operating strainers. Strainer mesh shall be approved by the Engineer.
- F. Painting: At the completion of all work all equipment on the project shall be checked for painting damage, and any factory finished paint that has been damaged shall be repaired to match the adjacent areas. Any metal or specially covered areas that have been deformed shall be replaced with new material and repainted to match the adjacent areas.

3.02 LUBRICATION OF EQUIPMENT

- A. The Mechanical Contractor shall properly lubricate all pieces of equipment before turning the building over to the Owner. He shall attach a tag to each motor showing the date of lubrication and lubricant needed.

3.03 GUARANTEE

- A. The entire mechanical system shall be guaranteed for a period of one year after final acceptance of the project against any defects in equipment, material or workmanship. Any necessary labor, equipment or material required to correct such defects shall be furnished and paid for by

the Mechanical Contractor without further cost to the Owner. Provide the Owner a written guarantee **on the above item. Deliver to the Architect for his approval.**

END OF SECTION 15000

PART I - GENERAL

1.01 GENERAL

- A. Conditions of the contract and Division I apply to this Division except that any requirements for prior approval of equipment does not apply to this Division. The work under this section consists of furnishing and installing all thermal insulation on ducts, pipes and all other equipment in Division 15 which are indicated to receive insulation. See also Section 15000 for General Requirements applying to this and all other Division 15 sections.

1.02 SUBMITTAL DATA

- A. The following submittal data shall be provided before any installation is made: Name of the Insulation Contractor; a narrative summary of material and method of installation for each system or component to be insulated (i.e. domestic water piping, ductliner, etc.); certified letter of compliance as required hereinafter; and descriptive literature for all material including insulation, covering, jackets, adhesives, etc.

PART 2 - PRODUCTS

2.01 GENERAL INSULATION

- A. All insulation materials shall have composite fire and smoke hazard ratings as tested by procedure ASTM-84, NFPA-255, and UL 723 not exceeding: smoke developed - 50; flame spread - 25; fuel contributed - 50. All components of the insulation (insulation, adhesives, and jackets or facings) shall have been tested as COMPOSITE product and shall bear labels showing the flame spread, smoke-developed, and fuel contributed properties do not exceed 25, 50 and 50 respectively. All insulation accessories (glass cloth, cement, adhesives, mastic, etc.) shall have the same component ratings as listed above. All products and/or their shipping cartons shall have a label affixed, indicating flame, fuel and smoke ratings do not exceed the above requirements. Paper laminate jacket, if used, shall be permanently fire and smoke resistant. Chemicals used for treating paper in jacket laminates shall not be water soluble and shall be unaffected by water and humidity. The use of canvas or other flammable materials is prohibited and any found on the job shall be removed at the Contractor's expense and at no additional cost to the Owner. The insulation and related items specified hereinafter by specific manufacturer's designation is intended to establish a standard of quality and is not intended to exclude equal products of reputable manufacturers.

2.02 PIPING SYSTEMS

- A. Piping shall be insulated by the following schedule with Owens/Corning Fiberglass 25 ASJ/SSL pipe insulation all service jacket with self-sealing lap.

PIPING TYPES	PIPING SIZES		
	1/2"-1"	1-1/4"-4"	4" +
Recirculated hot water	1"	-	-
Domestic cold water	1"	1"	-
Domestic hot water	1"	2"	-
Condensate	1"	1"	1"
Roof drains	1/2"	1/2"	1/2"

- B. Manville Flame-Safe GC or Armstrong Accotherm insulation of thermally equivalent thickness may be used in lieu of the above.
- C. All piping including domestic cold water piping which is exposed outside the building shall be insulated with a minimum of one inch (1") insulation or as specified above. Provide metal jacketing as described below. See drawings for heat tape requirement.
- D. All insulated piping which runs exposed, either inside or outside the building, shall be jacketed with aluminum sheet metal, banded 4" on center and sealed water tight. All joints shall be caulked with silicon caulking/sealer. Piping running exposed within boiler rooms shall not be required to have aluminum jacketing.

2.03 DUCT SYSTEMS

- A. All metal air conditioning or other ducts indicated to have ductliner shall be lined with thermal and acoustic ductliner, Manville Linacoustic or approved equal, approved by the City of El Paso, 1-1/2 pound per cubic foot density, 1-1/2" thick (R-5) or equivalent unless otherwise noted on the plans having a thermal conductance of 0.25 BTU/sq. ft./hr./degree F./inch thickness at 75F. mean temperature and with a noise reduction coefficient (NCR) of .20, Underwriters Laboratories Inc. fire hazard classification of flame spread 25, fuel contributed 50 and smoke developed 50 or better.
- B. All air conditioning duct indicated to be insulated shall be wrapped with insulation. Ductwrap shall be Manville Microlite Duct Insulation, 1.0 PCF density, 2" thick (R-5) with a thermal conductivity equal to .265 at 75 degrees F. Wrap shall have an FSK fiberglass reinforced foil face.
- C. All insulated duct which runs exposed outside the building, shall be jacketed with aluminum sheet metal, banded 4" on center and sealed water tight. All joints shall be caulked with silicon caulking/sealer.

PART 3 - EXECUTION**3.01 PIPING INSTALLATION**

- A. Pipe Insulation shall be applied on clean, dry surfaces. All insulation shall be continuous through opening and sleeves. Insulation on all cold surfaces where vapor barrier jackets are used must be applied with a continuous, unbroken vapor seal. Hangers, supports, anchors, etc., that are secured directly to cold surfaces must be adequately insulated and vapor sealed to prevent condensation. Inserts between the pipe and pipe hangers shall consist of a length of rigid pipe insulation of thickness equal to the adjoining insulation and shall be provided with vapor barrier where required. Insulation inserts shall not be less than six inches (6") long.
- B. Metal shields shall be applied between all hanger or supports and the pipe insulation unless otherwise noted. Shields shall be formed to fit the insulation and shall extend up to the centerline of the pipe and the length specified for the hanger inserts. All fittings and valves shall be insulated by wrapping with fiberglass blanket, wrapped firmly under compression to thickness equal to adjoining pipe insulation.
- C. Longitudinal jacket laps and butt strips shall be smoothly secured with adhesive. Valves and fittings, except unions and flanges, may be insulated with factory premolded Zeston Hi-Lo Temp PVC one-piece insulated fitting covers of the same thickness as the adjacent pipe insulation. The fitting covers shall be secured by stapling or tack fastening. Insulation shall be beveled at ends with insulation cement at check valves, valves, unions and flanges. These items then shall be separately insulated with larger sectional insulation overlapping the adjacent insulation such that the valve or other fitting so insulated may be uncovered without damage to the adjacent piping covering. Strainers shall be insulated in such a manner that the basket may be removed without damage to the adjacent insulation. Valves shall be insulated to the bonnet only. All exposed raw end of insulation shall be finished with insulating cement.

3.02 DUCT INSULATION

- A. Ducts indicated to have internal insulation shall be lined by carefully adhering the liner in a continuous piece to clean, flat metal sheets with quick-tacking rubber base adhesive. The duct shall be formed, with the liner attached, in a sheet brake. The coated side of the liner shall face the air stream, and all exposed edges shall be coated with adhesive. Ducts shall also have the liner additionally secured with mechanical fasteners. Spacing of fasteners shall be on approximately fifteen inches (15") centers, and shall be adhered with manufacturer's recommended adhesive. The insulation shall be held in place with surface anchor washers, speed clips or equal. All projecting ends of fasteners shall be cut off flush with washer.

- B. Ductwrap shall be applied in strict accordance with manufacturer's instructions. Wrap shall be continuous with overlapping sections. Fasten and seal overlap joints according to manufacturer's recommendations.
- C. Insulation shall be butted tightly at joints and vapor barrier facing shall be overlapped a minimum of two (2") inches. Insulation should be removed from lap prior to stapling. All seams shall be stapled approximately six (6") inches on center with outward clinching staples, then sealed with a foil vapor barrier tape or vapor barrier mastic.
- D. Where ducts are over 14" in width, the ductwrap shall be additionally secured to the bottom of rectangular ducts with mechanical fasteners spaced on 18" centers (maximum) to prevent sagging of insulation. Seal penetrations of facing so as to provide a vapor-tight system.

3.02 SHOP DRAWINGS

Data sheets for pipe and duct insulation systems.
Adhesives, and
Fitting and valve covers.

END OF SECTION 15180

PART 1- GENERAL

1.01 CONTENTS

- A. This section of the specifications contains items applicable only to the Plumbing Section. Section 15000, Mechanical General Conditions, contains items which also apply. This section of the specifications supplements some of the statements therein so as to apply to the plumbing system.

1.02 SCOPE OF WORK

- A. It is the intent of these specifications and drawings to furnish a plumbing system, inside and outside of the building, complete, fully adjusted and ready to use. All work and material must conform to all State and Local Plumbing Codes in every respect.
- B. Failure to install a piping system properly shall be cause for rejection and replacement of piping system.
- C. All piping systems shall be installed as indicated on the contract documents. Should the Contractor want to vary from the installation shown on the contract documents, detailed drawings of all proposed modifications must be submitted to the Engineer for approval prior to ordering materials or commencing with work.

PART 2 - MATERIALS

2.01 PIPE AND FITTINGS IN GENERAL

- A. All metal pipe is to be straight, free from dents, scars or burrs with ends reamed, cut smooth, and as further specified for the individual applications. All changes in pipe sizes in cast iron soil pipe shall be made with reducing fittings. Wye fittings with 1/8 or 1/16 bends or combination wye and 1/8 bend fittings shall be used where changes in direction occur. All piping shall be manufactured in the USA.

2.02 SEWER PIPE

- A. All sewer pipe shall be of the best quality standard weight cast iron. Pipe fittings shall be coated inside and out with varnish. See Section 15000 for backfill requirements.
- B. At the Contractor's option, schedule 40 polyvinyl chloride (PVC) solid core sewer pipe may be used inside of the building and outside, SDR 35 is not permitted. See Section 15000 for backfill requirements. All PVC pipe shall meet ASME D2665.

2.03 INSTALLATION OF CAST IRON PIPE AND FITTINGS

- A. Cast iron pipe and fittings shall be installed in accordance with manufacturer's instructions and shall be run in the most direct manner.
- B. Horizontal pipes shall have a grade of one quarter inch (1/4") per foot, wherever possible, and not less in any case than one eighth inch (1/8") per foot unless noted on the contract documents.
- C. Provide depression under bell of each joint where hub and spigot pipe is used to maintain even bearing of sewer pipe.

2.04 INSTALLATION OF PVC PIPE AND FITTINGS

- A. Materials shall be installed in accordance with ASTM D-2321 and shall be run in the most direct manner.
- B. Pipe grading shall be as noted above with continuous support from a firm base of 4 to 6 inches bedding depth of material and compaction meeting ASTM-2321.
- C. Provide depression under each joint to maintain even bearing of sewer pipe. Support of piping with materials other than bedding is forbidden.
- D. Trench width at the top of the pipe shall be a minimum of 18 inches or diameter of pipe plus one foot, whichever is greater and a maximum of the outside diameter of the pipe plus two feet.
- E. Initial backfill shall be 12 inches above top of pipe with material specified in ASTM D-2321.
- F. Any plastic lines in return air ceiling space or plenum shall be enclosed in sheetrock or covered with 3M Firemaster blanket or UL910 standard system.

2.05 JOINTS IN SOIL PIPE

- A. Joints in hub and spigot piping shall be Ty-seal or equal neoprene gaskets meeting CISPI 310 and ASTM C 564.
- B. Joints in no-hub cast iron pipe shall be made with a one piece neoprene gasket and stainless steel clamp meeting CISPI 310 and ASTM C564.
- C. Joints between cast iron and PVC shall be made with standard gasket and clamp described above. Install couplings in strict accordance with Manufacturer's instructions.

2.06 CLEANOUTS

- A. Provide where shown on drawings and required by Code, all necessary cleanouts. Equipment by Zurn, Wade, J.R. Smith and Josam shall be considered equal providing they meet the recommendations listed.
- B. Floor cleanouts: cleanouts in finished areas shall be Zurn, ZN-1400-NH with round scoriated nickel bronze top.
- C. Outdoor Cleanouts: Cleanouts in traffic areas shall be Zurn, ZN-1402-NH, with heavy duty grate and straight threaded tapered shoulder plug that seals against caulk lead seat.
- D. Wall cleanouts: Wall cleanouts shall be Zurn, Z-1468, with stainless steel access cover.
- E. Locations: Cleanouts shall be installed at the base of each soil stack, 90 degree turns and where shown on the drawings. The distance between cleanouts in horizontal runs of piping shall not exceed 50 ft. intervals in pipe 3-inch nominal diameter or less and 75 ft. Intervals in pipe 4-inches nominal through 6 inches nominal diameter. Install all cleanouts where shown on the drawings and where required by the Local Plumbing Code. Cleanouts shall be full size according to the size in which they are installed up to and including four inch (4").

2.07 GAS PIPING

- A. The gas distribution system shall be installed as indicated on the drawings complete with all valves and other required items.
- B. All pipe used for the fabrication of gas piping systems shall be schedule 40 black steel pipe. All steel pipe shall be provided with plain ends and assembled with welded fittings on a pipe 1-1/2" and larger. Joints in 1-1/4" and smaller pipe may be screwed. Under no circumstance shall pipe smaller than 3/4" be used.
- C. Gas piping system installed underground shall utilize medium density polyethylene resin pipe equal to Plexco PE 24076 meeting ASTM 3350, Type II, grade LPE 24.
- D. Joints in polyethylene pipe shall be made by any acceptable fusion method in strict accordance with manufacturer's recommendation.
- E. All polyethylene pipe shall be installed with caution tape and a minimum of twelve (12) inches above the pipe and a tracer wire at a minimum of 18 inches above the pipe.
- F. All piping shall be run in the most direct manner with all equipment connections having the required cocks, dirt legs and cutoffs.

2.08 INTERIOR DOMESTIC WATER PIPING SYSTEMS

- A. All domestic hot and cold water lines including evaporative cooler supply and drain lines within the building above ground shall be type "L" hard drawn copper pipe with sweat soldered wrought copper fittings and 95/5 lead free solder. All piping below grade shall be type "K" copper with silver solder joints unless otherwise indicated. Provide dielectric unions wherever copper and ferrous metals are joined. Dielectric separation using brass unions or valves shall not be considered an acceptable method of separation.

2.09 ROOF DRAIN PIPING

- A. All materials shall be service weight cast iron, schedule 40 black steel type "K" copper or schedule 40 PVC solid core. All cast iron piping shall be coated with asphaltum or coal tar pitch.
- B. Joints in cast iron hub and spigot piping shall be Ty-seal or equal with neoprene gasket. Joints in no-hub cast iron and steel piping shall be Anaco Husky 4000 or Tyler Wide-Body made of neoprene gasket with stainless steel shield and clam-s. Joints in copper piping shall be wrought copper sweat.
- C. All piping installation shall be run in the most direct manner. Horizontal pipes shall have a grade of one-quarter inch (1/4") per foot, wherever possible, and not less in any case than one eighth inch (1/8") per foot.
- D. Any plastic lines in return air ceiling space or plenum shall be enclosed in sheetrock or covered with 3M Firemaster blanket or UL910 standard system.

2.10 CONTROL VALVES

- A. Control valves shall be installed where indicated on Drawings and/or wherever necessary for controlling the several sections of the domestic water system. Valves shall be provided on all inlet (and outlet where applicable) connections to all kinds of apparatuses, all risers and all groups of fixtures. Groups of fixtures shall be arranged to have their group valves in one location. Access shall be provided to all concealed valves by means of a heavy duty keyed access door. Coordinate the location of valves with the architectural features of the building in order that the access doors will be located symmetrically with other features.
- B. The hot and/or cold water supply lines to each and every fixture hereinafter specified shall be equipped with stop valves which shall be chromium plated where exposed chrome plated pipe is used.

2.11 CROSS CONNECTIONS

- A. Care shall be exercised in fabricating plumbing lines to avoid all cross connections and to construct the piping systems in a manner which eliminates the possibility of water contamination.
- B. The piping systems have been designed in every case to avoid the possibility of reverse flow or back siphoning. Care shall be exercised in constructing plumbing lines to make certain that not only the letter, but the spirit, of these safety precautions is carried out to the fullest possible extent.

2.12 REQUIREMENTS OF INTERIOR WATER PIPING SYSTEMS

- A. All piping shall have reducing fittings used for reducing or increasing where any change in the pipe sizes occurs. No bushing of any nature shall be allowed in piping.
- B. All exposed chrome plated, polished or enameled connections from fixtures shall be put up with special care, showing no tool marks or threads at fittings, and supported by neat racks or hangers with round head screws of same material and finish.
- C. Wade Shokstop, or approved equal, sealed air chambers shall be provided in all water branches to fixtures, sized in accordance with manufacturer's recommendations, concealed, accessible, and located so as to protect each group of plumbing fixtures.
- D. The fabrication of copper pipe and fittings shall in every detail conform to the recommendations and instructions of the fitting manufacturer. The tools used shall be the tools adapted to that specific purpose.
- E. Refer to other parts of this Section and Section 15000 for other information concerning installation of piping.

2.13 CATHODIC PROTECTION

not used

2.14 CONDENSATE PIPING

- A. All condensate piping shall be type "M" hard drawn copper and shall have a minimum slope of one (1") inch/10 feet.

2.15 FLASHING

- A. All plumbing vent pipes and miscellaneous pipes passing through the roof shall be flashed with #4 lead with the base extending eighteen inches (18") on all sides of pipe. Vent pipes shall have lead flashing extending around the vent pipe and over the top of the pipe and beaten down inside of the pipe at least one inch (1").

2.16 INSULATION

- A. Insulation shall be as specified in Section 15180, Insulation for Mechanical Systems.

2.17 VALVES

- A. Valves shall be as specified in Section 15000, Mechanical General Conditions.

2.18 FIXTURES AND EQUIPMENT

- A. Fixtures as hereinafter specified and as indicated on the drawings shall be furnished and installed in a first-class manner with proper connections to the water and drainage systems. All fixtures shall be guaranteed by manufacturer to be free from flaws and defects of any sort in material and workmanship, and to operate perfectly when installed in accordance with the instructions which shall be furnished by the manufacturer. The manufacturer shall agree to replace free of charge, all or any part of the fixture which may show flaws or defect due to fault in manufacture, shipment or storage at any time after installation.

PART 3 – EXECUTION

3.01 PIPING IN GENERAL

- A. All plumbing piping must be run as direct as possible, exposed or concealed in accordance with the drawings. All water piping shall be carefully checked so as to avoid all noise due to vibration when water is turned off and on. All vertical pipe shall be rigidly supported or fastened. All horizontal steel or copper pipe shall be supported on not over ten (10') foot centers for pipe two inches (2") and larger and not over six foot (6') centers for smaller pipe. All horizontal soil pipes to be supported on not over five foot (5') centers. Where indicated and on all water supplies to fixtures, provide capped air chambers not less than sixteen (16") long. All horizontal piping shall be graded so as to drain dry at fixtures when water is shut off.

3.02 DISINFECTING AND FLUSHING OF THE WATER MAIN

- A. Disinfect the domestic water piping system. A chlorine solution of not less than 50 ppm shall be allowed to remain in the piping for six (6) hours. The

pipng system shall be flushed out before and after disinfecting the system. Entire procedure must be as approved by the State Health Department and Local authorities.

3.03 INSPECTIONS, TESTS AND ADJUSTMENTS:

- A. All tests described below shall be witnessed by a representative of the Engineer's office and SISD personnel. The Contractor shall inform the engineer of the time and place to witness the test.
- B. All drain, soil, waste and vent pipes, including branch bends and joints, shall be tested by filling with water and placing a stand pipe to extend ten (10) feet above the system and filling the system and the stand pipe with water. The Contractor may plug the system and hydrostatic test to eight (8) pounds pressure. Install gauge in connection with the test so that the actual test pressure can be observed. If there is a drop in pressure, the system shall be checked and the leaks repaired. Pipe systems may be tested in sections, provided that all portions to be concealed shall be subjected to the above test. If the stand pipe is used for these tests, it shall be not less than two (2) inches minimum in diameter. All lines shall be flushed after removing the test plugs.
- C. Water Piping: All water piping shall be tested to one hundred (100) pounds hydrostatic pressure. Place gauge on system or section of system and gauge shall show no drop in pressure for a period of thirty (30) minutes. Strip chart to be delivered to Owner.
- D. All gas piping systems shall be tested by subjecting the system to a pneumatic test pressure of 100 PSI. While the system is subjected to this air pressure all joints shall have a soapy water solution applied. Any leaks found shall be repaired and the system retested. The system shall then be subjected to the final pneumatic test pressure of 100 PSI and must hold the test pressure to twenty-four (24) hour. Chart strip recording must be delivered to engineer.
- E. Contractor shall perform a complete video inspection of all waste and sewer lines prior to acceptance by Owner. Video inspection tapes shall be provided to Owner and Engineer for their review. Any and all debris shall be cleared from all lines by means of pressure jetting or other acceptable method. Follow up video inspections shall be provided as required to satisfy Owner and Engineer of all lines being clear of debris.
- F. Smoke Test: Provide two smoke tests to insure vent systems are not leaking. First test shall be conducted prior to wall closings. Second test shall be conducted after fixtures are permanently connected and traps are filled with water, fill entire drainage and vent systems with smoke under pressure of 1.3 kPa (one inch of water) with a smoke machine. Chemical smoke is prohibited.

- G. Completion: Upon completion the entire system shall be tested under operating conditions. Water shall be turned into all supply lines. All fixtures shall be demonstrated to operate properly; valves and stops shall be adjusted, packed and repacked as may be required to eliminate leaks and produce proper flow; piping shall be adjusted to provide proper circulation and to prevent hammer, vibration and expansion. The Mechanical Contractor shall obtain and turn over the certificates of inspection and approval from State and Federal authorities having jurisdiction to the Architect.

3.04 SHOP DRAWINGS

- A. Submit shop drawings on the following:
1. Pipes and fittings,
 2. Cleanouts,
 3. Plumbing fixtures, and
 4. Rough-in modifications

END OF SECTION 15400

SECTION 15500 FIRE SPRINKLER SYSTEM

PART 1 GENERAL

1.1 DESCRIPTION

- A. Design, fabricate, install and secure all necessary approvals of a complete fire protection automatic sprinkler system in accordance with the standards set forth in this section.

1.2 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. The following are described in the indicated other sections for these specifications. Perform all such work required in strict accordance with the provisions of those sections.

Plumbing
Electrical

1.3 CODES AND STANDARDS

- A. In addition to conforming with all pertinent codes and regulations, conform with the requirements of the American Insurance Association and NFPA Standard #13 - Standards for the Installation of Sprinkler Systems (latest edition) and NFPA #13A - Recommended Practice of the Care and Maintenance of Sprinkler System (latest edition).

1.4 QUALIFICATIONS

- A. The entire fire protection automatic sprinkler system shall be designed, fabricated, installed and tested by a Company regularly engaged in the design, installation and testing of Automatic Fire Protection Sprinkler Systems for a period of five years.

1.5 SUBMITTALS

- A. Shop Drawings; Submit six (6) sets of the following shop drawings to the Engineer for approval. When approved, they will be forwarded to the Architect. All shop drawings, before being sent to the Engineer, must bear stamp of approval of the State Agency having jurisdiction over the project.
- B. Layout: Drawing of complete overhead sprinkler system indicating relationship of all other overhead items, including ceiling air diffusers, lighting fixtures, beams and all other items. Sprinkler system design capabilities and water demands should also be noted on the drawings.
- C. Plot plan indicating location of all underground connections, control valve, piping and related items and shown in the location of all structures within

15 feet of the building, plus all other items and data required to be shown by authorities having jurisdiction.

- D. Complete details and sections as required to clearly define and clarify the design, including a materials list describing all proposed materials by manufacturer's name and catalog number.
- E. As-built drawings: During progress of the work of this section, maintain an accurate record of all changes made in the design of the fire sprinkler system.
- F. Upon completion of the installation, and as a condition of its acceptance, accurately transfer all as-built information to three (3) identical blue-line prints of the approved shop drawings. Insert one print into each copy of the manual described below.
- G. Manual: Upon completion of the installation, and a condition of its acceptance, compile the following manual and deliver three (3) copies to the Owner.
- H. Size: Approximately 8-1/2 inches by 11 inches.
- I. Format: Firmly bound in hard backed binder with clear plastic pocket on spine. "Looseleaf" binding is not acceptable.
- J. Contents:

Identification inserted in the spine of each binder shall be as follows:
"FIRE SPRINKLER SYSTEM MANUAL".

Neatly typed index, at or near the front, with all emergency information location clearly identified.

A complete list of all components of the system with manufacturer's name, catalog numbers and all data required of ordering replacement parts.

One copy of the as-built drawings described above.

All information required to affect or secure emergency repairs or service.

1.6 DUCT HANDLING

- A. Use all means necessary to protect fire sprinkler system materials before, during and after installation and to protect the installed work of other trades. In the event of damage, immediately make all repairs and replacement necessary to the approval of, and at no additional cost to the Owner.

PART 2 PRODUCTS

2.1 DESIGN

- A. The design shall be complete in all regard sand shall include, but not necessarily be limited to:
- B. All underground piping pertaining to the fire protection system including all required pipe, valves, trenching, backfilling pavement replacing and other items.
- C. Connection to utility main, including all required valves, fittings and other items.
- D. Overhead sprinkler system for the area indicated on the plumbing plan sheet, including all required auxiliary spaces.
- E. This Contractor shall make all site visits as required to determine general floor plan configuration. Some building floor plans may be presented upon requires to the Architect.

2.2 MINIMUM REQUIREMENTS

- A. Piping shall be concealed in areas having ceilings and wall finishes. Piping may be exposed in auxiliary areas without ceiling and shall be kept a minimum distance from the roof deck or overhead structure.
- B. Sprinkler heads in areas with finished ceiling shall be pendant spray type. Heads in areas of exposed piping shall be upright.
- C. Fire sprinkler heads shall be located in a symmetrical pattern related to ceiling features such as grid, beams, light fixtures, diffusers, etc. Where applicable, heads shall be located symmetrically with the ceiling grid, centered in two directions.
- D. Provide the locations as required by NFPA and local Fire Marshall.

2.3 PIPING

- A. The site fire line piping shall be C-900 plastic pipe with mechanical joints at valves. From a point within five feet of the building the main fire line shall be ductile iron pipe to the main riser in the building. All fire sprinkler piping within the building shall be in strict accordance with NFPA requirements. All piping installation will be in strict accordance with manufacturer's instructions and NFPA.

2.4 FABRICATION

- A. All materials shall be new and approved by the Engineer. All piping shall be free from rust and shall be shop-primed with a minimum of one coat of rust-inhibitive paint. All fabrication shall be in strict accordance with the approved shop drawings.

2.5 OTHER MATERIALS

- A. Finish and install a metal cabinet containing 12 extra sprinkler heads (5 pendant type for ceiling installation and 5 upright for exposed installation) and all necessary wrenches.

PART 3 EXECUTION

3.1 PRIOR TO INSTALLATION

- A. Prior to the commencement of each stage of the fire sprinkler system installation, carefully inspect the installed work of other trades and determine that all such work is sufficiently complete to allow this installation to begin and that the work of other trades has been installed in such a manner as to permit this installation to be made in complete accordance with the approved design.

3.2 COORDINATION

- A. Coordinate the installation schedule for this portion of the work with the overall construction schedule for the work to ensure orderly progress of the work with an absolute minimum of delay.
- B. Coordinate interface of fire sprinkler system with the work of all other trades to ensure proper and adequate provision of the installation and connection of this system.

3.3 EXCAVATION, TRENCHING AND BACKFILLING

- A. Perform all required excavating, trenching and backfilling for this portion of the work in strict accordance with the provision of these sections of these specifications.

3.4 INSTALLATION

- A. Install the complete fire sprinkler system in strict accordance with the approved shop drawings. Perform all piping installation in strict accordance with the provision of the Plumbing Section of these specifications, including the furnishing of all required sleeves for fire sprinkler system pipes passing through walls, floors, and other parts of the building and the furnishing and installing of all split wallplates and escutcheons for exploded fire sprinkler system pipes.
- B. Do not cut or make holes in any part of the building except where shown on the approved shop drawings.
- C. This Contractor shall be responsible for interconnection of fire sprinkler system with the fire detection and alarm system.
- D. Furnish and install next to the sprinkler riser main a printed sheet protected by glass or a transparent plastic cover, giving brief instructions regarding control, emergency procedure and other data as required by NFPA #13. For hydraulically designed sprinkler systems, a placard must be permanently attached to the rise indicating the location, and the basis of design, (discharge density and system demand).

3.5 TESTING AND ACCEPTANCE

- A. All tests below shall be witnessed by a representative from the Engineer's office and/or a representative from the Owner's Special Systems Department. The Contractor shall inform the Engineer/Owner of the time and place to witness the tests a minimum of 24 hours in advance. Failure to notify the Engineer shall be cause for rejection and retest of the system.
- B. Prior to connecting to the overhead sprinkler piping, flush the underground main thoroughly. Secure all required approvals of the flushing operation.
- C. Upon completion of the fire sprinkler system installation, test and retest the complete installation and make all corrections as necessary to secure acceptance by any other authority having jurisdiction. Furnish all test equipment and personnel required.
- D. Submitt copies of all test results to Owner for approval.
- E. All risers shall be tagged, provide a floor plan denoting different zones.

3.6 INSTRUCTIONS

- A. Prior to the building opening date, instruct selected personnel in the operation of the sprinkler system. Take special care to ensure that these personnel will immediately recognize whether the main valve is in open or closed positions.
- B. Know how to drain the system.
- C. Know how to test alarm valve.
- D. Be familiar with the existence and contents of the manual described above.

3.7 SCHEDULE FOR COMPLETION

- A. Complete the Automatic Fire Sprinkler System ready for operation, in all respects, within the allotted time. When the system is complete and ready for continuous operation, activate the system for its intended use. After the system has been activated for continuous use, water changes, if any, will be paid by Owner.

END OF SECTION 15500

PART 1 - GENERAL

1.01 CONTENTS

- A. This section of the specifications contains items applicable only to the Heating, Ventilating and Air conditioning system. Section 15000, Mechanical General Conditions and Section 15180, Insulation for Mechanical Systems, contains items which also apply. This section of the specifications supplements and modifies some of the statements herein as to apply specifically to the heating, ventilating and air conditioning system.

1.02 SCOPE

- A. It is the intent of these specifications and drawings to furnish a heating, ventilating and air conditioning system inside and outside of the building, complete, fully adjusted and ready to use. All work and material must conform to all State and Local Codes in every respect.

PART 2 - PRODUCTS

2.01 INSULATION

- A. Insulation shall be as specified in Section 15180, Insulation for Mechanical Systems.

2.02 VALVES

- A. Valves shall be as specified in Section 15000, Mechanical General Conditions.

2.03 SHEET METAL

- A. All ductwork shall be fabricated and installed so that no undue vibration or noise results. All joints shall be airtight with additional caulking provided if necessary. Ducts shall be constructed of the best grade galvanized mild steel sheets with joints and reinforcing in accordance with the recommended construction as listed in the current edition of HVAC Metal Duct Construction Standards - SMACNA. Hang ducts with straps attached to bottom of ducts spaced in accordance with SMACNA Standards. Curved elbows, if used, shall have a center line radius equal to 1-1/2 times the duct width. Square elbows shall have turning vanes equal to HEP Aerodyne Co. ductturns. Job fabricated vanes will not be accepted without prior approval.
- B. Provide all necessary dampers as required for proper adjustment and control of air distribution. Provide volume extractors similar to Aerodyne HEP extractors set at 20 degrees at all branches in ductwork where other means of control are not indicated or used, and in ductwork behind

sidewall supply registers. All amper rods shall be marked to indicate the relative position of the damper lade with respect to rod.

- C. Provide one inch (1") angle collars for all exposed ducts passing through walls, ceiling or floors. Anchor collars in position after installation is complete.
- D. Provide flexible connection at inlet and discharge connections of fans and air handling equipment to prevent mechanical noises from being transmitted to connecting ductwork. Use flexible connection similar and equal to "Ventfab".
- E. Install hinged doors on ductwork and housing to provide access to all parts of every automatic damper, fire damper and all other items requiring maintenance or inspection. Access doors shall be 18" X 12" if permitted by duct size, and if not, shall be as large as possible. All access panels shall have sponge rubber gaskets cemented in place with cam lock closures.

2.04 GRILLES, REGISTERS, DIFFUSERS

- A. Furnish and install grilles, registers, diffusers and accessories of size and type as indicated on drawings. All to be as manufactured by Nailor, Metal-Aire, Carnes, Titus, or approved equal. See the schedule on the drawings for type and model.

2.05 EXHAUST FANS

- A. Furnish and install roof or ceiling mounted exhausters as scheduled on the drawings. Exhaust fans shall be all aluminum or steel construction, belt-driven or direct drive as indicated with birdscreen and backdraft dampers unless otherwise noted. Furnish an aluminum prefabricated curb, compatible with the exhauster where indicated. All exhaust fans shall be Acme, Cook, Jenn-Fan, Greenheck, Carnes, or approved equal.

2.06 SPLIT SYSTEMS (AIR HANDLER/CONDENSING UNITS/DX COIL)

- A. Furnish and install indoor high efficiency heatpump air handler unit and outdoor condensing unit suitable for floor installation as scheduled on the drawings. All units to have ARI certified performance listing. Acceptable manufacturers: Trane, Carrier, York, or approved equal.
- B. Air handlers shall have a rugged sheet metal and steel frame construction and shall be painted with enamel finish. Casing shall be insulated and knockouts for electrical power and control wiring. Integral condensate pan. Air stream surfaces to be insulated with minimum "R" value of 4.2. Fans and motor to be directly mounted. Motor to have overload protection. Units to have accessible disposable filters. Coils are to be seamless copper tubing with aluminum fins factory tested to 460 psig. Units shall be equipped with capillary expansion tubes and refrigerant check valve.

Controls installed at the factory or provided shall include relays and connections for outside unit and power supply.

- C. Outdoor condensing unit cabinet to be fabricated of galvanized steel w/ corrosion inhibiting coating. Provide wire fan guard. Compressors are to be hermetically sealed scroll type. Motors are to have overload protection. Coils to be seamless copper tubing with aluminum fins. Controls installed at the factory shall include compressor and condenser fan contactor, capacitors, loss of charge switches, low voltage transformers, low voltage terminals for interconnection with evaporators, high pressure control, power supply terminal block, compressor start assist, and suction line accumulators. Provide units with extended run option where required and low ambient operation down to 10 degrees F.

2.07 STAND ALONE AIR CONDITIONERS(ductless mini-splits)

- A. Furnish and install indoor air handler unit and outdoor condensing unit suitable for ground installation as scheduled on the drawings. Air handler units may be wall mount, suspended from the ceiling or mounted in the ceiling. See drawings and schedule for type of air handler units. All units to have ARI certified performance listing. Units shall be capable of connection to Owner's energy management and control system, provide with failure alarm. Acceptable manufacturers: EMI, Carrier, Mitsubishi, Fujitsu, or approved equal.
- B. Air handlers shall have molded resin chassis, heavy gauge zinc plated steel cabinet, anodized aluminum discharge grille, and integral condensate pan. Air stream surfaces to be insulated with 1/4"(6 mm.) of elastomeric insulation. Fans and motor to be directly mounted. Motor to have overload protection. Units to have accessible permanent washable aluminum filter. Coils are to be seamless copper tubing with aluminum fins factory tested to 460 psig. Units shall be equipped with capillary expansion tubes and refrigerant check valve. Controls installed at the factory or provided shall include relays and connections for outside unit and power supply. Front mounted thermostat and function switches on floor consoles and remote wall mounted on concealed unit. Provide condensate pump on all units. Ceiling mounted unit to be installed using all thread rod and vibration isolators
- C. Outdoor condensing unit cabinet to be fabricated of galvanized steel w/ corrosion inhibiting coating. Provide louvered hail guard. Compressors are to be hermetically sealed rotary or Inertia reciprocating type. Motors are to have overload protection. Coils to be seamless copper tubing with aluminum fins. Controls installed at the factory shall include compressor and fan motor contactor, capacitors, loss of charge switches, low voltage transformers, low voltage terminals for interconnection with evaporators, high pressure control on 18,000 Btu/h sizes, power supply terminal block,

compressor start assist, and suction line accumulators. Provide units with extended run option.

2.08 SPIRAL/ OVAL DUCT AND FITTINGS

- A. Spiral wound round and oval duct shall be made of galvanized steel. Spiral wound duct shall be manufactured in accordance with the latest editions of SMACNA, ASHRAE and SPIDA Standards.
- B. All round and/or flat oval spiral duct and fittings shall be manufactured by a company whose primary business is the manufacture of spiral duct and fittings...
- C. All spiral duct and fittings shall be manufactured from G-60 galvanized steel meeting ASTM A924 and A653 requirements.
- D. Branch connections shall be made with 90° conical and 45° straight taps as shown on the drawings. All branch connections shall be made as a separate fitting. Factory or field installation of taps into spiral duct shall not be allowed without written approval of the engineer.
- E. 90° and 45° elbows in diameters 3" round through 12" round shall be stamped or pleated elbows. All other elbows shall be of the gored type. Where it is necessary to use two-piece mitered elbows. All field joints for round duct up to and including 36" diameter and oval duct up to and including 41" major axis shall be made with a 2" slip-fit or slip coupling. Diameters 38" round and larger shall be provided with AccuFlange, or equal, flanged connections. AccuFlange, or equal, flanged connections may also be used in lieu of slip connections on smaller sizes.
- F. Access doors shall be supplied by the duct manufacturer at all fire and/or smoke dampers.
- G. All exposed duct shall be double wall, acoustically insulated round/oval duct shall be supplied. Double wall duct shall be constructed of an outer shell, a 1" thick layer of fiberglass insulation and an inner metal liner. Insulation shall have a thermal conductivity "K" factor of .26 BTU/hr/sq. ft./°F or less. The inner metal liner for all spiral and longitudinal seam duct shall be perforated metal. All fittings from fan discharge to a point where 35 lineal feet of spiral duct has been used shall have a perforated metal liner. All other fittings shall have a solid metal liner, which may be one even gauge lighter than that shown for perforated liners
- H. Spiral duct shall be as manufactured by Sisneros Brothers, Spiral pipe of Texas, United McGill, Duct Direct or approved equal.

PART 3 - EXECUTION

3.01 WORKMANSHIP

- A. All work shall be first-class in every respect and shall be done by mechanics skilled in the trade involved. Careless and/or sloppy work shall be resolved and replaced properly at the Contractor's expense.

3.02 SCHEDULING OF WORK

- A. The Contractor shall be required to confer with the Architect, General Contractor and Owner to determine a schedule of times at which the various items of work are to be accomplished.

3.03 CONSULTATION WITH OTHER CONTRACTORS

- A. Before commencing the work, the Contractor shall consult with the General Contractor and other Subcontractors and arrive at a thorough understanding as to the location of all equipment, ducts, etc., so that there will be no interference with other work. The time of installation of sleeves, etc. shall be determined by the Contractor. In the event he should fail to have material on the job and such provisions are not made previously with the Gen. Contractor, necessary arrangements shall be made at the expense of the Contractor.

END OF SECTION 15800

PART 1- GENERAL

1.1 SCOPE

- A. This section covers the testing and balancing of environmental system including but not limited to: air distribution systems, hydronic distribution system and the equipment and apparatus connected thereto.
- B. The work required herein shall consist of setting volume (flow) and speed adjusting facilities provided or specified for the systems, recording data, making tests and preparing reports, all as hereinafter specified.

1.2 GENERAL REQUIREMENTS

- A. The work described in this section shall be performed by a firm(s) certified by the National Environmental Balancing Bureau. If the Installing Contractor is not certified by the NEBB, he shall submit appropriate data indicating experience and qualifications.

PART 2 - PROCEDURE

2.1 PROCEDURES

- A. The environmental systems including all equipment, apparatus and distribution system shall be tested and balanced in accordance with the NEBB "Procedural Standards for Testing Adjusting and Balancing of Environmental Systems" published by the NEBB, Current Edition.
- B. All work performed under this section shall be under the direction of the supervisor who is designated and qualified under the certification requirements of NEBB.
- C. All instruments used for measurement shall be accurate, and calibration histories for each instrument shall be available for examination. Calibration and maintenance of all instruments shall be in accordance with the requirements of NEBB.
- D. Accuracy of measurement shall be in accordance with NEBB standards.

PART 3 - EXECUTION

3.1 REPORTS

- A. Four copies of the final reports shall be submitted on applicable Reporting Forms for review.
- B. Each individual final Reporting Form submitted must bear the signature of the person who recorded the data and the signature of the TAB supervisor of the performing firm. Identification of all types of instruments used and their last dates of calibration will be submitted with the final report.

3.2 GUARANTEE

- A. The NEBB certified firm guarantees that all testing and balancing work will be performed in accordance with NEBB standards and procedures and shall provide evidence of their certification for the Engineer or designated Owner's representative.

END OF SECTION

PART 1 - GENERAL

1.01 SCOPE

- A. The uniform general conditions of the contract, applicable portions of Division 1 and General requirements for Electrical, apply to the work specified in this section.

1.02 DESCRIPTION OF WORK

- A. Furnish and install all electrical work in conformance with the requirements of this section, as a supplement to other general requirements of the project.
- B. Furnish and install in the project the following units, systems and components in a completely workable installation:
 - 1. Electrical Service
 - 2. Panelboards
 - 3. Branch Circuits for lighting, convenience outlets, and equipment connections
 - 4. Voice/Data Conduit

1.03 LAWS, CODES AND ORDINANCES

- A. All work and material shall conform to the requirements of O.S.H.A. and all National and State Laws and ordinances having jurisdiction at the job site. The National Electrical Code, 2014 Edition, shall be strictly adhered to where N.E.C. requirements are considered "minimum requirements". Where requirements of the Contract Documents exceed N.E.C., the Contract Documents govern.
- B. All electrical systems shall be grounded in strict accordance with the requirements of the National Electrical Code.
- C. The Subcontractor shall give all necessary notices, obtain all permits and pay all government sales taxes, fees, and other costs, including utility connections or extensions, in connection with his work; file all necessary plans, prepare all documents and obtain all necessary approvals of all governmental departments having jurisdiction; obtain all required certificates of inspection for his work and deliver same to the Engineer before request for acceptance and final payment for the work.
- D. The Subcontractor shall include in the work, without extra cost to the Owner, any labor, materials, services, apparatus, drawings, in order to comply with all applicable laws, ordinances, rules and regulations, whether or not shown on drawings and/or specified.
- E. All materials furnished and all work installed shall comply with the National Fire Codes of the National Fire Protection Association, with the requirements of local utility companies, and with the requirements of all governmental departments having jurisdiction.
- F. All material and equipment for the electrical portion of the mechanical systems shall bear the approval label, or shall be listed by the Underwriters' Laboratories, Incorporated.

1.04 STANDARDS OF MATERIALS AND WORKMANSHIP

- A. All material shall be new and shall bear the label of the Underwriter's Laboratories, Inc. All material shall be of the best grade and latest pattern of manufacture as specified. All work shall be performed in a neat workmanlike manner and shall present a neat mechanical appearance when completed.

1.05 DRAWINGS AND SPECIFICATIONS

- A. The drawings and these Specifications are complementary each to the other, and what is called for by one shall be as binding as if called for by both. Carefully examine the Drawings and Specifications and report any discrepancies affecting the work to the Engineer.
- B. Circuits and feeders shall be as shown and no deviations from the indicated outlet circuit grouping will be permitted, except by permission of the Engineer. Branch circuit numbers indicated are for guidance only, and need not necessarily conform to the finished job.

1.06 MISCELLANEOUS ITEMS

- A. Miscellaneous items not covered in these specifications shall be as indicated on the drawings, installed and connected in the proper manner as recommended by the manufacturer.

1.07 REQUIRED SUBMITTALS

- A. Within two weeks after being awarded the Contract, this contractor shall submit to the Engineer for approval a complete descriptive and technical data list for all items of material furnished under this contract.
- B. All descriptive and technical data and shop drawings shall bear signed certification to the effect that they have been carefully examined and found to be correct with respect to dimensions, space available, non-interference with other trades, and the equipment complies with all requirements of these Specifications. Where catalog data is submitted, the proposed items shall be clearly "flagged" with a printed or stamped red or black arrow or otherwise identified so that no confusion exists.

1.08 FINAL COMPLETION AND TEST

- A. Upon completion of the work, the various systems shall be tested for short circuits and grounds in accordance with the method and resistance values outlined in the National Electrical Code and for load balance on feeders and branch circuits.
- B. The completed system shall operate satisfactorily in every respect. Make any repairs or adjustments necessary to this end to the satisfaction of the Owner.

1.09 RECORD DRAWINGS

- A. At the completion of this project, the contractor shall provide the Owner with one (1) complete and final corrected set of reproducible working drawings. This set of working

drawings shall be new, unused and in good condition. Actual circuit numbers shall be recorded on the As-Built drawings.

1.10 GUARANTEE

- A. The work performed shall be guaranteed for a period of two years after final acceptance against fault workmanship and/or materials and any failure or trouble due to such causes within the period of the guarantee shall be made good upon demand of the Owner and without cost to the Owner.

1.11 SITE OBSERVATION

- A. Site Observation by the Engineer is for the express purpose of verifying compliance by the Contractor with the Contract Documents, and shall not be construed as construction supervision or indication of approval of the manner or location in which the work is being performed as being a safe practice or place.

1.12 SUBSTITUTIONS

- A. Submit proposed substitutions with bid along with alternate price and sufficient descriptive data for comparison. In proposing a substitution, the Contractor assumes full responsibility for any associated modifications in building openings, circuiting, control wiring, and space considerations, and bears all costs. Engineer reserves right to reject any proposed substitution. Contractor shall provide the following form with each proposed substitution.

1.13 LIABILITY OF SUBSTITUTIONS

- A. Performance of substitutions shall be equivalent or superior to the item used for basis for design and shall meet all requirements of above "or equivalent by" clause. Should the substituted item fail to perform in accordance with specifications, replace with the originally specified item without extra compensation.

Substitution Approval Request Form

Contractor requests for substitutions will be considered upon receipt of this completed Substitution Request Form and all required supporting documentation. Substitutions made without completion of this form and Consultant's approval will be considered defective work.

Project Name:

The contractor proposes the following substitution in accordance with the requirements of the Contract Documents.

Scope of substitution:

Specification references:

Drawing references:

Reasons for proposed substitution:

Impact on project schedule:

Impact on guarantees and warranties:

Coordination required with adjacent materials and related systems:

Deviations from specified requirements:

Attachment: ____ yes ____ no (Attach supporting documentation sufficient for the Consultant to evaluate substitution. Substitution Request Forms submitted without adequate documentation will be returned without review.)

Response date: _____ (Date by which response by the Consultant is requested in order to maintain project schedule and allow sufficient time for inclusion of proposed substitution.)

Authorized Signature:

Date:

Consultant Response

The Consultant's response is based on information submitted by the Contractor. Changes to the contractor sum or changes of project schedule shall be processed using appropriate Change Order Forms.

Signed:

(Consultant)

Date:

Approved:

Approved as noted:

Revise and Submit:

Rejected:

Returned without a review:

1.14 VERIFICATION OF EXISTING UTILITIES

- A. General Contractor is responsible for locating all utilities, piping, conduits, etc., prior to start of construction contract, the General Contractor agrees to indemnify the Engineer, Engineer, and owner from any action arising as a result of damage to any existing utilities.

1.15 PRECEDENCE OF MATERIALS

- A. These Specifications and the accompanying drawings are intended to cover systems which will not interfere with the structural design of the building, which will fit into the several available spaces, and which will insure complete and satisfactory systems. Each subcontractor shall be responsible for the proper fitting of his material and apparatus into the building.
- B. Contractor and subcontractors shall so harmonize their work with that of the several other trades so that it may be installed in the most direct and workmanlike manner without hindering or handicapping the other trades. Piping interferences shall be handled by giving precedence to pipe lines which require a stated grade for proper operation. Where space requirements conflict, the following order of precedence shall, in general, be observed:
 - a. Vent piping
 - b. Supply ductwork
 - c. Exhaust ductwork
 - d. Domestic hot and cold water piping
 - e. Fire protection piping
 - f. Electrical Conduit

1.16 CODES FEES AND CHARGES

- A. The Subcontractor shall give all necessary notices, obtain all permits and pay all government sales taxes, fees, and other costs, including utility connections or extensions, in connection with his work; file all necessary plans, prepare all documents and obtain all necessary approvals of all governmental departments having jurisdiction; obtain all required certificates of inspection for his work and deliver same to the Engineer before request for acceptance and final payment for the work.
- B. The Subcontractor shall include in the work, without extra cost to the Owner, any labor, materials, services, apparatus, drawings, in order to comply with all applicable laws, ordinances, rules and regulations, whether or not shown on drawings and/or specified.
- C. All materials furnished and all work installed shall comply with the National Fire Codes of the National Fire Protection Association, with the requirements of local utility companies, and with the requirements of all governmental departments having jurisdiction.
- D. All material and equipment for the electrical portion of the mechanical systems shall bear the approval label, or shall be listed by the Underwriters' Laboratories, Incorporated.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 EXAMINATION OF SITE

- A. The Contractor shall thoroughly examine the site and satisfy himself as to the conditions under which the work is to be performed. The Contractor shall verify at the site all measurements affecting his work and shall be responsible for the correctness of the same. No extra compensation will be allowed to the Contractor for the expenses due to his neglect to examine or failure to discover conditions which affect this work. No extra compensation will be allowed on account of difference between actual dimensions and those indicated on the drawings.

3.02 OPERATING INSTRUCTIONS

- A. Upon completion of all work and all tests, Contractor shall furnish the necessary skilled labor and helpers for operating his system and equipment for a period of three (3) days of eight (8) hours each, or as otherwise specified.
- B. During this period, instruct the Owner or his representative fully in the operations, adjustment, and maintenance of all equipment furnished. Give at least forty-eight (48) hours notice to the Owner in advance of this period.
- C. This subcontractor shall furnish to the General Contractor four (4) complete bound sets for delivery to the Engineer of typewritten or blueprinted instructions for operating and maintaining all systems and equipment included in this contract. all instructions shall be submitted in draft for approval, prior to final issue. Manufacture's advertising literature or catalogs will not be acceptable for operating and maintenance instructions.
- D. The Subcontractor, in the above mentioned instruction, shall include the maintenance schedule for the principal items of equipment furnished under this contract.

3.03 WATERPROOFING

- A. Where any work pierces waterproofing including waterproof concrete, the method of installation shall be as approved by the Architect before work is done. Contractor shall furnish all necessary sleeves, caulking and flashing required to make openings absolutely watertight.

3.04 CUTTING AND PATCHING

- A. This Subcontractor shall provide all cutting and patching necessary to install the work specified in this section. Patching shall match adjacent surfaces.
- B. No structural members shall be cut without the approval of the Architect, and all such cutting shall be done in a manner directed by him.

3.05 ELECTRICAL CONNECTIONS

- A. The Electrical Subcontractor shall furnish and install all wiring except temperature control wiring. The Electrical Subcontractor shall furnish and install all power wiring complete from power source to motor or equipment junction box, including power wiring thru starters. Electrical Subcontractor shall furnish and install all starters not factory mounted on equipment.
- B. The Mechanical Subcontractor shall, regardless of voltage, furnish and install all temperature control wiring, for the equipment that the Mechanical Subcontractor furnishes. The Mechanical Subcontractor shall furnish a starter to the Electrical Subcontractor, where called for on the Mechanical Equipment List or in these specifications. The Mechanical Subcontractor shall provide and be responsible for the heater in all starters that the Mechanical Subcontractor furnishes.
- C. After all circuits are energized and completed, the Electrical Subcontractor shall be responsible for all wiring. Motors and equipment shall be provided for current characteristics as shown on the drawings.

3.06 PROTECTION

- A. The Subcontractor shall protect all work and material from damage by his work or workmen, and shall be liable for all damage thus caused.
- B. The Subcontractor shall be responsible for work and equipment until finally inspected, tested, and accepted; he shall protect work against theft, injury or damage; and shall carefully store materials and equipment received on site which are not immediately installed. He shall close open ends of work with temporary covers or plugs during storage and construction to prevent entry of obstructing material.

3.07 COOPERATION WITH OTHER TRADES

- A. This Subcontractor shall give full cooperation to other trades and shall furnish in writing to the Contractor, with copies to the Engineer, any information necessary to permit the work of all trades to be installed satisfactorily and with the least possible interference or delay.
- B. Where the work of the Subcontractor will be installed in close proximity to, or will interfere with work of other trades, he shall assist in working out space conditions to make a satisfactory adjustment. If so directed by the Engineer, the Subcontractor shall prepare composite working drawings and sections at a suitable scale not less than 1/4" = 1'-0", clearly showing how his work is to be installed in relation to the work of other trades. If the Subcontractor installs his work before coordinating with other trades, he shall make the necessary changes in his work to correct the condition without extra charge.
- C. The Subcontractor shall furnish to other trades, as required, all necessary templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.

END OF SECTION 16000

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes grounding and bonding systems and equipment.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.03 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article.
- B. Qualification Data: For testing agency and testing agency's field supervisor.
- C. Field quality-control reports.

1.04 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.
 - 1. Plans showing as-built, dimensioned locations of system described in "Field Quality Control" Article, including the following:
 - a. Ground rods.
 - b. Grounding arrangements and connections for separately derived systems.

1.05 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Certified by NETA.

PART 2 - PRODUCTS

2.01 SYSTEM DESCRIPTION

- A. 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.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

2.02 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B3.

2. Stranded Conductors: ASTM B8.
3. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.03 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- C. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.
- D. Cable-to-Cable Connectors: Compression type, copper or copper alloy.
- E. Conduit Hubs: Mechanical type, terminal with threaded hub.
- F. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.
- G. Straps: Solid copper, copper lugs. Rated for 600 A.
- H. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.
- I. Water Pipe Clamps:
 1. Mechanical type, two pieces with zinc-plated bolts.
 - a. Material: Die-cast zinc alloy.
 - b. Listed for direct burial.
 2. U-bolt type with malleable-iron clamp and copper ground connector.

2.04 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel, sectional type; 3/4 inch by 10 feet.

PART 3 - EXECUTION

3.01 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

3.02 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1. Feeders and branch circuits.
 - 2. Lighting circuits.
 - 3. Receptacle circuits.
 - 4. Single-phase motor and appliance branch circuits.
 - 5. Three-phase motor and appliance branch circuits.
 - 6. Flexible raceway runs.
- C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

3.03 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
- C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 - 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- D. Grounding and Bonding for Piping:
 - 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

3.04 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal and at individual ground rods. Make tests at ground rods before any conductors are connected.
 - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.

B. Grounding system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION 16060

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Copper building wire rated 600 V or less.
2. Fire-alarm wire and cable.
3. Connectors, splices, and terminations rated 600 V and less.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Schedule: Indicate type, use, location, and termination locations.

1.03 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

PART 2 - PRODUCTS

2.01 COPPER BUILDING WIRE

- A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
- B. Standards:
 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
 2. RoHS compliant.
 3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- C. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.

2.02 FIRE-ALARM WIRE AND CABLE

- A. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.
- B. Signaling Line Circuits: Twisted, shielded pair, size as recommended by system manufacturer.
 1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70, Article 760, Classification CI, for power-limited fire-alarm signal service Type FPL. NRTL listed and labeled as complying with UL 1424 and UL 2196 for a two-hour rating.

- C. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation, and complying with requirements in UL 2196 for a two-hour rating.
 - 1. Low-Voltage Circuits: No. 16 AWG, minimum, in pathway.
 - 2. Line-Voltage Circuits: No. 12 AWG, minimum, in pathway.
 - 3. Multiconductor Armored Cable: NFPA 70, Type MC, copper conductors, Type TFN/THHN conductor insulation, copper drain wire, copper armor[with outer jacket] with red identifier stripe, NTRL listed for fire-alarm and cable tray installation, plenum rated.

2.03 CONNECTORS AND SPLICES

- A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- B. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.
- C. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.
 - 1. Material: Copper.
 - 2. Type: Two] hole with standard barrels.
 - 3. Termination: Crimp.

PART 3 - EXECUTION

3.01 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- C. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

3.02 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.
- B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- C. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

- D. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.
- E. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

3.03 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.04 INSTALLATION OF FIRE-ALARM WIRING

- A. Comply with NECA 1 and NFPA 72.
- B. Wiring Method: Install wiring in metal pathway according to Section 280528 "Pathways for Electronic Safety and Security."
 - 1. Install plenum cable in environmental airspaces, including plenum ceilings.
 - 2. Fire-alarm circuits and equipment control wiring associated with fire-alarm system shall be installed in a dedicated pathway system. This system shall not be used for any other wire or cable.
- C. Wiring Method:
 - 1. Cables and pathways used for fire-alarm circuits, and equipment control wiring associated with fire-alarm system, may not contain any other wire or cable.
 - 2. Fire-Rated Cables: Use of two-hour, fire-rated fire-alarm cables, NFPA 70, Types MI and CI, is not permitted.
 - 3. Signaling Line Circuits: Power-limited fire-alarm cables shall not be installed in the same cable or pathway as signaling line circuits.
- D. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points

with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with fire-alarm system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

- E. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.
- F. Color-Coding: Color-code fire-alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and another for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire-alarm system junction boxes and covers red.
- G. Risers: Install at least two vertical cable risers to serve the fire-alarm system. Separate risers in close proximity to each other with a minimum one-hour-rated wall, so the loss of one riser does not prevent receipt or transmission of signals from other floors or zones.
- H. Wiring to Remote Alarm Transmitting Device: 1-inch conduit between the fire-alarm control panel and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

3.05 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-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
 - 1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches, 12 inches of slack.
- D. Comply with requirements in Section 283111 "Digital, Addressable Fire-Alarm System", Section 283112 "Zoned (DC Loop) Fire-Alarm System" for connecting, terminating, and identifying wires and cables.

3.06 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.07 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.08 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

END OF SECTION 16120

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Standard-grade receptacles, 125 V, 20A.
2. GFCI receptacles, 125 V, 20 A.
3. Toggle switches, 120/277 V, 20A.
4. Occupancy sensors.
5. Digital timer light switches.
6. Wall-box dimmers.
7. Wall plates.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- C. Samples: One for each type of device and wall plate specified, in each color specified.

1.03 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

PART 2 - PRODUCTS

2.01 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- B. Comply with NFPA 70.
- C. RoHS compliant.
- D. Comply with NEMA WD 1.
- E. Device Color:
 1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
- F. Wall Plate Color: For plastic covers, match device color.
- G. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.02 STANDARD-GRADE RECEPTACLES, 125 V, 20 A

A. Duplex Receptacles, 125 V, 20 A:

1. Description: Two pole, three wire, and self-grounding.
2. Configuration: NEMA WD 6, Configuration 5-20R.
3. Standards: Comply with UL 498 and FS W-C-596.

B. Weather-Resistant Duplex Receptacle, 125 V, 20 A:

1. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
2. Configuration: NEMA WD 6, Configuration 5-20R.
3. Standards: Comply with UL 498.
4. Marking: Listed and labeled as complying with NFPA 70, "Receptacles in Damp or Wet Locations" Article.

2.03 GFCI RECEPTACLES, 125 V, 20 A

A. Duplex GFCI Receptacles, 125 V, 20 A:

1. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding.
2. Configuration: NEMA WD 6, Configuration 5-20R.
3. Type: Non-feed through.
4. Standards: Comply with UL 498, UL 943 Class A, and FS W-C-596.

2.04 TOGGLE SWITCHES, 120/277 V, 20 A

A. Single-Pole Switches, 120/277 V, 20 A:

1. Standards: Comply with UL 20 and FS W-S-896.

B. Two-Pole Switches, 120/277 V, 20 A:

1. Comply with UL 20 and FS W-S-896.

C. Three-Way Switches, 120/277 V, 20 A:

1. Comply with UL 20 and FS W-S-896.

2.05 OCCUPANCY SENSORS

A. Wall Switch Sensor Light Switch, Dual Technology:

1. Description: Switchbox-mounted, combination lighting-control sensor and conventional switch lighting-control unit using dual (ultrasonic and passive infrared) technology.
2. Standards: Comply with UL 20.
3. Rated 960 W at 120 V ac for tungsten lighting, 10 A at 120 V ac or 10 A at 277 V ac for fluorescent or LED lighting, and 1/4 hp at 120 V ac.

4. Adjustable time delay of 20 minutes.
5. Able to be locked to Manual On mode.
6. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc (21.5 to 2152 lux).
7. Connections: Provisions for connection to BAS.
8. Connections: RJ-45 communications outlet.
9. Connections: Integral wireless networking.

2.06 DIMMERS

A. Wall-Box Dimmers:

1. Description: Modular, full-wave, solid-state dimmer switch with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.
2. Control: Continuously adjustable slider; with single-pole or three-way switching.
3. Standards: Comply with UL 1472.
4. LED Lamp Dimmer Switches: Modular; compatible with LED lamps; trim potentiometer to adjust low-end dimming; capable of consistent dimming with low end not greater than 1 percent of full brightness.

2.07 WALL PLATES

A. Single Source: Obtain wall plates from same manufacturer of wiring devices.

B. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

C. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
2. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
3. Install wiring devices after all wall preparation, including painting, is complete.

C. Device Installation:

1. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
 2. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.
- D. Receptacle Orientation:
1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.
- E. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- F. Dimmers:
1. Install dimmers within terms of their listing.
 2. Verify that dimmers used for fan-speed control are listed for that application.
 3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device, listing conditions in the written instructions.
- G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

END OF SECTION 16125

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Metal conduits and fittings.
 - 2. Boxes, enclosures, and cabinets.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.03 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
 - 1. Structural members in paths of conduit groups with common supports.
 - 2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

PART 2 - PRODUCTS

2.01 METAL CONDUITS AND FITTINGS

- A. Metal Conduit:
 - 1. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 2. EMT: Comply with ANSI C80.3 and UL 797.
- B. Metal Fittings: Comply with NEMA FB 1 and UL 514B.
 - 1. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 2. Fittings, General: Listed and labeled for type of conduit, location, and use.
 - 3. Fittings for EMT:
 - a. Material: Steel.
 - b. Type: compression.

2.02 BOXES, ENCLOSURES, AND CABINETS

- A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

- C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, aluminum, Type FD, with gasketed cover.
- D. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.
- E. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- F. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep).
- G. Gangable boxes are allowed.

PART 3 - EXECUTION

3.01 RACEWAY APPLICATION

- A. Indoors: Apply raceway products as specified below unless otherwise indicated.
 - 1. Exposed, Not Subject to Physical Damage: EMT.
 - 2. Exposed, Not Subject to Severe Physical Damage: EMT.
 - 3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
 - 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
- B. Minimum Raceway Size: 1/2-inch trade size.
- C. Raceway Fittings: Compatible with raceways and suitable for use and location.
 - 1. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.
- D. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- E. Install surface raceways only where indicated on Drawings.

3.02 INSTALLATION

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- B. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- C. Do not fasten conduits onto the bottom side of a metal deck roof.

- D. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- E. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.
- G. Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.
- H. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- I. Support conduit within 12 inches of enclosures to which attached.
- J. Stub-ups to Above Recessed Ceilings:
 - 1. Use EMT for raceways.
 - 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- L. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- M. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- N. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- O. Surface Raceways:
 - 1. Install surface raceway with a minimum 2-inch radius control at bend points.
 - 2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.
- P. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with 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.
- Q. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 2. Where an underground service raceway enters a building or structure.
 3. Conduit extending from interior to exterior of building.
 4. Conduit extending into pressurized duct and equipment.
 5. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
 6. Where otherwise required by NFPA 70.
- R. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- S. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- T. Locate boxes so that cover or plate will not span different building finishes.
- U. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- V. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- 3.03 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS
- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.
- 3.04 FIRESTOPPING
- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."
- 3.05 PROTECTION
- A. Protect coatings, finishes, and cabinets from damage and deterioration.
1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

END OF SECTION 16130

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Color and legend requirements for raceways, conductors, and warning labels and signs.
 - 2. Labels.
 - 3. Tapes and stencils.
 - 4. Tags.
 - 5. Signs.
 - 6. Cable ties.
 - 7. Paint for identification.
 - 8. Fasteners for labels and signs.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each type of label and sign to illustrate composition, size, colors, lettering style, mounting provisions, and graphic features of identification products.
- C. Delegated-Design Submittal: For arc-flash hazard study.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Comply with ASME A13.1.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Comply with NFPA 70E for requirements for arc-flash warning labels.
- F. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.
- G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F.

2.02 COLOR AND LEGEND REQUIREMENTS

A. Raceways and Cables Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage.

B. Color-Coding for Phase-[and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.

1. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
2. Colors for 208/120-V Circuits:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - c. Phase C: Blue.
3. Color for Neutral: White.
4. Color for Equipment Grounds: Green.

C. Warning Label Colors:

1. Identify system voltage with black letters on an orange background.

D. Warning labels and signs shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

E. Equipment Identification Labels:

1. Black letters on a white field.

2.03 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
- B. Install identifying devices before installing acoustical ceilings and similar concealment.
- C. Verify identity of each item before installing identification products.
- D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
- E. Apply identification devices to surfaces that require finish after completing finish work.
- F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.
- G. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.
- H. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.
 - 1. Secure tight to surface of conductor, cable, or raceway.
- I. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.
- J. Accessible Fittings for Raceways: Identify the covers of each junction and pull box of the following systems with the branch circuit number and panel name.

3.02 IDENTIFICATION SCHEDULE

- A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
- B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.
- C. Accessible Fittings for Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive labels containing the branch circuit number and panel name:

- D. Conductors to Be Extended in the Future: Attach marker tape to conductors and list source.
- E. Auxiliary Electrical Systems Conductor Identification: Marker tape, Self-adhesive vinyl tape that is uniform and consistent with system used by manufacturer for factory-installed connections.
 - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
- F. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.
- G. Workspace Indication: Apply floor marking tape or tape and stencil to finished surfaces. Show working clearances in the direction of access to live parts. Workspace shall comply with NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- H. Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.
- I. Arc Flash Warning Labeling: Self-adhesive labels.

END OF SECTION 16195

PART 1 - GENERAL

1.01 INSTALLATION AND MAINTENANCE GUIDELINES

- A. Any persons, whether with a Contractor or County, adding or moving copper or fiber optic patch (equipment) cords shall do so in a neat, workmanlike fashion in keeping with the original system cable management design concept and according to all industry best practices as outlined in cabling standards and applicable BICSI publications referenced in this document.
- B. Persons performing such moves, adds or changes (MACs) shall further adhere to the following:
 - 1. Use existing cabling management pathways and take care to place cable like with like, maintaining original segregation strategies for separating fiber and copper cables as well as any separation necessary between different types of copper cables.
 - 2. Cables shall be dressed neatly within patch management pathways with care taken to maintain minimum bend radius of not less than 1 times the cord outer diameter for copper and not less than a 1" bend radius for fiber jumpers as per ANSI/TIA 568-C.0.
 - 3. All patch cords used shall be of same Copper Category or Fiber OM/OS designation as the media used in the permanent cabling links.
 - 4. Patching in all cases shall be done using factory terminated cords manufactured for that purpose. Hand terminated patch cords will not be accepted unless approved by the IT Department. Hand terminated patch cords must be properly labeled.
 - 5. All patch cords or jumpers must be completely contained within supplied cable management paths. Cables draped across the front cabinets or racks will not be accepted and shall be remedied at Contractor's expense.
 - 6. Any persons installing or moving fiber optic patch cords for any reason will clean the connector with lint-free wipes and 99% or higher isopropyl alcohol before replacing the connector in a patch or equipment port.
 - 7. Any technicians, whether with County or Contractors performing moves, adds or changes within patch field will label additions to the system according to the labeling conventions in place at that facility.
 - 8. Any persons with the County or installing Contractor performing moves, adds or changes within patch field will record the move according to record system in place at that facility.

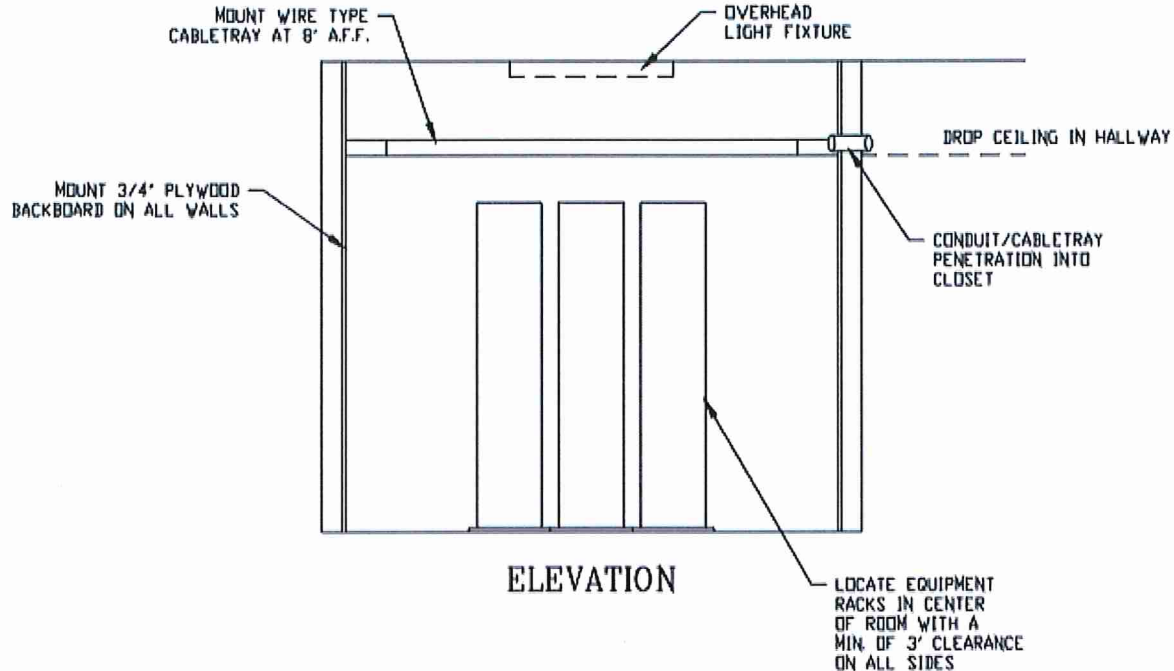
1.02 TELECOMMUNICATION CLOSET

- A. Main Telecommunications Entrance Facility (EF) or Main Distribution Frame (MDF) – This location shall be designed/sized to serve the entire building based on the assessment results. This closet is to be centrally located so as to ensure that all copper voice and data cable sheath lengths out to the outlets are less than 90 m (295 ft.). This closet shall interconnect with each Telecommunications Closet (TC) or Intermediate Distribution Facility (IDF) via distinct, dedicated multimode and single-mode fiber optic backbone cables, 25 pair twisted pair copper data risers and 100 pair twisted pair voice

riser cables. In smaller buildings, where only one telecommunications closet is required, the MDF will also function as the IDF. Closet size requirements are based on distributing telecommunications service to one individual work area per 100 sq. ft. of occupied floor space.

- B. Telecommunication Closet (TC) or Intermediate Distribution Frame (IDF) - This location shall be designed/sized to serve the floor on which it is located, and the floors above and below, based on the assessment results. This closet is to be centrally located so as to ensure that all copper voice and data cable sheath lengths out to the outlets are less than 90 m (295 ft.). In larger buildings, several IDFs per floor may be required to adhere to this maximum cable length requirement. This closet shall interconnect to the MDF via distinct, dedicated multimode and/or single-mode fiber optic backbone cables as per requested by the ITD Infrastructure Network Team. A twenty-five (25) pair twisted pair copper data risers and/or 100 pair twisted pair voice riser cables if required by the ITD Infrastructure Network Team. The overall design shall minimize the total number of closets while staying within the 90 m (295 ft.) requirement.
- C. Closet size requirements are based on distributing telecommunications service to one individual work area per 100 sq. ft. of occupied floor space. The total serving area is calculated using only the worker-occupied floor space. Minimum ceiling height inside the telecommunication closet shall be 10'-0". False ceilings are not permitted in the MDF or IDF. Minimum telecommunications closet (MDF or IDF) sizes are shown in the table below:
 - 1. Up to 8,000 sq. ft. 10 ft. x 10 ft.
 - 2. Larger than 8,000 sq. ft. 10 ft. x 12 ft.
- D. No other utilities shall pass through the MDF, IDF or TC, except for building sprinkler systems. This room shall not be shared with or used for any function other than legitimate telecommunication systems. Each room shall be designed and located to minimize the potential for environmental entry.
- E. Closets shall be connected by four - 4" EMT sleeves conduits or equivalent cable tray, without offsets, for a clear cable pull.
- F. The design and construction of all new telecommunication closets shall be coordinated with the ITD Infrastructure Network Team.
- G. Where available telecommunication closet power outlets shall be connected to the emergency power system in the building. If not available system shall be designed to allow future installation of emergency power.
- H. Closets shall include a minimum of 2 dedicated, non-switched, 120 V AC 20 ampere duplex receptacles on separate branch circuits on each wall and one 120 volt duplex outlet installed below the power panel if applicable. The dual duplex receptacles shall be mounted in separate boxes with 3 inches between. 120 V AC 20 ampere and 240 V AC 30 ampere (L6-30R) Outlets shall be positioned 6 inches below the cable. Two sets of the outlets to be positioned to serve equipment in rack(s) in the center of each closet. A telecommunications grounding source shall be provided at the terminating space.

- I. Closet grounding and bonding shall follow section 1.3.8 Communications Grounding Network.
- J. A complete building design including closet and raceway locations and closet layouts shall be submitted for review to the ITD Infrastructure Network Team in advance of the issuance of permission to proceed with the project.
- K. The MDF or IDF shall not have doorsills or center posts. The door shall be 7 feet high by 3 feet wide, lockable, and open outward. Doors and frames shall be designed and piped for door alarms or future electric locksets and access control system readers.
- L. All walls of the closet shall be lined with rigidly installed wall-to-wall framing of 3/4 inch trade size AC grade plywood, 8 ft. high. All surfaces (including the unexposed side) of the plywood shall be painted with a white latex nonconductive fire-retardant overcoat. (Exception is only the exposed side shall be painted if plywood is mounted on a 30 minute rated or greater wall.) All areas and equipment above the plywood including the ceilings shall be painted. Color shall be white.
- M. Allow a minimum clear working space of 4 feet from front and 3 feet from rear of data racks to the wall. Distances may have to be increased to account for specialized equipment or cross-connect fields mounted on the wall as applicable.
- N. Conduits and cable trays located above 8'-0" shall protrude a minimum of 12 inches into the closet.
- O. Utilize appropriate fire stopping materials after penetrating walls or slabs with any type of horizontal or vertical raceway. A smoke detector shall be provided in the TC and connected to the building fire alarm system. Fire protection sprinklers shall be extended into the TC in buildings that have existing sprinkler systems.
- P. The temperature of the room shall be kept between 64° F and 75° F. The fan coil unit should be installed outside the closet where permitted or equipped with a gravity condensation drain line.
- Q. Relative humidity in the telecommunications room shall be kept between 30% and 55%.



NOTE: Length and width of closet shall be established to comply with the requirements set by the ITD Infrastructure Network Team. This document is for internal departmental **USE ONLY**.

1.03 CABLE PULLING AND TERMINATION

- A. Installing systems according to all applicable codes and the standards cited in this document.
- B. Use grommets to protect the cable when passing through metal studs or any openings that can possibly cause damage to the cable. This includes grommets on ends of hard conduit where used.
- C. Do not deform the jacket of the cable. The jacket shall be continuous, free from pinholes, splits, blisters, burn holes or other imperfections.
- D. Install proper cable supports, spaced less than 5 feet apart, and within manufacturer's requirements for fill ratio and load ratings.
- E. Leave a pull string to the end of each conduit run. Replace pull string if it was used for a cable pull.
- F. Service loops may not touch the drop-ceiling assembly. Any portion of the communications cabling making contact with ceiling structures must be remedied at the Contractor expense.
- G. Label every cable within 12 in. of the ends with self-laminating wire wrap cable appropriate to that cable size. Use a unique number for each cable segment as required by the project documentation and the labeling section of this document.

- H. Dress the cables neatly with hook and loop with Velcro or Panduit plenum cable ties in telecommunications rooms. Plastic ties are approved in pathways where cable bundles will not be reentered. Contractor responsible for using plenum ties and appliances in air-return (plenum) spaces as required by the local authority having jurisdiction.
- I. When installing cabling systems in County facilities shall utilize plenum rated cable in all instances. Non-plenum cable is not allowed and shall be removed at Contractor's expense.

1.04 COPPER

- A. When making additions to legacy systems, Contractor shall match the cabling configuration (pinout) of the existing systems. Legacy systems at County are in most cases T568B.
- B. All new installations within the County facilities, contractor shall use copper pinout T568B.
- C. All four pair Category 6/6A cable runs shall be kept to a maximum permanent link length of 83 meters when using a total 10 meters of 28 awg "small diameter" patch cords.
- D. Copper links that are 90 meters in permanent link, shall not exceed 6 meters (total) of patch cords when using 28 awg "small diameter" patch cords.
- E. Use low to moderate force when pulling cable. Maximum tensile load may not exceed 25' lbs. maximum pulling force per 4 pair cable.
- F. No pathway, including conduits shall have greater than a 35% fill per manufacturer fill charts. Contractor is responsible for bringing to the attention of IT Department point of contact any insufficiently sized conduit or cable pathways in project documentation.
- G. Keep Category 6/6A cables as far away from potential sources of EMI (electrical cables, transformers, light fixtures, etc.) as required in cited TIA Standards.
- H. All copper horizontal cabling shall have slack service loops no less than 12" at the work area (equipment outlet) and not less than 3 feet in the telecommunications room.
- I. Slack at the work area may be stored in the ceiling or in the wall space. Service loops in the telecommunications room may be wall mounted or where approved by the IT Department contained in pathways or racking systems if done in a neat, workmanlike fashion.
- J. Service loops shall be stored in such fashion as to not violate bend radius, slack touching the drop ceiling is not allowed and must be remedied at Contractor expense.
- K. Maintain the twists of the pairs all the way to the point of termination, or no more than 0.5" (one half inch) untwisted.
- L. All UTP patching shall be accomplished using Category 6/6A rated modular patch panels as indicated elsewhere in this document.
- M. All removed copper cable is to be disposed of in a County recycling bin designated for "copper".

1.05 FIBER

- A. When making additions to legacy systems, Contractor shall match the fiber type and fiber connectors used within that system, unless specified to utilize LC connector by the IT Department.
- B. Within all new fiber installations within the County, contractor shall use Panduit OptiCam LC connectors as specified in the fiber section of this document.
- C. When installing fiber cable, Contractor shall maintain a minimum bend radius, both under pulling load and static (installed), per requirements outlined within TIA standards, or manufacturer's recommendations, whichever is the most stringent.
- D. Fiber terminations shall be done according to recommendations of TIA, manufacturer's requirements and accepted industry best practices.
- E. All unjacketed fiber shall be contained within appropriate fiber enclosures. Exposed tight-buffered or loose-tube strands will not be tolerated and shall be remedied at Contractor's expense.
- F. Contractor shall use fusion splices when terminating new and legacy installations.
- G. Contractor shall perform test setup and testing according to guidelines in the "Testing and Acceptance" section of this document.

1.06 CABLING SYSTEMS AND ASSOCIATED INFRASTRUCTURE; CABLING SUBSYSTEM I – HORIZONTAL CABLING SYSTEM: SLACK (SERVICE LOOPS) IN HORIZONTAL UTP CABLE

- A. Horizontal cable in the County facilities is routed through conduit, but electrical boxes are not used for low-voltage communications cable.
- B. Contractor shall use low-voltage mounting brackets ("box-eliminators") for mounting low-voltage communications faceplates.
- C. Contractor shall provide a minimum 12" slack or service loop at the equipment outlet (work area) on each terminated copper horizontal permanent link. Work area slack shall be contained within the wall behind the faceplate if this may be done easily without violating cable bend radius.
- D. Contractor will pull work area slack into the ceiling space and properly store service loop with appropriately rated hook and loop Panduit cable ties or Velcro. Cable slack shall in no instances touch the ceiling grid or associated drop ceiling components or fixtures.
- E. Contractor shall provide a minimum of 10 feet slack or service loop in the horizontal telecommunications room on each terminated copper horizontal permanent link, to be stored on the wall backboard using appropriate mounting fixtures built to that purpose (i.e. D-rings).

- F. Contractor should consult project-specific documentation or the County's project point of contact for other mounting methods where wall mount is not an option.

1.07 METAL CONDUIT

- A. Contractor shall size conduit large enough to accommodate at least 50% growth, i.e. conduit for 4 cables shall be sized to accommodate 6 cables, etc.

1.08 Equipment Outlets (Faceplates)

- A. When adding horizontal cabling to existing facilities within the County, Contractor shall match the existing cable plant in regards to color of existing raceway and faceplates.
- B. Flush mount faceplates in new projects shall be Mini-Com® Classic Series Faceplates with Label and Label Cover.
- C. Faceplates shall be form-molded plastic, single-gang, International White (eggshell) in color and available in 2, 3, 4, 6 and 8 hole versions. Faceplates shall further have the following characteristics:
 - 1. Accept Mini-Com ® Modules for STP and UTP, fiber optic, and audio/video, which snap in and out for easy moves, adds, and changes.
 - 2. Include label covers for easy port identification.
 - 3. Have available replacement label covers.
- D. Contractor shall use blank inserts to reserve space on any unused positions (holes) in faceplates.

1.09 Equipment Outlets – Surface Boxes

- A. Wireless Access Points (WAPs) mounted on walls and ceilings utilize (2) Category 6A horizontal runs (drops) terminated in a 2 port white Mini-Com® Surface Mount, unless specified otherwise by the IT Department point of contact.
- B. Two hole boxes shall further meet the following requirements:
 - 1. Accept Mini-Com ® Modules for STP and UTP, fiber optic, and audio/video, which snap in and out for easy moves, adds, and changes.
 - 2. Mount easily with supplied mounting screws, adhesive tape, or optional magnet (CBM-X).
 - 3. Cable entry from side and rear knockouts and from opening in center of base.
 - 4. CBXJ2 and CBX2 include built-in removable blank to add a second module.
 - 5. Optional adhesive labels available.

1.10 Copper Jacks – All work areas Category 6

- A. Copper jacks shall be Mini-Com® TX6™ PLUS UTP Jack Modules.
- B. Category 6 jacks at the work area shall be color Blue at both IT Closet and at workstation with White faceplate.

- C. Jacks used to populate angled modular panels shall be Blue.
- D. Category 6 jacks shall further meet the following requirements:
1. Exceed ANSI/TIA-568-C.2 Category 6 and ISO 11801 2nd Edition Class E standards
 2. Meet requirements of IEEE 802.3af and IEEE 802.3at for PoE applications
 3. Be 100% tested to ensure NEXT and RL performance and be individually serialized for traceability.
 4. Color-coded, keyed jack modules mechanically and visually distinguish connections to prevent unintentional mating with unlike keyed or non-keyed modular plugs accommodating more discrete networks.
 5. Utilize patent-pending enhanced Giga-TX™ Technology for jack terminations which optimizes performance by maintaining cable pair geometry and eliminating conductor untwist.
 6. Have contacts plated with 50 micro inches of gold for superior performance.
 7. Require no punch down tool required; termination tool (EGJT) ensures conductors are fully terminated by utilizing a smooth forward motion without impact on critical internal components for maximum reliability.
 8. Have guaranteed ability to be re-terminated a minimum of twenty times without measurable degradation of performance.
 9. Employ a white termination cap to designate Category 6 performance at a glance and provides positive strain relief; help control cable bend radius and securely retain terminated cable.
 10. Utilize a universal termination cap is color-coded for T568B wiring schemes for flexibility across installations.
 11. Accept 6 and 8-position modular plugs without damage to conductor pins.
 12. Identified options that include optional labels and icons.
 13. Be compatible with Mini-Com® Modular Patch Panels, Faceplates, and Surface Mount Boxes.
 14. Have available optional RJ45 blockout device that blocks out unauthorized access to jack modules and potentially harmful foreign objects.

1.11 Copper Jacks – Wireless Access Points (WAPs) Category 6A

- A. Copper jacks shall be Mini-Com® TX6A™ PLUS UTP Jack Modules.
- B. Category 6A jacks at the WAP area shall be color yellow to match the 2 port surface box.
- C. Jacks used to populate angled modular panels shall be yellow.
- D. Category 6A jacks shall further meet the following requirements:
1. Exceed ANSI/TIA-568-C.2 Category 6A and ISO 11801 Class EA standards
 2. Meet requirements of IEEE 802.3af and IEEE 802.3at for PoE applications
 3. Be 100% tested to ensure NEXT and RL performance and be individually serialized for traceability.

4. Color-coded, keyed jack modules mechanically and visually distinguish connections to prevent unintentional mating with unlike keyed or non-keyed modular plugs accommodating more discrete networks.
 5. Include MaTriX split foil tape to suppress the effects of alien crosstalk, allowing 10 Gb/s transmission even in high density 48-port, 1RU patch panels.
 6. Utilize patent-pending enhanced Giga-TX™ Technology for jack terminations which optimizes performance by maintaining cable pair geometry and eliminating conductor untwist.
 7. Meets ANSI/TIA-1096-A contacts plated with 50 micro inches of gold for superior performance.
 8. Require no punch down tool required; termination tool (EGJT) ensures conductors are fully terminated by utilizing a smooth forward motion without impact on critical internal components for maximum reliability.
 9. Have available a high-volume “gun-style” optional termination tool (TGJT) that reduces termination time by 25% and is ideal for high volume installations.
 10. Have guaranteed ability to be re-terminated a minimum of twenty times without measurable degradation of performance.
 11. Employ a yellow termination cap to designate Category 6A performance at a glance and provides positive strain relief; help control cable bend radius and securely retain terminated cable.
 12. Have range to terminate 4-pair, 22 – 26 AWG, 100 ohm, solid or stranded twisted pair cable.
 13. Utilize a universal termination cap is color-coded for T568A and T568B wiring schemes for flexibility across installations.
 14. Accept 6 and 8-position modular plugs without damage to conductor pins.
 15. Identified options that include optional labels and icons.
 16. Be compatible with Mini-Com® Modular Patch Panels, Faceplates, and Surface Mount Boxes.
 17. Have available optional RJ45 blockout device that blocks out unauthorized access to jack modules and potentially harmful foreign objects, saving time and money associated with data security breaches, network downtime, repair, and hardware replacement
 18. Have an optional dust cap keeps out dust and debris while not in use.
- 1.12 Category 6 unshielded Twisted Pair Cable – All Work Areas
- A. Inside 4 pair horizontal cable for the County facilities shall be blue jacketed plenum rated TX6000™ High Performance Category 6 UTP Copper Cable.
 - B. In addition, performance Category 6 UTP Copper Cable must meet the following mechanical and performance criteria:
 1. Exceeds requirements of ANSI/TIA-568-C.2 Category 6 and ISO 11801 2nd Edition Class E channel standards.
 2. Exceeds requirements of ANSI/TIA-568-C.2 and IEC 61156-5 Category 6 component standards.
 3. Meets requirements of IEEE 802.3af and IEEE 802.3at for PoE applications.
 4. Third party tested to comply with ANSI/TIA-568-C.2.
 5. Cable diameter: Riser 0.240 in. (6.1mm) nominal, Plenum 0.236 in. (5.9mm) nominal.

6. Installation temperature range: 32°F to 122°F (0°C to 50°C).
7. Operating temperature range: 14°F to 140°F (-10°C to 60°C).
8. Characterized to 550 MHz, 300 MHz above the standard.
9. Descending length cable markings enable easy identification of remaining cable which reduces installation time and cable scrap.

1.13 Wireless Access Points (WAPs) Category 6A Unshielded Twisted Pair Cable

- A. Inside 4 pair horizontal cable for "Company Name" facilities shall be blue jacketed plenum rated TX6A™ 10Gig™ UTP Copper Cable with Advanced MaTriX Technology.
- B. In addition, performance Category 6A UTP Copper Cable must meet the following mechanical and performance criteria:
- C. Exceeds requirements of ANSI/TIA-568-C.2 Category 6A and ISO 11801 Class EA channel standards.
- D. Exceeds requirements of ANSI/TIA-568-C.2 and IEC 61156-5 Category 6A component standards.
- E. Meets requirements of IEEE 802.3af and IEEE 802.3at for PoE applications.
- F. Third party tested to comply with ANSI/TIA-568-C.2.
- G. Cable diameter: Plenum 0.275 in. (5.9mm) nominal.
- H. Installation temperature range: 32°F to 122°F (0°C to 50°C).
- I. Operating temperature range: 14°F to 140°F (-10°C to 60°C).
- J. Include advanced MaTriX tape to suppress the effect of alien crosstalk allowing 10 Gb/s transmission, while minimizing cable diameter.
- K. Descending length cable markings enable easy identification of remaining cable which reduces installation time and cable scrap.

1.14 Wireless Access Points (WAPs) Category 6A Unshielded Twisted Pair Cable

- A. County copper patch panels in the horizontal patch fields shall angled 1 RU or 2 RU Mini-Com® Modular Faceplate Patch Panels as needed to accommodate UTP cable quantity.
- B. Modular patch panels shall be standard density of 24 ports per rack unit with front removable retaining plates so installing work may be done from the front of the rack in tight spaces.
- C. Contractor may populate modular panels with designated color code set by the County IT Department Panduit Category 6/6A jacks, or approved equivalent as described elsewhere in this document.

D. Patch Panels shall further meet the following criteria:

1. Have release snap feature on faceplate to allow front access to installed modules.
2. Accept Mini-Com® Modules for UTP, fiber optic, and audio/video, which snap in and out for easy moves, adds, and changes.
3. Be available in label versions available for easy port identification, with replacement label/label covers available.
4. Mount to standard EIA 19" racks or 23" racks with optional extender brackets.
5. Be available in angled patch panels to facilitate proper bend radius control and minimize the need for horizontal cable managers.

1.15 Work Areas – Small Diameter Category 6 Copper Patch Cords

A. Copper patching of Category 6 links in the County facilities shall use Blue Panduit 28 awg "small diameter" patch cords.

B. Small diameter patch cords shall have the following characteristics:

1. Cable diameter not more than 0.150 in. (3.8mm) nominal.
2. Category 6/Class E channel and component performance.
3. Exceeds all ANSI/TIA-568-C.2 Category 6 and ISO 11801 Class E Edition 2.1 electrical performance requirements for all frequencies from 1 to 250 MHz.
4. FCC and ANSI compliance: Meets ANSI/TIA/EIA-1096-A; contacts plated with 50 micro inches of gold for superior performance.
5. IEC compliance: Meets IEC 60603-7 c (UL) US listed: UL 1863, CSA standard C22.2.
6. PoE compliance: Meets IEEE 802.3af and IEEE 802.3at for PoE applications in bundle sizes up to 48 cables.
7. Operating temperature: 14°F to 140°F (-10°C to 60°C).
8. Storage temperature: -40°F to 158°F (-40°C to 70°C).
9. Plug housing: UL94V-0 rated clear Polycarbonate.
10. Contacts: Gold plated phosphor bronze.
11. RoHS compliance: Compliant.
12. Flammability rating: CM/LSZH dual rated.
13. Due to miniature size of patch cords, utilize increased attenuation de-rating value of 1.9. These support 96 meter channels that include 90 meter permanent links, and 6 meters of patch cord. A channel using 10 meters total of patch cord would support a 93 meter channels.

1.16 Wireless Access Points (WAPs) Small Diameter Category 6A Copper Patch Cords

A. Copper patching of Category 6A links in the County facilities shall use "Yellow" Panduit 28 AWG "small diameter" patch cords.

B. Small diameter patch cords shall have the following characteristics:

1. Cable diameter not more than 0.185 in. (4.7mm) nominal.
2. Category 6A/Class EA channel and component performance.

3. Exceeds all ANSI/TIA-568-C.2 Category 6A and ISO 11801 Class EA electrical performance requirements for all frequencies from 1 to 500 MHz
 4. FCC and ANSI compliance: Meets ANSI/TIA/EIA-1096-A; contacts plated with 50 micro inches of gold for superior performance.
 5. IEC compliance: Meets IEC 60603-7
 6. PoE compliance: Meets IEEE 802.3af and IEEE 802.3at for PoE applications in bundle sizes up to 48 cables.
 7. Operating temperature: 14°F to 140°F (-10°C to 60°C).
 8. Storage temperature: -40°F to 158°F (-40°C to 70°C).
 9. Plug housing: UL94V-0 rated clear Polycarbonate.
 10. Contacts: Gold plated phosphor bronze.
 11. RoHS compliance: Compliant.
 12. Flammability rating: CM/LSZH dual rated.
- C. Due to miniature size of patch cords, utilize increased attenuation de-rating value of 1.9. These supports 96 meter channels that include 90 meter permanent links, and 6 meters of patch cord. A channel using 10 meters total of patch cord would support a 93 meter channels.

1.17 Surface Mount Raceway – Wall Mount

- A. For installations, Contractor shall match raceway which are already installed in the facility unless instructed otherwise by the IT Department project point of contact.
- B. For installations where the environment (cinder block walls) or project documentation requires cable to be surface-mounted in the work area; horizontal cable shall be routed through Panduit LD10 International White (color), plastic "latching-duct raceway.
- C. Contractor is responsible for sizing raceway to accommodate not less than 40% fill upon installation, per manufacturer fill tables, providing room for at least 50% growth in additional cables: i.e. a work area requiring 4 cables, raceway shall be sized to hold 6, etc. LD10 will allow up to 8 CAT6 cables at a max OD of .240. If over this limit, replace LD10 with Panduit T45/T70 series surface raceway according to cable fill ratio.
- D. Contractor is responsible for LD10 raceway installations which include all associated fittings, drop ceiling fittings, couplers and 1" control-bend-radius fittings.
- E. Contractor shall not rely on the pressure sensitive adhesive foam to mount raceway, but rather use adhesive to hold raceway in place while screwing down the raceway to the structure beneath using anchors appropriate to the wall type at intervals not to exceed 2 ft. (24 inches).
- F. Standard LD-10 Panduit raceway shall have the following features:
 1. For routing data and low voltage cabling.
 2. One-piece hinged design allows cables to be laid in.
 3. Factory applied adhesive backing speeds installation.
 4. FT4 rated.
 5. Terminate using surface mount outlet box solutions or Panduit Mini-Com surface mount boxes.

- G. Installations requiring raceway shall use the same faceplates used in flush-mount applications as specified in this document, mounted on Panduit "JB1" surface boxes. The County shall not accept adhesive-backing to hold surface boxes in place, contractor must use appropriate wall anchors for firm, permanent installation.
- H. T45/T70 Pan-Way® Fast-Snap™/Snap-On Technology - Pan-Way® Fast-Snap™ Surface Mount Boxes assemble without the use of screws or additional hardware and can accommodate both power and communication applications. Fast-Snap™ Boxes can accept any standard NEMA 70mm screw-on faceplate. Pan-Way® Snap-On Faceplates attach directly to Fast-Snap™ Boxes, any 70mm raceway, Cove, or Pan-Pole™ device without the use of screws or additional hardware.
- I. Standard T45/T70 Pan-Way® Surface Raceway shall have the following features:
1. Allows multiple inline access points for space optimization and aesthetic installation.
 2. Supports any NEMA standard screw-on faceplate with use of device bracket and can reduce to smaller profile raceway (T-45 or LD raceway).
 3. Shall have a modular divider wall that allows channel configuration flexibility.
- 1.18 Cabling Subsystem II – Intrabuilding Backbone Fiber Optics (Multimode Fiber Trunk for use within building)
- A. In addition to the County's existing fiber cable plant, Contractor shall consult with County IT Department for fiber requirements.
- B. For new projects for the County of El Paso, backbone fiber running between telecom spaces within buildings shall be Panduit 12/24/48 strand OM4 multimode, indoor tight buffered, plenum-rated, armored cable, with the following characteristics:
1. Used in intrabuilding backbone, building backbone, and horizontal installations for riser (OFNR), plenum (OFNP), and general-purpose environments.
 2. Available in 6, 12, and 24-fiber counts in a "single jacket" design, and in 36, 48, 72, 96 and 144-fiber counts in a "subunit" design.
 3. Multimode (OM4, OM3, OM2, and OM1) and singlemode (OS1/OS2) fiber available.
 4. Sheath markings provide positive identification, quality traceability, and length verification.
 5. Cable design and flexible buffer tubes allow for quick breakout and ease of routing.
 6. 900µm standards-based color-coded buffer coating protects fibers during handling and allows for easy identification and stripping.
 7. Opti-Core® 10Gig™ Fiber Optic Cable is designed to support network transmission speeds up to 10 Gb/s for link lengths up to 300 meters for OM3 and up to 550 meters for OM4 with an 850nm source per IEEE 802.3ae 10 GbE standard; backward compatible for use with all 50/125µm system requirements.
- C. Contractor shall terminate tight-buffered cable constructions with LC Opticam connectors, as indicated elsewhere in this document.

- 1.19 Cabling Subsystem III – Interbuilding Backbone Fiber (Singlemode Fiber Trunks for Use Between Buildings)
- A. In addition to the County's existing fiber cable plant, Contractor shall consult with the County IT Department for fiber requirements.
- B. In new County projects, backbone fiber running between telecom spaces within buildings shall be Panduit 12/24/48 strand OS1/OS2 singlemode, indoor/outdoor, loose-tube, plenum-rated, armored cable, with the following characteristics:
1. Allows installation using loose tube cable methods for aerial and duct applications.
 2. Gel-free design with water swellable tape provides dry water blocking.
 3. All-dielectric construction provides a non-metallic design that eliminates the need to bond or ground for aerial or duct applications, allowing easy access to cable for lower installation costs.
 4. UV resistant cable sheathing protects the cable and meets or exceeds the performance requirements of Telcordia GR-20, Issue 2 and ICEA 640 to withstand harsh outdoor environmental demands.
 5. Tested in accordance with relevant EIA-455 series FOTPs for fiber optic cables.
 6. Complies with RUS 7 CFR 1755.900 requirements for fiber optic service entrance cables.
 7. Available in 6, 12, 24, 36, 48, 72, 96 and 144-fiber counts as a "stranded loose tube" design.
 8. Medium density polyethylene jacket provides low friction installation.
 9. Multimode (OM4, OM3, OM2, and OM1) and singlemode (OS1/OS2) fiber available.
 10. Sheath markings provide positive identification, quality traceability, and length verification.
 11. 250µm buffer coating protects fibers during handling and allows for ease of stripping.
 12. Opti-Core® 10Gig™ Fiber Optic Cable is designed to support network transmission speeds up to 10 Gb/s for link lengths up to 300 meters for OM3 and up to 550 meters for OM4 with an 850nm source per IEEE 802.3ae.
 13. 10 GbE standard; backward compatible for use with all 50/125µm system requirements.
- C. Contractor shall terminate loose-tube cable constructions with LC pigtails and fusion splices as indicated elsewhere in this document.
- D. Plenum armored cable shall meet the following physical properties:

physical properties-plenum

Fiber Count	Cable O.D. Inches (mm)	Installation Bend Radius Inches (cm)	Long-Term Bend Radius Inches (cm)	Cable Weight Lb./kft. (kg/km)
2	0.45 (11.4)	4.5 (11.5)	9.0 (22.9)	81 (120)
4	0.45 (11.4)	4.5 (11.5)	9.0 (22.9)	85 (127)
6	0.47 (11.9)	4.7 (12.0)	9.4 (23.9)	87 (130)
8	0.48 (12.1)	4.8 (12.2)	9.4 (23.9)	91 (135)
12	0.51 (13.0)	5.1 (13.0)	10.2 (25.9)	95 (142)
24	0.58 (14.7)	5.8 (14.8)	11.6 (29.5)	131 (195)
36	0.938 (23.8)	8.0 (20.4)	16.0 (40.7)	167 (248)
48	0.938 (23.8)	8.1 (20.6)	16.2 (41.2)	243 (363)
72	1.052 (26.7)	9.4 (23.9)	18.8 (47.8)	361 (537)
96	1.189 (30.2)	10.9 (27.7)	21.8 (55.4)	511 (760)

- E. Contractor shall bond to ground armor from fiber backbones at both ends as indicated in the grounding section 2.3.8 of this document.

1.20 Fiber Connectivity - LC Fiber Connectors – Tight-Buffered Fiber

- A. All tight-buffered indoor fiber cable shall be terminated using Panduit multimode LC OptiCam® Fiber Optic Connectors.
- B. LC cam connectors shall further have the following properties:
1. Be a TIA/EIA-604 FOCIS-10 compatible connector that exceed exceeds TIA/EIA-568-B.3 requirements.
 2. Have connector backbone and boot colors that follow TIA/EIA-568-C.3 suggested color identification scheme.
 3. Have insertion loss: 0.3dB average (multimode and singlemode).
 4. Have return loss: >26dB (10Gig TMmultimode), >20dB (multimode), >50dB (singlemode).
 5. Be a spring-loaded “Senior” rear pivot latch LC connector.
 6. Be a pre-polished cam style termination for in less than half the time of field polish connectors.
 7. Have patented re-termination capability provides yield rates approaching 100%.
 8. Feature a factory pre-polished fiber end face eliminates time-consuming field polishing to reduce installation costs, labor, scrap and the number of tools required.
 9. Be cam activated, with fiber and buffer clamp mechanisms that provide superior fiber and buffer retention with less sensitivity to fiber tensile loading.
 10. Utilize the OptiCam® Termination Tool that simplifies tooling and termination, and virtually eliminates operator error by providing a visual indication of proper termination after the cam step has been completed.
 11. Have a range of cable retention boot assemblies that consistently provide higher than industry standard cable retention.
 12. Include a non-optical disconnect that maintains data transmission under tensile loads for jacketed cable.

13. Have ability to accept 900µm tight-buffered fiber with included boot(s), and accept 1.6mm – 2.0mm and 3.0mm jacketed cable with available OptiCam ®Cable Retention Boot Assemblies (ten per package).

1.21 LC Fiber Connectors – Loose-tube cable and Fusion with LC Pigtails

- A. Outdoor rated loose-tube fiber shall be terminated at the demarcation with fusion splices and LC fiber pigtails having the following characteristics:

1. Available in riser (OFNR) or plenum (OFNP) flame ratings; part numbers listed are for OFNR (F9E10-10M1Y).
2. For OFNP, place a P after the X in the part number and drop the Y (F9PE10-10M1).
3. Pass all TIA/EIA-568-B.3 performance requirements.
4. LC and SC connector housing and boot colors follow TIA/EIA-568-C.3 suggested color identification scheme.
5. 100% factory inspected end face geometry in compliance with Telcordia GR-326-CORE, Issue 3.
6. Typical insertion loss per connection: 0.25dB.
7. UPC polished (55dB minimum return loss).
8. Factory terminated and 100% tested for insertion loss and return loss.
9. Insertion loss and return loss data recorded for every singlemode patch cord.
10. Lifetime traceability of test data to a Q.C. number on each patch cord.
11. Highest quality flame retardant fiber optic cable with tight-buffered coating on each optical fiber.

- B. Fusion splices shall be contained in protective splice trays and tray brackets.

1.22 Fiber Enclosure

- A. Fiber cable terminations shall be contained in 1 RU, or 2 RU Panduit FCE series rack mount fiber enclosures.
- B. Properly size enclosure as needed for the projected fibers in that telecommunication space when fully populated.
- C. Contractor shall fill any unused enclosure space with a blank fiber adapter panel (FAP).
- D. FCE enclosures shall further have the following properties:
 1. Be able to hold QuickNet™ Fiber Optic Cassettes, Opticom® Fiber Adapter Panels, or splice modules.
 2. Have a slide-out, tilt-down drawer to provide full front access to all fibers and cables.
 3. Employ integral bend radius control and cable management appliances for fiber optic patch cords.
 4. Have rear cable management for proper slacking/spooling of trunk cable break-outs and interconnect cables.

5. Have multiple trunk cable entry locations and include fiber optic cable routing kit (grommets, Panduit cable ties or velcro, spools, strain relief bracket, and ID/caution labels) for different installation configurations.

1.23 Fiber Adapter Panels

- A. FCE fiber enclosures shall be populated with fiber adapter panels containing 6 singlemode duplex fiber adapters.
- B. Contractor is responsible to blank out any enclosure spaces where adapter panels are not used.
- C. Adapter panels shall further have the following features:
 1. Loaded with TIA/EIA-604 FOCIS-10 compatible adapters.
 2. Exceed TIA/EIA-568-B.3 requirements.
 3. Adapter housing colors follow TIA/EIA-568-C.3 suggested color identification scheme.
 4. Snap quickly into the front of all Opticom ® components
 5. LC fiber adapter panels are Sr/Jr. to conserve enclosure space.
 6. Accept FOCIS-10 compatible senior LC connectors at either end and FOCIS-10 junior LC connectors at the inside end for behind the wall applications.
 7. Both ends accept FOCIS-10 compatible senior LC connectors.
 8. Junior end also accepts FOCIS-10 compatible junior (fixed ferrule/springless) LC connectors.
 9. Choice of phosphor bronze or zirconia ceramic split sleeves to fit specific network requirements; zirconia ceramic split sleeves are recommended for OM4/OM4 multimode and OS1/OS2 singlemode applications.
 10. Every adapter is laser marked with Q.C. number to assure 100% traceability.
 11. LC adapters are also available in QuickNet™ Fiber Optic Cassettes.

1.24 Fiber Patch Cords

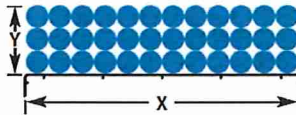
- A. Fiber patch fields within the County facilities shall utilize riser rated multimode and singlemode "push/pull" fiber jumpers (fiber patch cords) that have the following properties:
 1. Push-Pull LC Duplex Fiber Optic Patch Cords shall feature the push-pull strain relief boot and duplex clip, to allow users easy accessibility in tight areas when deploying very high density LC patch fields.
 2. Jumpers shall be available in OM3, OM4 and OS1/OS2 and be available in riser (OFNR), plenum (OFNP), and low smoke zero halogen (LSZH) rated jacket materials.

1.25 Cable Pathways - Overhead Metallic Pathway

- A. Cable delivery over racking systems in telecommunications rooms shall be done with Wyr-Grid® overhead cable tray routing system.
- B. Any pathway offered must have the following properties:

1. Wyr-Grid® Pathways are provided in four widths: 12" (305mm), 18" (457mm), 24" (610mm), and 30" (762mm).
 2. Wyr-Grid® System incorporates non-integral Snap-On sidewalls which minimize specification requirements and are offered in three different heights: 2" (50mm), 4" (102mm), and 6" (152mm).
 3. Wyr-Grid® Splice Connectors have an integral bonding screw that creates a mechanical-electrical bond between cable tray pathway sections.
 4. Wyr-Grid® Waterfalls are offered in two different configurations that attach to all pathway sections: 12" (305mm), 18" (457mm), 24" (610mm), and 30" (762mm) to facilitate bend radius control and cable management.
 5. Wyr-Grid® Support Brackets are offered in various widths to accommodate pathways: 12" (305mm), 18" (457mm), 24" (610mm), and 30" (762mm); have integral quick-clip retention; accommodate 1/2" or 12 mm threaded rods.
- C. All metallic cable trays must be grounded and all sections bonded in accordance with listing requirements for the particular type of system and per TIA 607-B including most recent revisions, TSB and addenda.
- D. Contractor is responsible for sizing all pathways to represent no more than a 35% fill upon installation per manufacturer's fill chart below:

Wire Fill for Wyr-Grid® Overhead Cable Tray Routing System



X (in.)	Y (in.)	Internal Area (in²)	Category 6A (SD) Diameter 6.1mm 0.240"	Category 6A Diameter 7.6mm 0.300"	Category 6 Diameter 6.1mm 0.240"	X (in.)	Y (in.)	Internal Area (in²)	Category 6A (SD) Diameter 6.1mm 0.240"	Category 6A Diameter 7.6mm 0.300"	Category 6 Diameter 6.1mm 0.240"
12.2	2	24.3	269	172	269	24.2	2	48.3	534	342	534
	4	48.7	538	344	538		4	96.7	1069	684	1069
	6	73.0	807	516	807		6	145.0	1603	1026	1603
18.2	2	36.3	401	257	401	30.2	2	60.3	666	427	666
	4	72.7	804	514	804		4	120.7	1334	854	1334
	6	109.0	1205	771	1205		6	181.0	2000	1280	2000

"Y" equates to the height of the Wyr-Grid® Optional Sidewalls. The internal area defines the allowable fill capacity based on the Wyr-Grid® Pathway width and optional sidewall height. The Wyr-Grid® Pathway cable fill is based on NEC allowable fill of 50%. The above cable diameters represent the nominal Panduit cable diameter per performance level.

- E. All cable trays and grounding conductors shall be clearly marked in accordance with manufacturer's instructions, applicable codes, standards and regulations.
- F. Contractor shall take care to segregate and protect armored fiber from copper cabling in metallic pathway.
- G. Bundled copper and fiber backbones shall be dressed to maintain segregation of cable types throughout the pathway. Inner duct or separate fiber duct is not necessary due to armored construction on fiber backbone.

1.26 J-Hooks

- A. Bundles of 120 Category 6 cables or less may be required to be routed above ceilings using J-hooks. Check project documentation for clarification.
- B. J-hook systems used by the County shall be Panduit "J-Pro" series.
- C. Contractor installing J-hook systems shall space them no more than 5 feet apart as per TIA 569-C standard.
- D. Contractor is responsible for proper sizing of J-hook systems based upon cable count and manufacturers recommendations for fill, with new J-hooks to not have more than 30% fill per manufacturer's fill charts based upon projected worst case future bundle size.
- E. If J-hooks are deemed too small by above criteria, Contractor shall bring this to the attention of the County IT Department point of contact for resolution in writing. J-hook pathways that will not have sufficient capacity should be replaced in the design with the proper sized basket tray for future cable additions and flexibility.
- F. J-hook systems used by the County shall have the following properties:
 1. Patented design provides complete horizontal and vertical 1" bend radius control that helps prevent degradation of cable performance.
 2. UL 2043 and CAN/ULC S102.2 listed and suitable for use in air handling spaces.
 3. Pre-ripped assemblies allow for attachment to walls, ceilings, beams, threaded rods, drop wires and underfloor supports to meet requirements of a variety of applications.
 4. Wide cable support base prevents pinch points that could cause damage to cables.
 5. Cable tie channel allows user to easily install 3/4" (19.1mm) Tak-Ty ® Panduit Cable Ties or Velcro to retain cable bundle.
 6. Durable non-metallic J Hook materials provide the ability to manage and support a large number of cables.
 7. Material: Black Nylon 6.6 J Hook with metal attachments.

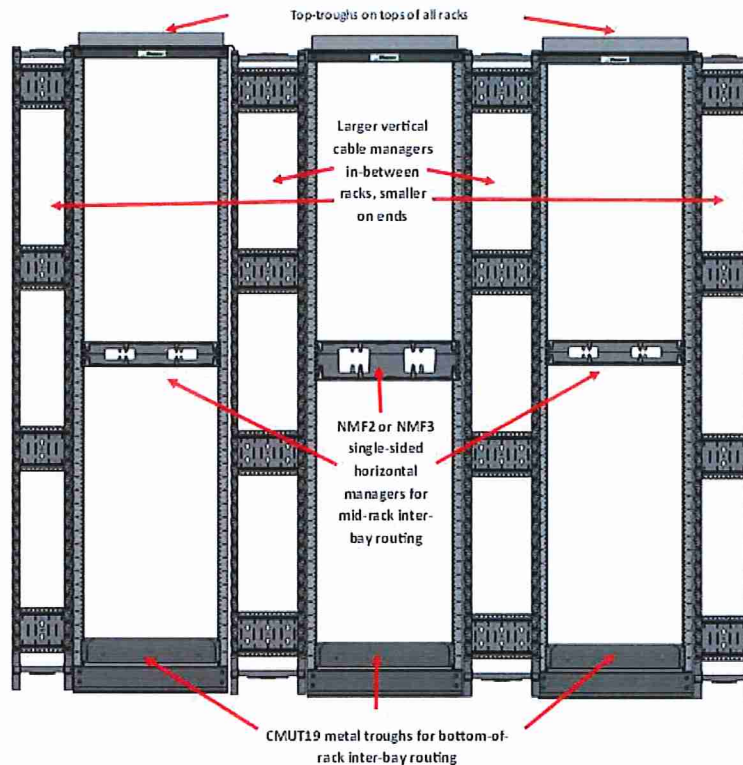
1.27 19" Racks and Rack-mount Cable Managers - Two-post Communication Racks

- A. 2-post racks will be Panduit black-powdered aluminum and have the following properties:
 1. 19" EIA rack, aluminum.
 2. Dimensions: 96.0"H x 20.3"W x 3.0"D (2134mm x 514mm x 76mm).
 3. Rack units numbering up from bottom to allow quick and easy location of rack mount items
 4. UL listed for 1,000 lbs. load rating.
 5. Double-sided #12-24 EIA universal mounting hole spacing with 24 #12-24 mounting screws included.
 6. Accepts all Panduit cable management and patch panel products in addition to any industry standard 19" components.

7. Includes paint piercing washers for assembly to assure electrical continuity between components as per TIA 607-B Bonding and Grounding Standard.
- B. Includes paint piercing washers for assembly to assure electrical continuity between components as per TIA 607-B Bonding and Grounding Standard.
- C. Interbay routing shall be provided in the form of top troughs, interbay mid-rack path and flanged shelf at the bottom. (See "Illustration of Interbay Routing" below).

Illustration of Inter-bay Routing in Rack Systems

(Note: Doors left off vertical and horizontal managers for clarity)



- D. For bottom-of-rack interbay routing where cable quantities exceed capacity of CMUT19 troughs, Contractor shall substitute 4RU trough CMLT19.
 - E. All racks shall be outfitted with a vertical grounding busbar along one rail, with all equipment bonded to ground according to TIA 607-B Bonding and Grounding Standard. See Bonding and Grounding section 2.3.8 of this document for details.
- 1.28 Rack-mounted Cable Management – Vertical Managers

- A. Vertical cable managers shall be PatchRunner™ High Capacity Vertical Cable Management System in sizes 6" wide, 8" wide, 10" wide and 12" wide.
- B. Contractor will use double sided (front and back) vertical managers on 2-post racks.

- C. All vertical cable managers shall have metal dual hinged doors.
- D. Contractor shall choose vertical cable manager width according to manufacturer's fill tables to not represent more than a 35% fill at installation based on projected worst-case density when racks are fully populated.
- E. Vertical cable managers shall have the following features:
 - 1. High density minimizes area required for network layout, freeing up valuable floor space.
 - 2. Allows mounting of many standard EIA 19" accessories, such as patch panels, vertically in the manager.
 - 3. Ventilated side walls provide maximum airflow for equipment cooling.
 - 4. Snap on finger sections can be removed to improve airflow, and break away fingers allow routing of large cable bundles.
 - 5. Large finger spacing accommodates up to 48 Cat6A cables.
 - 6. Optional sure-close dual hinged metal doors provide easy access to vertical pathway and provide visual and audible feedback on closure.
 - 7. Available in 7 foot version.
- F. In IDF rooms or areas where there are low cable counts, vertical cable managers shall be 6" wide NetRunner™ Vertical Cable Manager, dual sided.

1.29 Rack-mounted Cable Management – Horizontal Managers

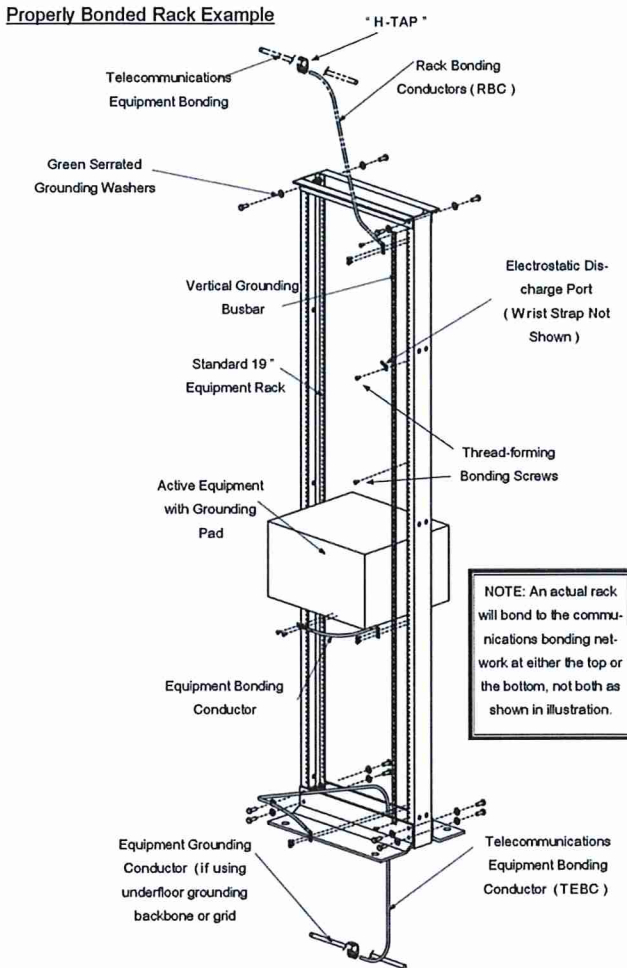
- A. For areas requiring horizontal cable managers, Contractor shall use double-sided NetManager™ High Capacity Horizontal Cable Managers having the following features:
 - 1. Innovative inset fingers slope inward toward back of managers offering unobstructed access to network cabling for easier moves, adds, and changes.
 - 2. Large front finger openings easily accommodate Category 6A and 10 Gigabit Ethernet cables, speeding installation and reducing maintenance costs.
 - 3. Rear cable management finger spacing utilizes open D-rings for greater accessibility.
 - 4. Can be used to create large capacity horizontal pathways for routing cable.
 - 5. Patented front and rear dual hinged cover allows cable access without removing cover.
 - 6. Curved surfaces maintain cable bend radius.
 - 7. Pass-through holes allow for front to rear cabling.
 - 8. Built in cable retainers hold cable in place for easy moves, adds, and changes.
 - 9. Mount to 19" EIA racks and cabinets.
 - 10. Covers, #12-24 and M6 mounting screws included.

1.30 Cable Accessories

- A. Cables bundle on racks and in pathways shall be bundled with re-enterable hook and loop cables ties that come in continuous rolls.
 - 1. Cable bundles on racks and in pathways shall be bundled with re-enterable hook and loop Panduit cable ties or Velcro that come in continuous rolls.

2. Contractor is responsible for using plenum hook and loop ties in air-return spaces.
- B. Physical Security Devices
1. Some portions of the County network require additional physical security devices. These take three forms:
 - a. Devices that block-out copper and fiber ports in patch fields and faceplates that require a special tool for removal.
 - b. Devices that lock-in copper patch cords and require a special tool for removal of those patch cords.
 - c. Devices that temporarily or permanently block USB ports on laptops and computers.
 2. Areas where such devices are required will be called out in the project documentation.
- 1.31 Communications Grounding Network – General
- A. Contractor is responsible for bonding to ground all newly placed equipment and installed racks or cabinets per the TIA 607-B Standard.
- 1.32 Room Busbars
- A. All Telecommunications spaces and distributor rooms shall have installed an appropriately sized wall-mount busbar with BICSI hole spacing that bonds to the building bonding backbone.
- 1.33 Rack and Equipment Grounding
- A. Contractor is responsible for properly grounding all network equipment, racks and cabinets and bonding them to the wall mounted busbars as described in the TIA 607-B standard.
 - B. Contractor is responsible for properly grounding all network equipment, racks and cabinets and bonding them to the wall mounted busbars as described in the TIA 607-B standard.
 - C. Smaller equipment without an integrated grounding pad shall be bonded to the vertical busbar through the use of a thread-forming grounding screw that is anodized green and includes serrations under the head to cut through oxidation or paint on the equipment flange.
 - D. Larger equipment (chassis switches) with a designated grounding terminal shall be bonded to the vertical busbar with an EBC (equipment bonding conductor) kit built to that purpose.
 - E. Contractor shall take care to clean (wire brush, scotchbrite pads) any metallic surface to be bonded down to bare metal and apply a film of anti-oxidation paste to the surfaces prior to effecting the bond.

- F. All bonding lugs on racks and busbars shall be of two-hole irreversible compression type. Mechanical lugs and single-hole lugs will not be accepted and shall be removed and replaced at Contractor's expense.
- G. Every rack or cabinet shall have an individual bonding conductor into the grounding network, serially connecting (daisy-chaining) of racks is expressly forbidden and will not be accepted.
- H. Rack Bonding Conductors (RBC) may tap into an overhead or underfloor aisle ground, or may run to the wall-mounted grounding busbar in smaller Telecommunications rooms containing 5 racks or less.
- I. A minimum of every other rack or cabinet shall be outfitted with a properly installed and bonded ESD (electro-static discharge) port along with a wrist strap and lead to be used by any technicians servicing network equipment. On four post racks and cabinets these ESD ports and straps shall be provided on front and back to be accessible and able to reach any active equipment needing servicing.
- J. Armored cables shall be properly bonded to the earthing system on both ends with a kit built to that purpose.
- K. For examples of rack grounding refer to the illustrations below:



1.34 Network Infrastructure labeling – General Requirements

- A. Horizontal and backbone cables shall be labeled at each end. The cable or its label shall be marked with its identifier.
- B. A unique identifier shall be marked on each faceplate to identify it as connecting hardware.
- C. Each port in the faceplate shall be labeled with its identifier.
- D. A unique identifier shall be
- E. Each port on the connecting hardware shall be labeled with its identifier.

- F. Labels will provide the following information and conform to the format defined below:
Multi-level facilities served by a single main cross connect (MC).
- G. The first number represents the building floor where the main cross connect (MC) is located.
- H. The second number indicates the floor on which the work area office (WAO) is located.
- I. The third number indicates the patch panel within main cross connect (MC).
- J. The fourth number indicates the port on the patch panel.
 - 1. Single-Level Facilities served by a main cross connect (MC) and multiple intermediate cross connect (IC) or horizontal cross connects (HC).
 - a. The first number represents the building floor where the main cross connect (MC) or multiple intermediate cross connect (IC) is located.
 - b. The second number indicates the number of the horizontal cross connects (HC) on that floor.
 - c. The third number indicates the patch panel within that main cross connect (MC)/ intermediate cross connect (IC)/ horizontal cross connects (HC).
 - d. The fourth number indicates the port on the patch panel.

1.35 Testing and Acceptance – General

- A. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions.
- B. All copper pairs or optical fibers of each installed cable shall be tested and verified prior to system acceptance.
- C. Any defect in the cabling system performance or installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors or fibers in all cables installed.
- D. All cables shall be tested in accordance with this document, the ANSI/TIA Standards, the PANDUIT®™ System Warranty guidelines and best industry practice.
- E. If any of these are in conflict, the Contractor shall bring any discrepancies to the attention of the IT Department project point of contact for clarification and resolution.

1.36 Copper Link Testing

- A. All twisted-pair copper cable links shall be tested for compliance to the requirements in ANSI/TIA 1152 and ANSI/TIA 568-C.2 for the appropriate Category of cabling installed using a test unit meeting a minimum IEC level of accuracy.

- B. All testers used must have been factory calibrated by the manufacturer within one year of use or according to factory calibration recommendations, whichever is the more stringent.
 - C. Contractor shall set references according to manufacturer's recommendation prior to each day's testing and reset references anytime tester is left unused for more than two hours.
 - D. Contractor shall set references according to manufacturer's recommendation prior to each day's testing and reset references anytime tester is left unused for more than two hours.
- 1.37 Fiber Testing
- A. All installed fiber shall be tested for link-loss in accordance with ANSI/TIA-C.0 and shall be within limits specified within ANSI/TIA-C.3, or as spelled out in the project documentation.
 - B. For horizontal cabling system using multimode optical fiber, attenuation shall be measured in one direction at either 850 nanometer (nm) or 1300 nm using an LED light source and power meter.
 - C. Attenuation testing shall be performed with a stable launch condition using two-meter jumpers to attach the test equipment to the cable plant. The light source shall be left in place after calibration and the power meter moved to the far end to take measurements.
 - D. Backbone single-mode fiber cabling shall be tested at the 1310 and 1550 wavelengths in both directions.
 - E. Test set-up and performance shall be conducted in accordance with ANSI/568-C.0 standard, Method B.
 - F. Where links are combined to complete a circuit between devices, the Contractor shall test each link from end to end to ensure the performance of the system. Only basic link-loss testing with a power meter is required. The contractor can optionally install patch cords to complete the circuit and then test the entire channel. The test method shall be the same used for the test described above.
 - G. The values for calculating loss shall be those defined in the ANSI/TIA 568-C.3 Standard. If the link loss requirements defined within the standard are in conflict with those referenced in the project documentation, Contractor shall immediately bring this to the attention of IT Department Project point of contact for resolution.

1.38 System Documentation

- A. Upon completion of the installation, the contractor shall provide one (1) full documentation set for approval. Documentation shall include the items detailed in the sub-sections below.
- B. Documentation shall be submitted during the completion of each testing phase. This is inclusive of all test results and draft as-built drawings. Draft drawings may include

annotations done by hand. Digital generated (final) copies of all drawings shall be submitted by the completion of each testing phase.

- C. Contractor shall submit with drawings a diagram of each telecommunications room with indicating which cabling drops will terminate in which rooms or facility areas. This is both to give an idea of contractor cable plant design, as well as to facilitate future troubleshooting.
- D. At the request of the County IT Engineer, the contractor shall provide copies of the original test results in tester native format, not spreadsheet.
- E. County Information Technology may request that a 10% random field re-test be conducted on the cable system, at no additional cost, to verify documented findings. Tests shall be a repeat of those defined above. If findings contradict the documentation submitted by the contractor, additional testing will be requested to the extent determined necessary by County Information Technology, including a 100% re-test. This re-test shall be at no additional cost to the County of El Paso.

1.39 Test Results

- A. Documentation shall be provided in electronic format within the completion of the project. The media shall be clearly marked on the outside front cover with the words "Project Test Documentation", the project name, and the date of completion (month and year).
- B. The results shall include a record of test frequencies, cable type, conductor pair and cable (or outlet) I.D., measurement direction, reference setup, and crew member name(s). Documentation shall also include test equipment name, manufacturer, model number, serial number, software version and last factory calibration date.
- C. Unless the manufacturer specifies a more frequent calibration cycle, an annual calibration cycle is anticipated on all test equipment used for this installation.
- D. The test document shall detail the test method used and the specific settings of the equipment during the test as well as the software version being used in the field test equipment.
- E. Digital generated for each cable by the wire (or fiber) test instrument shall be submitted as part of the documentation package.
- F. The media shall contain the electronic equivalent of the test results as defined by the specification along with the software necessary to view and evaluate the test reports.
- G. When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall be documented.
- H. The As-Built drawings are to include cable routes and outlet locations. Their sequential number as defined elsewhere in this document shall identify outlet locations.
- I. Numbering, icons, and drawing conventions used shall be consistent throughout all documentation provided. The County will provide floor plans in paper and electronic

(DWG, AutoCAD) formats on which as-built construction information can be added as available.

- J. These documents will be modified or built accordingly by the Contractor to denote as-built information as defined above and returned to the County IT Department.
- K. The Contractor shall annotate the base drawings and return a hard copy (same plot size as originals) and electronic (AutoCAD) form.

1.40 Applicable Regulatory References

- A. The contractor will be responsible for knowledge and exercise of current version of all applicable standards and codes. In cases where listed standards and codes have been updated, contractor shall adhere to the most recent revision, including all relevant changes or addenda at the time of installation.
- B. Anywhere cabling standards conflict with electrical or safety codes, Contractor shall defer to the National Electrical Code (NEC) and any applicable local codes or ordinances, or default to the most stringent requirements listed by either. Knowledge and execution of applicable standards and codes is the sole responsibility of the Contractor. Any violation of applicable standards or codes committed by the Contractor shall be remedied at the Contractor's expense.

1.41 ANSI/TIA

- A. TIA-526-7 (OFSTP-7) (2008) Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant
- B. TIA-526-14-B (2010) (OFSTP-14) Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant
- C. ANSI/TIA/EIA-598-C (January 2005) Optical Fiber Cable Color Coding
- D. ANSI/TIA-568-C.0 (September 2010) Generic Telecommunications Cabling for Customer Premises
- E. TIA-568-C.0-1 (September 2010) Generic Telecommunications Cabling for Customer Premises-Addendum 1, Updated Reference for Balanced Twisted-Pair Cabling
- F. ANSI/TIA-568-C.1 (February 2009) Commercial Building Telecommunications Cabling Standards
- G. TIA-568-C.1-2 (November 2011) Commercial Building Telecommunications Cabling Standard, Addendum 2 General Updates
- H. ANSI/TIA-568-C.2 (August 2009) Balance Twisted Pair Communications and Components Standards
- I. ANSI/TIA-568-C.3 (June 2008) Optical Fiber Cabling Components Standard

- J. ANSI/TIA-568-C.3-1 (December 2011) Optical Fiber Cabling Component Standard-Addendum 1, Addition of OM4 Cabled Optical Fiber and array connectors
- K. ANSI/TIA-1183 (August 2012) Test Fixtures for Balun-Less Measurements of Balanced Components and Systems
- L. ANSI/TIA-568-C.4 (July 2011) Broadband Coaxial Cabling Components Standard
- M. ANSI/TIA-942-A (August 2012) Telecommunications Infrastructure Standard for Data Centers
- N. ANSI/TIA-942-A-1 (March 2013) Telecommunications Infrastructure Standard for Data Centers, Addendum 1 - Cabling Guidelines for Data Center Fabrics
- O. TIA-569-C (May 2012) Telecommunications Pathways and Spaces
- P. TIA-569-C-1 (February 2013) Telecommunications Pathways and Spaces Addendum 1- Revised Temperature and Humidity Requirements for Telecommunications Spaces
- Q. ANSI/TIA-606-B (June 2012) Administration Standard for Telecommunications Infrastructure
- R. TIA-607-C (November 2015) Generic Telecommunications Grounding (Earthing) and Bonding for Customer Premises
- S. TIA-758-B (April 2012) Customer-Owned Outside Plant Telecommunication Infrastructure Standard
- T. ANSI/TIA-598-C-2005, Optical Fiber Cable Color-coding
- U. TIA-1152 (September 2009) Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling
- V. ANSI/TIA-862-A (April 2011) Building Automation Systems Cabling Standard
- W. ANSI/TIA-1005 (March 2009) Telecommunications Infrastructure Standard for Industrial Premises
- X. TIA-1005-1 (March 2010) Telecommunications Infrastructure Standard for Industrial Premises; Addendum 1 - Industrial Pathways and Spaces
- Y. TIA, TSB-140 Additional Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber Cabling Systems
- Z. TSB-155-A: Guidelines for the Assessment and Mitigation of Installed Category 6 Cabling to Support 10GBASE-T
- AA. TSB-184: Guidelines for Supporting Power Delivery Over Balanced Twisted-Pair Cabling
- BB. TSB-190: Guidelines on Shared Pathways and Shared Sheaths

1.42 ISO/IEC

- A. ISO/IEC 11801 Edition 2.2: Information Technology – Generic Cabling For Customer Premises
- B. ISO/IEC 24702 Edition 1.0: Information Technology – Generic Cabling – Industrial Premises
- C. ISO/IEC 24764 Edition 1.0: Information Technology – Generic Cabling Systems For Data Centers
- D. ISO/IEC 14763-2 Edition 1.0: Implementation and Operation of Customer Premises Cabling – Part 2: Planning and Installation
- E. ISO/IEC 14763-3 Edition 1.1: Implementation and Operation of Customer Premises Cabling – Part 3: Testing of Optical Fiber Cabling.

1.43 National Electric Codes

- A. National Electrical Safety Code (NESC) (IEEE C2-2012)
- B. ANSI/NFPA 70-2011, National Electrical Code® (NEC®)
- C. ANSI/IEEE C2-207, National Electrical Safety Code®
- D. National Electrical Code (NEC) (NFPA 70)

1.44 OSHA Standards and Regulations: All Applicable

- A. Local Codes and Standards: all applicable

1.45 BICSI – Building Industry Consultative Services International

- A. Telecommunications Distribution Methods Manual, 13th Edition
- B. ANSI/BICSI 005-2013, Electronic Safety and Security (ESS) System Design and Implementation Best Practices
- C. Information Transport Systems Installation Methods Manual (ITSIMM), 6th Edition
- D. ANSI/BICSI 002-2011, Data Center Design and Implementation Best Practices
- E. Network Systems and Commissioning (NSC) reference, 1st Edition
- F. ANSI/NECA/BICSI 568-2006, Standard for Installing Commercial Building Telecommunications Cabling
- G. NECA/BICSI 607-2011, Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings

- H. AV Design Reference Manual, 1st Edition
- I. Network Design Reference Manual, 7th Edition
- J. Outside Plant Design Reference Manual, 5th Edition
- K. Wireless Design Reference Manual, 3rd Edition
- L. Electronic Safety and Security Design Reference Manual, 3rd Edition
- M. Commercial Installation On-the-Job Training Booklet
- N. Telecommunications Project Management (TPM) reference, 1st Edition

1.46 Substitution Policy

- A. This is a performance-based specification developed from the experience of the County of El Paso IT Infrastructure Division in providing exceptional solutions for all our facilities and departments. As such, substitution of specified products or systems is not allowed, unless approved in writing by the County IT Department.
- B. Contractor shall assume all costs for removal and replacement of any product installed in substitution of those specified. Such costs shall include but not be limited to labor, materials as well as any penalties, fees or costs incurred for late completion.

1.47 Contractor Qualifications

- A. Contractor shall be a current Panduit ONESM Partner, Gold or above only, that has completed the Structured Cabling Deployment Training (Panduit Certified Installer). A copy of the corporate Panduit manufacturer certification shall be included with all quotes.
- B. Contractor must have at least 5 years documented experience installing and testing structured cabling systems of similar type and size.
- C. Contractor shall have offices and service personnel based within a fifty-mile radius of County of El Paso and be capable of same-day response to service calls.
- D. Contractor shall employ at least one BICSI Registered Communication Distribution Designer (RCDD) to sign-off on all designs offered, including stamping the design with their current BICSI/RCDD stamp.
- E. Contractor shall have the responsibility to obtain any of the necessary permits, licenses, and inspections required for the performance of data, voice, and fiber optic cable installations. Contractor acknowledges that all communications will be solely communicated through the IT Department point of contact (POC) on a per project basis.
- F. At least 50 percent of the technicians on the job must have a current Panduit Certified Copper Technicians certificate, or accepted substitute manufacturer, to install copper distribution systems.

- G. At least 75 percent of the technicians installing any Fiber Distribution Systems must have a current Panduit Certified Fiber Technicians certificate, or accepted substitute manufacturer certificate, to install fiber distribution systems.
- H. At least 50 Percent of the technicians on the job must be trained in the installation of pathways but not limited to racks, cable management, patch panel(s), cable tray(s), cable ladder(s), conduit, labeling, grounding and bonding, etc.
- I. The contractor must provide a project manager to serve as the single point of contact to manage the installation, speak for the contractor and provide the following functions:
 - 1. Initiate and coordinate tasks with the County of El Paso project point of contact and others as specified by the project schedule. Provide day to day direction and site supervision of contractor personnel.
 - 2. Ensure conformance with all contract and warranty provisions.
 - 3. This individual will remain project point of contact for the duration of the project. The contractor may change project point of contact only with the written approval from the County IT Department.

1.48 Warranty - General

- A. Contractor shall provide a 25 year Panduit Certification PLUS™ System Warranty on all copper and fiber permanent cabling links.
- B. It is understood the Certification PLUS™ Warranty is a system performance warranty guaranteeing for 25 years from acceptance that the installed system shall support all data link protocols for which that category of copper cabling system or fiber OM/OS designation of fiber optic system is engineered to support according to current and future IEEE and TIA standards.
- C. The Certification PLUS™ System Warranty may be invoked only if the cabling channel links are comprised of continuous Panduit/General Cable components, including patch cords, equipment cords and fiber jumpers.
- D. Upon acceptance of Warranty, Panduit will mail a notification letter to the installer and a notification letter and warranty certificate to "County of El Paso".

1.49 Contractor Warranty Obligations

- A. Contractor must be a current Panduit ONESM Partner, Gold or above, in good standing and shall include a copy of the company installation certification with the bid.
- B. Contractor shall name a supervisor to serve on site as a liaison responsible to inspect and assure all terminations are compliant to factory methods taught in Panduit Technician Certification Training, or approved equal, and according to all Standards cited in the Regulatory References section of this document.
- C. Contractor liaison (project supervisor) shall have a current, up-to-date Panduit Certified Technician (PCT) certificate in both copper and fiber. Copies of the copper and fiber certificates of the Panduit liaison shall be submitted with the bid and renewed on a yearly

basis at the contractor's expense. On a yearly basis the contractor will provide the updated copied to the County IT Department.

- D. Fiber optic cabling system additions and upgrade to existing facilities shall match the fiber type (OM "multimode" /OS "single" designation) of the system to which it is being installed. Contractor shall under no circumstances mix different OM/OS classes of cable or termination devices (connectors) within the same system.
- E. All intrabuilding new fiber optic installations shall utilize an appropriate construction of OM3/OM4 or OS1/OS2 fiber as specified herein.
- F. All UTP cable pulled and terminated shall be Category 6/6A cable and connectivity whether new or specified by the County IT Department.
- G. All UTP terminations within County of El Paso projects shall be terminated using the T568B pin-out (wire map). Legacy additions shall match the copper pin-out of the facility to which cabling is being added-to or upgraded.
- H. Contractor shall install all racking and support structures according to cited standards in such fashion as to maintain both cited industry standards as well as manufacturer recommendations for uniform support, protection, and segregation of different cable types.
- I. Contractor is responsible for maintenance of maximum pulling tensions, minimum bend radius, and approved termination methods as well as adhering to industry accepted practices of good workmanship.
- J. Contractor is responsible for understanding and submitting to Panduit all documents required prior to project start to apply for the Panduit Certification PLUS warranty. These include but are not limited to the project information form and SCS warranty agreement.
- K. Contractor is responsible for understanding and submitting to Panduit all documents required at project end. These include, but are not limited to: completed warranty forms, passing test reports and drawings of floor plans showing locations of links tested.
- L. Test results shall be delivered in the tester native format (PDF) and represent the full test report, summaries shall not be accepted. Contractor will contact a Panduit representative for a current list of approved testers, test leads and latest operating systems.
- M. Contractor shall correct any problems and malfunctions that are warranty-related issues without additional charge to the County of El Paso for the entire warranty period.
- N. The warranty period shall commence following the final acceptance of the project by the County of El Paso and written confirmation of Warranty from Panduit.

1.50 Return Policy / Defective Products

- A. All equipment shall be guaranteed to be new and to perform to the manufacturer's specifications. Contractor will warrant the hardware against defects in installation, materials, and workmanship.

PART 2 – NETWORK TELECOMMUNICATION

2.01 Hardware guidelines and specifications

- A. The purpose of this specification is to purchase network equipment for County facilities. The County of El Paso Standardizes on Cisco Catalyst 3850 Series stackable access-layer switches that provide full convergence between wired and wireless on a single platform.
- B. The Cisco reseller must be an approved and registered Cisco Systems Reseller. When products are purchased through unauthorized channels (also known as the gray or secondary market), the customer does not know if the products are legitimate or counterfeit and it is not supported by Cisco Systems. To protect the County's investment all equipment must be channeled through a registered Cisco Systems Reseller and approved by the Cisco Brand Protection Office.
- C. Installation of equipment will be done by the County Information Technology Department.
- D. Network Switching Hardware Specifications:
 1. Integrated wireless controller capability with:
 - a. Up to 40G of wireless capacity per switch (48 port models)
 - b. Up to 50 access points (APs) and 2000 wireless clients support on each switching entity (switch or stack)
 2. 48 10/100/1000 data and Power over Ethernet Plus (PoE+) models with Energy Efficient Ethernet (EEE).
 - a. Cisco StackWise®-480 technology provides scalability and resiliency with 480 Gbps of stack throughput
 - b. Cisco StackPower™ technology provides power stacking among stack members for power redundancy
 - c. Uplink modules with 4 x 10 Gigabit Ethernet ports.
 - d. Dual redundant, modular power supplies and three modular fans providing redundancy.
 - e. Full IEEE 802.3at (PoE+) with 30W power on all ports in 1 rack unit (RU) form factor
 - f. Cisco Universal Power over Ethernet (UPOE) which delivers up to 60W per port over standard cabling infrastructure.
 3. Software support for IPv4 and IPv6 routing, Multicast routing, modular quality of service (QoS), Flexible NetFlow (FnF) Version 9, and enhanced security features
 4. Single Universal IOS image across all license levels, providing an easy upgrade path for software features
 5. Enhanced limited lifetime warranty (E-LLW) with next business day (NBD) advance hardware replacement and access to Cisco Technical Assistance Center (TAC) support

6. **Multigigabit Ethernet Technology:** Cisco Multigigabit Ethernet is a unique Cisco innovation to the new Cisco Catalyst Ethernet access switches. With the enormous growth of 802.11ac and new wireless applications, wireless devices are promoting the demand for more network bandwidth. This creates a need for a technology that supports speeds higher than 1 Gbps on all cabling infrastructure. Cisco Multigigabit technology allows you to achieve bandwidth speeds from 1 Gbps through 10 Gbps over traditional Cat 5e cabling or above. In addition, the Multigigabit ports on select Cisco Catalyst switches support UPOE, which is increasingly important for next-generation workspaces and Internet of Things (IoT) ecosystems.
7. **Mobility agent (MA):** This is the default mode in which the Cisco Catalyst 3850 switch ships. In this mode the switch is capable of terminating the CAPWAP tunnels from the access points and providing wireless connectivity to wireless clients. Maintaining wireless client databases and configuring and enforcing security and QoS policies for wireless clients and access points can be enforced in this mode. No additional license on top of IP Base is required to operate in the mobility agent mode.
8. **Mobility controller (MC):** In this mode, the Cisco Catalyst 3850 switch can perform all the mobility agent tasks in addition to mobility coordination, radio resource management (RRM), and Cisco CleanAir® coordination within a mobility subdomain. The mobility controller mode can be enabled on the switch CLI. IP Base license level is required when the Cisco Catalyst 3850 switch is acting as the mobility controller. A centrally located Cisco 5508 Wireless LAN Controller (WLC 5508), Cisco Wireless Services Module 2 (WiSM2) (when running AireOS Version 7.3), and Wireless LAN Controller 5760 can also perform this role for larger deployments.
9. **Flexible NetFlow (FNF):** Full visibility into the wired plus wireless traffic is achieved because of the access point Control and Provisioning of Wireless Access Points (CAPWAP) tunnel termination on the switch. This helps identify users and user traffic flows in order to identify potential attackers and take corrective action at the access layer before the attack penetrates further into the network. This is achieved using FNF, which monitors every single flow entering and exiting the switch stack for wired and wireless users. It also helps identify the top wired/wireless talkers and enforce appropriate bandwidth provisioning policies.
10. **QoS:** The 3850 switch has advanced wired plus wireless QoS capabilities. It uses the Cisco modular QoS command line interface (MQC). The switch manages wireless bandwidth using unprecedented hierarchical bandwidth management starting at the per-access-point level and drilling further down to per-radio, per-service set identification (SSID), and per-user levels. This helps manage and prioritize available bandwidth between various radios and various SSIDs (enterprise, guest, and so on) within each radio on a percentage basis.
11. **Security:** The Cisco Catalyst 3850 provides a rich set of security features for wired plus wireless users. Features such as IEEE 802.1x, Dynamic Host Configuration Protocol (DHCP) snooping, IP Source Guard and control plane protection, wireless intrusion prevention systems (WIPs), and so on enable protection against unauthorized users and attackers. With a variety of wired plus wireless users connecting to the network, the switch supports session-aware networking, in which each device connected to the network is identified as one session, and unique access control lists (ACLs) and/or QoS policies can be defined and applied using the ISE for each of these sessions, providing better control on the devices connecting to the network.

Regular Equipment	Description	Quantities
WS-C3850-48U-L	Cisco Catalyst 3850 48 Port UPOE LAN Base	1
CON-SSSNT-WS5048UL	SOLN SUPP 8X5XNBD Cisco Catalyst 3850 48 Port UPOE LAN Base	1
S3850UK9-163	UNIVERSAL	1
CAB-TA-NA	North America AC Type A Power Cable	1
STACK-T1-50CM	50CM Type 1 Stacking Cable	1
PWR-C1-BLANK	Config 1 Power Supply Blank	0
C3850-NM-BLANK	Cisco Catalyst 3850 Network Module Blank	0
C3850-NM-4-10G=	4 x 1GE/4 x 10GE Network Module spare	1
GLC-T=	1000BASE-T SFP	0
PWR-C1-1100WAC=	1100W AC power supply spare	1
STACK-T1-3M=	Cisco Stackwise-480 3 m stacking cable spare	1

PART 3 – WIRELESS INFRASTRUCTURE

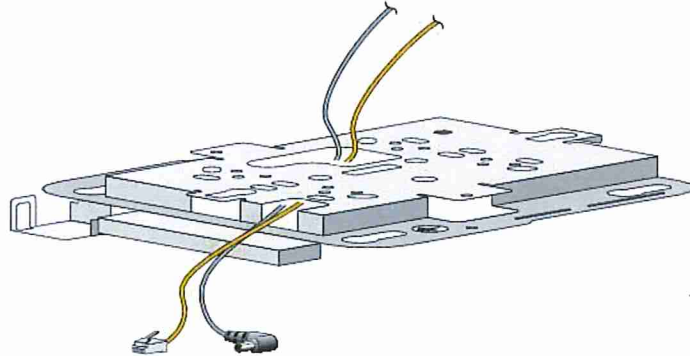
3.01 Hardware guidelines and specifications

- A. The purpose of this specification is to purchase wireless network equipment for the County Courthouse Employee Fitness and Wellness Center. The County of El Paso Standardizes on Cisco Aironet 3800 series for indoor access point and Cisco Aironet 1560 Series for outdoor use.
- B. The Cisco reseller must be an approved and registered Cisco Systems Reseller. When products are purchased through unauthorized channels (also known as the gray or secondary market), the customer does not know if the products are legitimate or counterfeit and it is not warranted by Cisco Systems. To protect the County's investment all equipment must be channeled through a registered Cisco Systems Reseller and approved by the Cisco Brand Protection Office and local regional government Cisco Representative and Account Manager.
- C. Wireless Site Survey
 - 1. The contractor will perform a pre-installation wireless site survey at the County Courthouse Employee Fitness and Wellness Center. The Site survey will determine the best location to install the access point on the area surveyed. The survey will also determine the access point (Indoor or Outdoor) type to be used for best results based on survey equipment used. If the presence of County's wireless is available at the site the contractor will work with the Information Technology Department to best results when conducting the site survey.
- D. Equipment Cabling and infrastructure
 - 1. All wireless access point cabling infrastructure must follow the Cabling Infrastructure and Telecommunication Closets specifications.
- E. Mounting Access point Below suspended ceilings
 - 1. As per the the site survey find the location to place the access point.
 - 2. Open the ceiling grid clip completely
 - 3. Place the ceiling grid clip over the T-rail and close it to the appropriate detent (A, B, or C).
 - 4. Use a screwdriver to tighten the two ceiling grid clip locking screws to prevent the clip from sliding along the T-rail.
 - 5. Observe the ceiling grid clip width detent letter (A, B, or C) that corresponds to the T-rail width.
 - 6. Align the corresponding holes (A, B, or C) on the mounting bracket over the mounting holes on the ceiling grid clip.
 - 7. Hold the mounting bracket and insert a 6-32 x 1/4 in. screw into each of the four corresponding holes (A, B, or C) and tighten.
 - 8. If necessary, drill or cut a cable access hole in the ceiling tile large enough for the Ethernet and power cables. Pull the cables through the access hole until you have about 1 foot of cable protruding from the hole.

9. Use the ground screw to ground the access point to a suitable building ground.
10. Connect the Ethernet and power cables to the access point.
11. Align the access point feet over the keyhole mounting slots on the mounting bracket. If you created a hole for the cables, make sure the access point is positioned so that the cables reach their respective ports.
12. Gently slide the access point onto the mounting bracket until it clicks into place.
13. Reference the Cabling Infrastructure and Telecommunication Closets specifications for completion of installation.

F. Mount Access point to a electrical box.

1. Position the universal mounting bracket (AIR-AP-BRACKET-2) over the existing network or electrical box and align the bracket mounting holes with the box holes.
2. Hold the mounting bracket in place and insert a 6 x 32 x 1/4-in pan head screw into each of the mounting holes and tighten.
3. Pull approximately 9 inches of Ethernet and power cable through the hole. Route the cables through the bracket before you attach the bracket to the ceiling. Route the cables through the main cable access hole and then through the smaller



access hole as shown.

4. Use the ground screw to attach the building ground wire to the mounting bracket.
 5. Connect the Ethernet and power cables to the access point.
 6. Align the access point feet over the keyhole mounting slots on the optional mounting bracket.
 7. Slide the access point onto the optional mounting bracket until it clicks into place.
 8. Reference the Cabling Infrastructure and Telecommunication Closets specifications for completion of installation.
- G. Indoor Cisco Aironet 3800 series Hardware Specifications:
1. 802.11ac Wave 2 support: Provides a theoretical connection rate of up to 2.6 Gbps per radio—roughly double the rates offered by today's high-end 802.11ac access points.
 2. High-density experience: Best-in-class RF architecture that provides high-performance coverage for a high density of client devices, giving the end user a seamless wireless experience. Features include custom hardware in 802.11ac Wave 2 radios, Cisco CleanAir®, Cisco ClientLink 4.0, cross-access point noise reduction, and an optimized client roaming experience.

3. Multiuser Multiple-Input Multiple-Output (MU-MIMO) technology: Supporting three spatial streams, MU-MIMO enables access points to split spatial streams between client devices, to maximize throughput.
4. Multigigabit Ethernet support: Providing multiple gigabit uplink speeds of 2.5 Gbps and 5 Gbps in addition to 100-Mbps and 1-Gbps speeds. All speeds are supported on Category 5e cabling for an industry first, as well as 10GBASE-T(IEEE 802.3bz) cabling.
5. Flexible Radio Assignment: Allows the access points to intelligently determine the operating mode of serving radios based on the RF environment. The access points can operate in the following modes:
 - a. 2.4-GHz and 5-GHz mode: One radio serves clients in 2.4-GHz mode, while the other serves clients in 5-GHz mode
 - b. Dual 5-GHz mode: Both radios inside the access point operate on the 5-GHz band, maximizing the benefits of 802.11ac Wave 2 and increasing client device capacity
 - c. Wireless Security Monitoring and 5-GHz mode: One radio serves 5-GHz clients while the other is scanning the full spectrum for attackers, RF interference, and rogue devices
6. Dual 5-GHz radio support: Enables both radios to operate in 5-GHz client serving mode, allowing an industry-leading 5.2 Gbps (2 x 2.6 Gbps) over-the-air speed while increasing client capacity.
7. Smart antenna connector: An intelligent second physical antenna connector is included on 3800 Series models with an external antenna. This connector provides advanced network design flexibility for high-density and large open-area environments such as auditoriums, convention centers, libraries, cafeteria, and arenas/stadiums, allowing two sets of antennas to be connected and active on a single access point.
8. Modular architecture: Second-generation modular architecture first introduced by the 3600 Series access points. New side-mount connection allows companies to add and remove modules as needed without having to dismount the access point from the ceiling, further simplifying the customer's time and dollars when performing network upgrades. The new side-mount architecture allows for additional flexibility in the form factor of a 3800 Series module, and in the choice of solutions with integrated or even external antennas of their own. We have doubled the amount of power available to 3800 Series modules from 9W to 18W, broadening the potential module applications and solutions.
9. 160-MHz channel support: Supporting channels up to 160 MHz wide, Dynamic Bandwidth Selection allows the access point to dynamically switch between 20-, 40-, 80-, and 160-MHz channels, depending on the RF channel conditions, providing the industry's best-performing wireless network.
10. Zero-impact Application Visibility and Control: Uses dedicated hardware acceleration to improve the performance of line-speed applications such as Cisco Application Visibility and Control.
11. Cisco ClientLink 4.0: Cisco ClientLink 4.0 technology improves downlink performance to all mobile devices, including one-, two-, and three-spatial-stream devices on 802.11a/b/g/n/ac while improving battery life on mobile devices such as smartphones and tablets.
12. Cisco CleanAir 160 MHz: Cisco CleanAir technology, enhanced with 160-MHz channel support, provides proactive, high-speed spectrum intelligence across 20-

- , 40-, 80-, and 160-MHz-wide channels to combat performance problems due to wireless interference.
13. Cross-access point noise reduction: A Cisco innovation that enables access points to intelligently collaborate in real time about RF conditions so that users connect with optimized signal quality and performance.
 14. Optimized access point roaming: Helps ensure that client devices associate with the access point in their coverage range that offers the fastest data rate available.
 15. Automatic link aggregation (LAG) support: 802.3ad (Link Aggregation Control Protocol [LACP]) compliant, allowing both Ethernet interfaces to automatically enable LAG, increasing overall throughput to the access point.
 16. Cisco Mobility Express: Flexible deployment mode through the Cisco Mobility Express solution is ideal for high density environments and can support up to 100 access points. Easy setup allows the 3800 Series access points to be deployed on networks without a physical controller.

H. Outdoor Cisco Aironet 1560 series Hardware Specifications:

1. 802.11ac Wave 2 radio: Provides up to 1.3-Gbps data rates with 3 x 3 multiple input, multiple output (MIMO) and up to three spatial streams
2. Multiuser MIMO (MU-MIMO): Allows transmission of data to multiple 802.11ac Wave 2-capable clients simultaneously to improve client experience; prior to 802.11ac Wave 2, access points could transmit data to only one client at a time, typically referred to as single-user MIMO
3. Flexible deployment modes: Allows for deployment of the 1560 in a variety of ways including point-to-point and mesh networks; it can also be deployed with the Cisco Mobility Express Solution, which is ideal for small to medium-sized deployments that supports multiple access points without a physical controller; all deployment modes are easy to set up and configure
4. Small Form-Factor Pluggable (SFP) port: Supports optical fiber-based network connectivity for remote locations
5. Cisco Flexible Antenna Port technology uses software configurable for either single- or dual-band antennas. It allows you to use the same antenna ports for either dual-band antennas to reduce footprint or single-band antennas to optimize radio coverage.
6. Cisco Mobility Express: This solution is designed to bring enterprise-class wireless access to small and medium-sized networks. Easy to set up with low maintenance, Mobility Express includes advanced features from Cisco and does not require a physical controller appliance.
7. Cisco High Density Experience (HDX): Cisco HDX comes standard on the 1560, giving this access point top-of-the-line network efficiency over a large number of wireless clients. HDX uses customized chipsets to target the needs of high-density networks. It is built with best-in-class RF architecture and gives a better user experience for high-performance applications.

END OF SECTION 17000