Attachment 2 - North Delta Storage Building

List of Specifications

List of Drawings

G-01 COVER SHEET
C-01 EXISTING SITE PLAN
C-02 PROPOSED BUILDING LOCATION
C-03 PROPOSED UTILITIES PLAN
C-04 DEMOLITION PLAN
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A-01-02 FLOOR PLAN & ELEVATIONS
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SECTION 01010
SUMMARY OF WORK

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Description of work.

B. Owner responsibility.

1.2 DESCRIPTION:

A. Work under this contract consists of the following items of work: Base Bid

1. Purchase and erection of a pre-engineered metal building for the following uses:

a. 4,600-square-foot pre-engineered. Exterior siding is to be architecturally compatible with existing structures on the site.

b. Site utilities including extensions of water, sewer, telephone, gas systems and the connection to existing sewer.

1.3 LOCATION:

A. Project is located on 1560 H 50 Road, Delta CO
B. Project owner is the U.S. Forest Service.

1.4 OWNER RESPONSIBILITY:

A. The owner's responsibility for project construction includes:

1. Review and approve shop drawings, product data and submittals from the Contractor.

2. Prepare and approve Contractor payment invoices and final payments.

3. Review and authorize contract change orders.

4. Provide project inspection and approval of Contractor's work.

5. Provide access to the site for performance of specified work.

1.5 CONTRACTOR'S USE OF PREMISES:

A. Construction camping within the site will not be allowed.

B. The Contractor shall conduct his operations to minimize inconvenience to the public

and site operations. The Contractor may close portions of the site during construction, providing temporary access lanes. The traffic control plan shall be developed and approved by the Contracting Officer. Access to existing buildings and fire suppression equipment must be maintained.

C. Storage of construction materials shall be limited to those areas designated and approved by the Owner.

D. The Contractor shall take precautions to locate and protect all existing utility lines. Notify utility companies and the Contracting Officer prior to excavations in the vicinity of known utilities.

1. Should damage occur to an unknown utility, repairs shall be performed as directed by the Contracting Officer. Damage to existing utilities shall be repaired by the Contractor at no additional cost to the Owner.

E. The Contractor shall comply with all legal load requirements of the State of Colorado and County Jurisdictions when operating on area access roads. Damage to existing roadways from equipment operation or excessive loads shall be repaired by the Contractor at no additional cost to the Owner.

F. Surplus excavated soil material shall be spread around the site.

1.6 FIELD VERIFICATION:

A. The Contractor shall field-verify all new and existing dimensions and field conditions prior to starting work or ordering products.

1.7 CONTRACTOR-FURNISHED ITEMS:

A. The Contractor shall furnish all labor, materials and equipment necessary for the completion of the work, as specified.

END OF SECTION

SECTION 01050
FIELD ENGINEERING

PART 1 – GENERAL

1.1 CONTRACTOR RESPONSIBILITIES

A. The building corner elevations and locations shall be located by the Contractor and approved by the Contracting Officer. It will be the responsibility of the Contractor to maintain the stakes and confirm that they conform to the drawings. Any discrepancies shall be brought to the Contracting Officer's attention.

B. The Contractor is responsible for surveying and staking lines and grades for all earthwork and utilities, including electrical conduits.

1.2 CONSTRUCTION STAKING

A. This work shall consist of the construction staking of roads, parking and structures in accordance with the drawings and specifications. Work includes furnishing all labor, equipment, instruments, materials, transportation, and other incidentals necessary to complete the construction staking in accordance with these specifications and acceptable engineering practice. Work shall also include grade setting for finished grade and staking of structures as required.

B. Construction staking shall be performed under the direction of a registered professional engineer or land surveyor. The engineer or surveyor will be closely associated and familiar with the construction staking. Periodic visits to the site may be required.

C. Construction stakes, reference points, and temporary bench marks shall be set in accordance with standard surveying practice and shall be utilized by the Contractor and the Owner to control structure location, lines and elevations and site grading features, such as grade breaks, drainages and elevations of subgrade and finish grade.

D. Accuracy Requirements:

1. Precision and accuracy of construction stakes shall be as follows:

a. Horizontal and vertical accuracy of slope stakes, and reference stakes:

(1) Slope stakes, reference points: 0.10 feet

(2) Centerline location, and stationing horizontal and vertical: 0.10 feet

(3) Structures and retaining walls – base elevation and horizontal position 0.05 feet

E. Vertical Control:

1. Existing bench marks shall be re-established outside construction limits for use as vertical grade control. Bench mark shall be permanent in nature and remain undisturbed during the construction work.

F. Slope Stakes and Topography:

1. Slope stake catchpoints and reference stakes shall be established to the precision stated above. Slope stakes shall be set at hinge points and angle points at the parking lot perimeter.

G. Approval:

1. Construction work shall not begin until all stakes, marks and controls established by the Contractor have been reviewed and approved by the Contracting Officer.
Approval of the construction staking will not relieve the Contractor of the responsibility for maintaining the survey work and correcting errors. Stakes within construction limits will not require maintenance during construction.

H. Existing Monuments:

1. All bench marks, land corners, and triangulation points established by other surveys, existing within the construction area shall be preserved. If existing monuments interfere with the work, secure written permission before removing them.

I. Structures:

1. Staking for structure shall be provided by the location of one corner of the building, and the establishment of one outside wall line. These corner and line stakes shall also reference finish floor elevation. Reference stakes and elevation bench mark shall be set and maintained through the completion of site grading, structure foundation and finish floor construction.

1.3 MATERIALS TESTING:

A. Material sampling and gradations testing for submittals shall be the responsibility of the Contractor. An independent testing laboratory or qualified materials technician shall be employed by the Contractor to perform materials testing or materials suppliers shall furnish certificates of compliance to project specifications.

B. Material samples for in-place densities and material control shall be the responsibility of the Contractor. Material gradations shall be submitted to the Contracting Officer for approval prior to placement of material. Material sampling shall be in accordance with the following schedule:

Subgrade beneath buildings: 95% of maximum density. Base beneath buildings: 95% of maximum density.
Subgrade beneath pavement: 95% of maximum density. Base beneath pavement 95% of maximum density.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

PART 4 - MEASUREMENT AND PAYMENT

4.1 FIELD ENGINEERING:

A. Construction staking includes all necessary labor, equipment, instruments, materials, supplies, transportation, and incidentals for completion of construction staking, maintenance of stakes during construction, and establishment of final finished grades. Measurement and payment for all field engineering activities shall be as shown in the Bid Schedule.

B. Construction staking will be considered incidental to the work for which field engineering is required. No separate measurement and payment shall be made for this work.

END OF SECTION

SECTION 012500
UTILITY COMPANY COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. The work of this section consists of coordination with utility companies for connection to their systems.

B. Related work specified elsewhere

C. Section 015000 – Temporary Facilities and Controls

D. Section 017700 – Closeout Procedures

1.2 COORDINATION

A. Where work by a utility company is required in conjunction with construction, such as installation of cable by a utility company in a common trench with other utilities to be installed by the Contractor, the Contractor is solely responsible for contacting the utility company to coordinate any and all work required by the utility provider.

B. Payment to Utility Companies:

1. Any costs associated with utility installation as a component of construction, including, but not limited to, distribution lines, distribution equipment, and meter assemblies, will be the responsibility of the contractor. This does not include tap fees (See 3 below). All utility use charges associated with permanent utility installation shall be the responsibility of the Contractor until Substantial Completion.

2. At least two weeks prior to the anticipated date of Substantial Completion, prepare a written request to the Contracting Officer for all desired pertinent Government information for each utility, such as the billing name, billing address, and contact information. Once this information is furnished by the Government to the Contractor, the Contractor shall be responsible for contacting each utility company and changing the billing information to the name of the Government, with pertinent information as described above, on or after the date of Substantial Completion.

1.3 INSPECTION

1. Comply with utility company requirements for inspections before final connection is made.

1.4 PERMITS

A. Applications for utility connection permits will be completed by the Government. Copies will be provided to the Contractor.

PART 2 – PRODUCTS – NOT USED
PART 3 – EXECUTION – NOT USED

END OF SECTION 012500

SECTION 01300
SUBMITTALS

PART 1 - GENERAL

1.1 DESCRIPTION: The work of this section consists of submittal requirements before and during construction.

1.2 RELATED REQUIREMENTS: Closeout submittals - Section 01700.

1.3 PROPOSALS: Submittal of project proposals shall be as described in the Request for Proposals and General Provisions. Proposals shall include:

A. Progress Schedule: Submit schedule of work (normally in bar chart form) showing estimated starting and completion dates for each part of the work.

B. Schedule of Values: Submit a schedule of dollar values for lump sum bid items based on the Contract Bid Schedule. Break down into component parts each bid item involving a series of operations for which progress payments may be requested. The total costs for the component parts shall equal the bid amount for that item, and the total cost of all items shall equal the contract sum. The Contracting Officer may request data to verify accuracy of dollar values. The Schedule of Values will form the basis for progress payments as provided for in the General Provisions.

1.4 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES:

A. General Procedures:

1. As specified in the individual sections, forward submittals to the Contracting Officer at least 15 days before need for approval. Unless a different number is specified, submit three copies of each shop drawing, two specimens of each sample, and three copies of all other submittals requested, all of which will be retained by the Contracting Officer. Submit any additional copies that are to be returned.

2. Coordinate all submittals and review them for legibility, accuracy, completeness, and compliance with contract requirements. Forward submittals that are related to or affect one another as a package to facilitate coordinated review.

3. List submittals on a transmittal letter with date of submittal and content of submittal. Transmittal letter shall be on Contractor’s letterhead or other approved format. All submittals shall be uniformly transmitted.

4. Submittals will not be accepted for review if an incorrect amount of submittals are submitted, the transmittal form is incorrectly filled out, submittals are not coordinated, or submittals do not show evidence of Contractor’s approval.

5. Specific Procedures:

1. Shop Drawings: Identify each copy of shop drawings with contract drawing number in lower right hand corner.

2. Samples: Samples shall be large enough to illustrate clearly the functional characteristics and full range of color, texture, or pattern.

3. Manufacturer's Literature: Submit only pertinent pages; mark each copy of standard printed data to identify products referenced in specification section.

4. Materials: Submit Certificates of Compliance and mix designs for materials incorporated into the project. Materials include aggregates, Portland Cement concrete and asphalt concrete, as provided in these specifications.

5. Pre-engineered Metal Building: Submit in accordance with Section 13121.

C. Contracting Officer's Review:

1. After approving submittals, Contracting Officer will return Contractor's copies.

2. If submittals are not approved, Contracting Officer will return all copies to Contractor with reasons for rejection. Resubmit, identifying changes.

3. Any work done before approval shall be at Contractor's own risk.

1.5 APPROVED EQUALS AND SUBSTITUTIONS:

A. For each item proposed as an 'approved equal', submit a separate request. With each request, submit supporting data, including:

1. Drawings and samples as appropriate.

2. Comparison of the qualities of the proposed item with that specified.

3. Changes required in other elements of the work because of the substitution.

4. Name, address and telephone number of vendor.

5. Manufacturer's literature regarding installation, operation and maintenance, including schematics for electrical and hydraulic systems, lubrication requirements, and parts lists. Describe availability of maintenance service, and state source of replacement materials.

B. A request for approval constitutes a representation that the contractor:

1. Has investigated the proposed item and determined that it is equal or superior in all respects to that specified.

2. Will provide the same warranties for the proposed item as for the item specified.

3. Has determined that the proposed item is compatible with interfacing items.

4. Will coordinate the installation of an approved item and make all changes required in other elements of the work because of the substitution.

5. Waives all claims for additional expenses that may be incurred as a result of the substitution.

C. New Construction Materials: The Contractor is encouraged to submit for approval products made out of recycled or environmentally-responsible material.

1.6 MANUFACTURER'S INSTALLATION INSTRUCTIONS: When contract documents require compliance with manufacturer's printed instructions, provide one complete set of instructions for the Contracting Officer and keep another complete set of instructions at the project site until substantial completion.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

PART 4 - MEASUREMENT AND PAYMENT

4.1 SUBMITTALS: Payment will be included in the bid schedule for which this work relates. No separate measurement and payment shall be made.

END OF SECTION

SECTION 01530
BARRIERS

PART 1 - GENERAL

1.1 DESCRIPTION: The work of this section consists of furnishing, installing and maintaining barriers to protect existing facilities and the public from construction operations, when construction zones remain open for public use.

PART 2 - PRODUCTS

2.1 GENERAL: Material may be new or used, but shall be suitable for intended purpose. Fences and barriers shall be structurally adequate and neat in appearance.

2.2 BARRICADES AND SIGNS: Manual on Uniform Traffic Control Devices (MUTCD 2009 edition with revision number 1 and 2 incorporated, dated May 2012.

2.3 LUMBER: Free of nails, large knot holes and splinters.

2.4 BARRIER TAPE: Banner Guard, imprinted with 'CAUTION: CONSTRUCTION AREA', manufactured by Reef Industries, Inc., Houston, Texas, or approved equal.

PART 3 - EXECUTION

3.1 PROTECTION OF PUBLIC:

A. Fence, barricade, or otherwise block off the immediate work area to prevent unauthorized entry.

B. Erect and maintain barricades, lights, danger signals, and warning signs in accordance with MUTCD-2009 with revision number 1 and 2 incorporated, dated May 2012.

C. Illuminate barricades and obstructions at night; keep safety lights burning from sunset to sunrise.

D. Adequately barricade and post open cuts in or adjacent to thoroughfares.

E. Protect pedestrian traffic by guardrails or fences.

F. When pedestrian traffic is detoured onto a roadway, provide temporary walkways with protection as required at ends and overhead. For walkways, use lumber running parallel to direction of traffic movement and provide ramps at changes of elevation.

G. Cover pipes, hoses and power lines crossing sidewalks and walkways with troughs using beveled edge boards.

H. Erect and maintain sufficient detour signs at road closures and along detour routes.

3.2 BARRIER TAPE: Install where directed by the Contracting Officer. Keep a minimum of two rolls on site at all times.

3.3 REMOVAL: Completely remove barriers no longer needed when approved by the Contracting Officer.

PART 4 - MEASUREMENT AND PAYMENT

4.1 BARRIERS: Payment shall be included as incidental to work requiring barriers. No separate measurement and payment will be made.

END OF SECTION

SECTION 01600
MATERIAL AND EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION: The work of this section consists of the general procedures for handling, storing, and protecting material and equipment.

1.2 TRANSPORTATION AND HANDLING: Arrange deliveries of materials in accordance with construction schedules; coordinate to avoid conflict with work and conditions at the site. Deliver materials in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible. Contractor is encouraged to obtain materials in biodegradable or recyclable/reusable packaging, which uses the minimum amount of packaging possible.

1.3 STORAGE AND PROTECTION: Store materials in accordance with manufacturer's instructions, with seals and labels accessible for inspection. Confine all on-site storage to designated areas within project limits.

A. Interior Storage: Maintain temperature and humidity within the ranges required by manufacturer's instructions.

B. Exterior Storage:

1. Store products subject to damage by the elements in weather-tight enclosures.

2. Store fabricated products above the ground, on blocking or skids; prevent soiling or staining. Cover products subject to damage or deterioration with impervious sheet coverings; provide adequate ventilation to avoid condensation.

3. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.

C. Protection After Installation: Provide adequate coverings as necessary to protect installed materials from damage resulting from natural elements, traffic, and subsequent construction. Remove when no longer needed.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MATERIAL AND EQUIPMENT: Payment will be included in the bid schedule for which this work relates. No separate measurement and payment will be made.

END OF SECTION

SECTION 01700
PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 DESCRIPTION: The work of this section consists of final clean-up, closeout submittals, and final inspection procedures.

PART 2 - PRODUCTS

2.1 CLEANING MATERIALS: As recommended by the manufacturer of surface to be cleaned.

2.2 OPERATING INSTRUCTIONS: Place operating instructions in convenient location on or adjacent to the equipment, as approved by the Contracting Officer. In areas where operating instructions are subject to sunlight or moisture, provide weather-resisting materials.

PART 3 - EXECUTION

3.1 POSTED OPERATING INSTRUCTIONS: As specified in the individual sections, furnish operating instructions attached to or posted adjacent to equipment. Include wiring diagrams, control diagrams, control sequence, start- up, adjustment, operation, lubrication, shut-down, safety precautions, procedures in the event of equipment failure, and other items of instruction recommended by the manufacturer.

3.2 CLEANING: Before scheduling the final inspection, remove all tools, equipment, surplus materials and rubbish. Restore or refinish surfaces that are damaged due to work of this contract to original condition. Remove grease, dirt, stains, foreign materials and labels from finished surfaces. Thoroughly clean building interiors. Pick up all construction debris from the site. At time of final inspection, project shall be thoroughly clean and ready for use.

3.3 PROJECT RECORD DRAWINGS:

A. Maintain one complete full-size set of contract drawings and one full-size set of vendor-supplied drawings. Clearly mark changes, deletions and additions using conventional drafting standards to show actual construction conditions. Show additions in red, deletions in green and special instructions in black.

B. Keep record drawings current. Inspection will be made monthly. Certification of accuracy and completeness will be required on monthly payment requisitions.

C. On completion of the total project, submit complete record drawings. Include all shop drawings, sketches and additional drawings that are to be included in the final set, with clear instructions showing the location of these drawings.

3.4 CLOSEOUT SUBMITTALS: Submit before final inspection request.

A. Project Record Drawings: As specified above.

B. Guarantees and Bonds: As specified in individual sections.

C. Spare Parts and Materials: As specified in individual sections.

D. Operation and Maintenance Data: As specified in individual sections.

E. Keys and Keying Schedule: Submit all keys including duplicates. Wire all keys for each lock securely together. Tag and plainly mark with lock number, equipment identification, or panel or switch number and indicate location, such as building and room name or number. Where special keying is required, lockset cylinders shall be supplied by the Owner.

3.5 SUBSTANTIAL COMPLETION AND FINAL INSPECTION: Submit written certification that project, or designated portion of project, is substantially complete, and request in writing a final inspection. The Contracting Officer will make an inspection within 10 days of receipt of request.

A. When work is determined to be substantially complete, the Contracting Officer will prepare a list of deficiencies to be corrected before final acceptance and issue a Letter of Substantial Completion.

B. If work is not determined to be substantially complete, the Contracting Officer will notify the Contractor in writing. After completing work, the Contractor shall resubmit certification and request a new final inspection.

3.6 ACCEPTANCE OF THE WORK: After all deficiencies have been corrected, a Letter of Acceptance will be issued.

PART 4 - MEASUREMENT AND PAYMENT

4.1 CONTRACT CLOSEOUT: Payment will be included in the bid schedule for which this work relates. No separate measurement and payment shall be made.

END OF SECTION

SECTION 01900
MOBILIZATION

PART 1 – GENERAL

1.1 DESCRIPTION: This work shall include preparatory work and operations necessary for the movement of personnel, equipment, supplies and incidentals to the project site, and for all other work and operations that must be performed prior to beginning work on various items on the project. This work also includes bonding costs.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

Not used.

PART 4 – MEASUREMENT AND PAYMENT

4.1 MEASUREMENT: Shall be lump sum for the job.

4.2 PAYMENT: Progress payments shall be made as follows:

A. When 5 percent or more of the original contract amount is earned from other pay items, 50 percent of the amount for mobilization, or 5 percent of the original contract amount, whichever is less, will be paid.

B. When 10 percent or more of the original contract amount is earned from other pay items, 100 percent of the amount for mobilization, or 10 percent of the original contract amount, whichever is less, will be paid.

C. Upon completion of all work on the project, any unpaid amount for mobilization will be paid.

The total of all payments, including bonding, shall not exceed the original contract amount for this item.

END OF SECTION

SECTION 02200
BUILDING DEMOLITION

PART 1 – GENERAL

A. Work included in this section covers complete removal of the existing storage building, flammable building, small storage building #1 & #2 , south grain building and north grain building (see sheet 5 for buildings details); and removal of the substructure for the service building (concrete slab to remain).

B. See attached envirinmental reports for asbestos and lead information. .

PART 2 – PRODUCTS

A. None

PART 3 – EXECUTION

A. Provide asbestos and lead paint removal plan.

B. Asbestos shall be removed and disposed of in accordance with regulations by a certified contractor.

C. Disconnect electrical service to building prior to demolition.

D. The Forest Service reserves the right to remove and retain ownership of any equipment from the buildings prior to a date agreed to by the Contractor and the Contracting Officer.

E. Dispose of all refuse at a State Approved facility.

END OF SECTION

SECTION 02210
SITE GRADING

PART 1 – GENERAL

1.1 SECTION INCLUDES:

A. Provide all labor, material, equipment and services required for and/or reasonably incidental to the completion of the following work. Includes all such work shown on the drawings and/or listed below.

1. Removal from the site and disposal of all clearing and debris, unusable or excess materials, except as may be specified to be stockpiled for use by the Owner.

2. All on-site excavation, cut and fill operations.

3. Excavation and compacted fill under building, roadway and parking lot.

4. Dust control as required to prevent dust nuisance on or about the site or borrow site.

5. Remove or abandon any subsurface structures such as waterlines, sewer lines, storm drains, etc., not incorporated in the final development.

6. Backfill of depressions resulting from the removal of surface and subsurface structures.

7. Sub-grade scarification and compaction under pavement areas.

8. Removal and disposal of abandoned existing buried utility lines, septic tank, and/or foundations found on site. Disposal of clean fill material shall be at the designated disposal site. Disposal of other construction debris shall be in accordance with County ordinances and local regulations.

1.2 RELATED SECTIONS

A. Section 01050 – Field Engineering.

B. Section 02221 – Utility Trenching and Backfill.

C. Section 02232 – Aggregate Base Course.

1.3 QUALITY ASSURANCE

A. A qualified Engineer shall be employed by the Contractor to perform all required tests of fill and of soil compaction, and for observation of the earthwork. The Contractor shall notify the Contracting Officer at least 24 hours prior to completion of each lift and phase of the work in order to permit him to review tests, as required. Certificates of Compliance for all imported fill materials proposed for use shall be delivered to the

Contracting Officer at least five (5) days prior to the time that such materials are expected to be placed in the work. No import fill materials shall be placed until receipt of written approval of samples and all materials used shall be the same as those in the samples submitted. Any fill that does not meet the specification requirements shall be removed or otherwise corrected as he directs.

1.4 GUARANTEES:

A. The Contractor guarantees all of the work under this section to be free of defects of any kind, whether due to workmanship or materials, for a period of one (1) year from the time of final completion of the project. Written guarantees are not required; Contractor and Subcontractors under this Section shall, by beginning the work, be considered to have agreed to this guarantee.

PART 2 – PRODUCTS

2.1 ENGINEERED FILL:

A. All fill soils should be essentially free of organic debris, less than three inches (3") in maximum dimension with about 15 to 70 percent passing the No. 200 sieve, evenly graded, and with low plasticity (i.e. plasticity index less than 12; liquid limit less than 30). On-site soils free of organic debris may be reused as fill materials. All imported fill materials should be samples, tested and approved by the Engineer prior to being transported to the site.

Engineered fill soils meeting the criteria above should be moisture conditioned to near the optimum moisture content, placed in horizontal lifts less than eight inches (8") in loose thickness, and compacted to at least 95 percent relative compaction.

2.2 TRENCH BACKFILL:

A. Trench backfill shall conform to the requirements of Section 02221.

PART 3 – EXECUTION

3.1 CLEARING AND GRUBBING:

A. Prior to general site grading, existing vegetation and any debris should be stripped and disposed of as designated. Stripped topsoil may be stockpiled and reused for landscape purposes; however, it shall not be incorporated into any engineered fill without written approval of the Contracting Officer.

3.2 EXISTING, BURIED UTILITIES:

A. Existing utility lines, septic tanks, cesspools, and/or foundations found on site shall be removed and disposed of offsite or abandoned in place as shown on plans or directed by the Engineer.

3.3 SCARIFICATION AND COMPACTION:

A. Following site stripping and any required over-excavation, all areas to receive fill or to be used for the future support of structures, concrete slabs supported on grade or pavements, to be scarified to a depth of eight inches (8”), uniformly moisture conditioned to near optimum moisture content, and compacted to minimum 95 percent of the maximum dry density for embankments and 95 percent for building pads and foundations, as determined by ASTM Test Method D 1557.

3.4 CLEAN UP:

A. Perform the work under this Section so as to keep affected portions of the building and site neat, clean and orderly. Upon completion of the work under this Section, remove immediately all surplus materials, rubbish and equipment associated with or used in the performance of this work. Failure to perform such clean-up operations within 24 hours of notice by the Owner or Contracting Officer shall be considered adequate grounds for having the work done by others at the Contractor’s expense.

PART 4 MEASUREMENT AND PAYMENT

4.1 PAYMENT:

A. Payment shall be included in the Bid Schedule under ‘Site Grading and Compacting’.

4.2 MEASUREMENT:

A. Measurement shall include all excavation grading, and embankment necessary to achieve subgrade elevations to the dimensions shown on the plans. All excavation is considered common unless otherwise specified. Measurement shall be as follows:

1. Site grading and compacting.....Lump Sum

2. Structure excavation. No separate measurement or payment shall be made.

END OF SECTION

SECTION 02221
UTILITY TRENCHING AND BACKFILLING

PART 1 – GENERAL

1.1 DESCRIPTION: The work of this section consists of trenching and backfilling for the construction and installation of pipelines, culverts, conduits and cables. All trenching will be open cut, except as specified in the drawings.

1.2 DEFINITION: Materials used in backfill and bedding, as shown in trench details, are defined as follows:

A. Bedding and Backfill: When rock, unstable material or wet trench is encountered at the excavated grade for utility installation, bedding is required. Materials shall be predominantly sand and gravel, meeting the requirements of paragraph 3.4. Bedding may be omitted if, in the opinion of the Contracting Officer, the excavated trench bottom will adequately support and not damage the utility line.

1.3 QUALITY ASSURANCE:

A. All material gradation analysis shall be accomplished by an independent testing lab arranged and paid for by the Contractor, in accordance with Section 01050.

B. All references to percent of maximum density shall be as determined by ASTM D1557, Method C, at a moisture content determined to be suitable for such density. Moisture-density curves shall be prepared in a certified soils testing laboratory.

C. In-Place Soil Density Testing: Procedures used be in accordance with ASTM D1556-82, Density of Soil in Place by the Sand-Cone Method, or ASTM D2922-81, Density of Soil and Soil-Aggregate in Place by Nuclear Methods (shallow depth). Testing shall be in accordance with Section 01050.

Test locations will be selected at the discretion of the Contracting Officer.

1.4 PROJECT CONDITIONS:

A. Arrange construction sequences to provide the shortest practical time that the trenches will be open to avoid hazard to the public and to minimize the possibility of trench collapse.

1.5 EXCAVATION CLASSIFICATION: Regardless of the nature of material excavated, all excavation will be considered unclassified.

PART 2 - PRODUCTS

2.1 GENERAL: All backfill material shall be approved before use and be free of cinders, ashes, ice, frozen soil, large hard clods, organic debris, or other deleterious items. Trench excavation materials may be used as approved by the Contracting Officer.

2.2 MATERIALS FOR BACKFILLING: Furnish required bedding, select backfill, and backfill materials listed under the appropriate types of utility line in the sections to which this work relates, and in accordance with Paragraph 3.4 of this section.

2.3 UTILITY LINE MARKING: All utilities shall be marked for location and identified by marking tapes, as specified in Section 02229.

PART 3 - EXECUTION

3.1 TRENCH CLEARING:

A. The maximum width of clearing for utility trenches shall be 10 feet unless otherwise directed by the Contracting Officer. Trench spoils shall not be placed over or around uncleared vegetation unless specifically approved by the Contracting Officer.

3.2 TRENCH EXCAVATION:

A. All excavations must comply with the current requirements of Colorado/OSHA. Additionally, all cuts greater than five feet (5') in depth and involving personnel within the excavation should be sloped and/or shored. Temporary excavations to ten feet (10') below surrounding grade may be sloped at ¾(h):1(v) or flatter. Flatter slopes will be required if clean/or loose sandy soils are encountered along the slope face. Temporary excavations adjacent to existing footings should not extend below a plane projected downward at a 45-degree angle from the closest edge of the footing.

1. Paved Areas: Areas paved with asphalt or concrete shall be marked for alignment and trench width. Asphalt and concrete paving, or sidewalks, shall be cut with a saw in neat parallel lines. The cut lines shall be at least 6" outside each edge of the trench width to prevent over-breaking and cracking of the paved surfaces.

2. Trench Configuration: Trench locations shall be marked on the ground prior to excavation. The trench shall be excavated to allow the pipe to be aligned in the approximate center. Trench widths shall permit the pipe to be laid and joined properly and to allow for proper placement and compaction of backfill material. In no case shall the trench width be less than the pipe O.D. plus 16 inches. The trench side walls shall be as near vertical as possible, except where sloping is permitted by the Contracting Officer or required by OSHA standards. The trench bottom shall provide a firm, uniform and continuous bedding for the pipe. Properly sized and placed bell holes shall be provided at each joint. Mounding of trench bottom to support pipe will not be allowed.

3. Stockpiling: The Contractor shall exercise caution in stockpiling excavated and import materials so as not to interfere with public traffic and so as to maintain a clear distance from the trench sufficient to prevent collapse of the trench wall.

4. Underground Facilities: The Contractor shall proceed with caution in excavation and preparation of the trench so that the exact location of all underground facilities may be determined. It shall be the Contractor's responsibility to locate and protect all existing underground utilities. All damage to underground facilities due to the failure of the Contractor to have the facilities located or due

to carelessness in excavation after the facilities are located, shall be the Contractor's responsibility. Location of existing underground facilities on the plans or in the field does not relieve the Contractor of his responsibility to determine their exact location.

5. Over Excavation: Trenches for all types of PVC pipeline materials shall be over excavated to provide for a minimum 6-inch sand (class 1) bedding. Trenches for ductile iron pipe shall be over excavated by a minimum of 6 inches in areas of rock, hardpan, shale or other unsuitable bedding materials, all as shown on the plans.

   Trenches in areas of underground water shall be over excavated to allow for 6 inches or more of permeable backfill, as required for Pipe Trench Backfill, as described elsewhere in this section.

   Any areas of trench over excavated beyond the lines and grades shown on the plans or specified herein shall be brought back up to proper grade using suitable materials as approved by the Contracting Officer. This material shall be compacted to the specified degree prior to placing any pipe or sand bedding in the trench.

6. Ground Water and Unsuitable Material: Material taken from excavations where excessive ground water or surface water or other sources of water have rendered the soil material unsuitable for trench backfill material shall be removed from the site and replaced with suitable material. The over- wet material may, at the Contractor's option, be dried to a proper moisture content and reused in the work, provided the material meets all other requirements of these specifications.

3.3 SHORING AND SHEETING:

A. Construct and maintain all shoring, sheeting and slope layback necessary to protect the excavation, as needed for the safety of the employees and as required by applicable State and Federal laws.

B. For trenches over 5 feet deep, provide suitable barricades, shoring and exit means for worker protection. When work area is left open and unattended by the Contractor, provide suitable barricades for public safety, regardless of trench depth.

C. Remove all other sheeting and shoring when safe to do so.

3.4 BACKFILLING:

A. Backfill Selection:

1. Native material removed from the trench may be used for backfill material provided it meets all of the requirements set forth on the plans and in these specifications. Native backfill material may be mechanically screened to meet these requirements. Materials excavated from the trench which are found to be excess, and materials found to be unsuitable for trench backfill shall be disposed of in a manner described elsewhere in this section.

2. The Contractor shall import the type and quantities of backfill materials not found on the job site at his own cost. The Contractor shall provide the equipment and materials necessary to collect samples of the native materials and proposed import material for testing, all as directed by the Contracting Officer.

B. Pipe Bedding and Backfill:

1. Class 1 Material: Three types of materials are acceptable for pipe bedding and envelope; 1) naturally occurring rounded sand, 2) crushed sand, 3) decomposed granite. All material shall be free from clay, organic, or other deleterious material, shall have a sand equivalent of at least 50, and shall meet the following percent passing by weight gradations:

Sieve Size	**Natural Sand**	**Crushed Sand**	**Decomposed Granite**
1-1/2”	100	---	
3/4”	75-100	100	100
No. 4	55-100	75-100	75-100
No. 200	0-5	0-15	0-5

2. Class 2 Material: Select excavated earth, free from stones or lumps exceeding 1” in greatest dimension, vegetative matter, or other deleterious material.

3. Class 3 Material: Aggregate base course material conforming to the requirements of Section 02232.

4. Class 4 Material: Select excavated earth, free from stones or lumps exceeding 4” in greatest dimension, vegetable matter or other deleterious material.

5. Permeable Backfill Material: Hard, durable, clean gravel or crushed stone, free from organic material, clay balls, or other deleterious substance, conforming to one of the following grades:

	Percentage Passing	
Sieve Size	**1/2”**	**1-1/2”**
2”	--	100
1-1/2”	--	95-100
3/4”	100	50-100
1/2”	95-100	
3/8”	70-100	13-55
No. 4	0-55	0-25
No. 8	9-10	0-5
No. 200	0-3	0-3

6. Sand-Cement Slurry Backfill Material: Sand-cement slurry shall consist of

washed sand, free from clay and organic material of which 100% will pass a 3/4" screen, at least 75% will pass a No. 4 sieve and no more than 5% will pass a No. 200 sieve. The sand shall be mixed thoroughly with Type 1 or 2 cement, at a ratio of 1-1/2 sacks per cubic yard of sand and enough water to accommodate mixing and placing, but not more than will allow a 4" compacting replacement asphalt.

C. Backfilling Operations:

1. Native and imported backfill material shall be screened or otherwise prepared before placing the material in the trench. Backfill material shall be at or near optimum moisture content. Excessive moisture must be removed by windrowing and air drying. Dry soils shall be moistened and thoroughly mixed.
2. Compaction: Use vibratory compactors for sands and gravel (non- cohesive soils). Use mechanical tampers for sand and gravel containing a significant portion of fine-grained material, such as silt and clay (cohesive soils). Hand tamp around pipe or cable to protect the lines until adequate cushion is attained. Puddling or water flooding for consolidation of backfill or compaction by wheel rolling with construction equipment will not be permitted.

3. Bedding: Compact the specified material to 95 percent of maximum density to the finished utility grade.

4. Utility Installation: Shape the trench bottom to ensure uniform contact with the full length of the installed line and remove any sharp-edged materials that might damage the line. Compaction shall be maintained beneath the line.

5. Select Backfill: Fill by hand placement around the utility to just over half depth, and compact in a manner to ensure against lateral or vertical displacement. Place select backfill to 12 inches above the utility line by hand placement in not more than 6-inch layers. Compact each layer to 95 percent of maximum density.

D. Sand-Cement Slurry Backfill:

1. All water main and service line crossings under existing paved roadways shall be backfilled from 6" above the pipe to the underside of the replacement paving with sand-cement slurry, except as shown otherwise on the plans. The pipeline shall be bedded and backfilled to 6" above the pipe with Class 1 material prior to placing the sand-cement slurry.

2. All pipe trench which requires tunneling under features such as walks, curbs, retaining walls, or other rigid or concrete features, shall be backfilled with sand-cement slurry from within 6" of the top of the pipe to up underneath, and if necessary, around the bottom of the feature so as to provide adequate support.

3.5 SURFACE FINISH WORK:

A. Paved Areas: Replace removed paving and base course with new material of equal or

better quality and of the same texture and color as the adjacent paved areas. Saw cut pavement edge to a true line and broom as needed prior to paving.

B. Open Areas: Grade all disturbed areas to a finish ordinarily obtained from a blade grader, with no abrupt changes in grade or irregularities that will hold water.

C. Drainage Ditches: Restore drainage ditches to appropriate line and grade, using surface erosion-prevention techniques approved by the Contracting Officer.

D. Clean-Up: Prior to final inspection and acceptance, remove all rubbish and excess material for disposal as approved, and leave area in a neat, satisfactory condition.

PART 4 - MEASUREMENT AND PAYMENT

4.1 UTILITY TRENCHING AND BACKFILLING: Payment will be included in the Bid Schedule under Utility System Installed, and will include trench excavation, pipe fittings, valves, boxes, conduit, bedding, and backfill, patching and surface finish, for the completed installation.

4.2 MEASUREMENT: Measurement shall be as shown for all trenching regardless of utility placed. Multiple utilities placed in common trenches shall be measured and paid for under the utility being placed.

END OF SECTION

SECTION 02229
UTILITY LINE MARKING

PART 1 - GENERAL

1.1 DESCRIPTION: The work of this section consists of furnishing and installing utility line marking.

1.2 SUBMITTALS: As specified in Section 01300.

A. Samples: 24-inch strips of tape and two markers.

B. Certification that the materials used in the tape fabrication meet the requirements of this section.

PART 2 - PRODUCTS

2.1 MARKING TAPE: Capable of being inductively detected electronically.

A. Construction: Metallic foil laminated between two layers of impervious plastic film not less than 3 inches wide. Total thickness of tape shall not be less than 0.005 inch (5 mil) plus or minus 10 percent manufacturing tolerances.

1. Film: Inert plastic. Each film layer shall be not less than 0.0005 inch thick (0.5 mil).

2. Foil: Not less than 0.00035 inch thick (0.035 mil).

3. Adhesive: Compatible with foil and film.

B. Imprint: 3/4-inch or larger bold black letters.

C. Legend: Identify buried utility line tape with imprint such as ‘Caution: Sewer Line Below’. Repeat identification at approximately 24-inch intervals.

D. Background Color: APWA color code and as specified below:

Color	Utility
Safety Red	Electric
Safety Precaution Blue	Water System
Safety Green	Sanitary Sewer, Storm Drain
Safety Yellow	Gas Lines
Safety Orange	Communication (telephone)

E. Manufacturer: Lineguard, Inc., Wheaton, Illinois; Allen Systems, Inc.; Thor Enterprises, Inc., Sun Prairie, Wisconsin; or approved equal.

PART 3 - EXECUTION

3.1 MARKING TAPE:

A. Install tape in backfill directly over each buried utility line as shown on the drawings. Place tape during final backfilling.

B. Where utilities are buried in a common trench, identify each line by a separate warning tape. Bury tapes side by side directly over the applicable line.

PART 4 - MEASUREMENT AND PAYMENT

4.1 UTILITY LINE MARKING: Payment will be included in the bid schedule for which this work relates.

END OF SECTION

SECTION 02232
AGGREGATE BASE COURSE

PART 1 - GENERAL

1.1 DESCRIPTION: The work of this section consists of furnishing and placing aggregate base course, and filler if required, on a prepared subgrade.

1.2 SUBMITTALS: As specified in Section 01300.

A. If materials are obtained from a commercial source, submit certification from the supplier certifying that aggregate base course meets the requirements of this section.

1.3 QUALITY ASSURANCE: Material testing required to determine compliance with the requirements for the work of this section will be the responsibility of the Contractor.

PART 2 - PRODUCTS

2.1 AGGREGATE: Clean, hard, durable fragments or particles of crushed stone, or crushed or natural gravel and shall meet the following requirements:

A. Gradation: The aggregate shall be 3/4" maximum and shall conform to requirements of Standard Specification (Cal Trans) Section 26 for Class 2 base:

Sieve Size	Percent Passing
1"	100
3/4"	87-100
No. 4	30-65
No. 30	5-35
No. 200	0-12

B. Quality Requirements: The material shall conform to the following:

Test	Test Method No.	Requirement
R-Valve	Calif. 301	78 Min.
Sand Equivalent	Calif. 217	50 Min.
Durability Index		35 Min.

PART 3 - EXECUTION

3.1 PLACING: If the required compacted depth of the aggregate base course exceeds 6 inches, place course in two or more layers of approximately equal thickness. The maximum compacted thickness of any one layer shall not exceed 6 inches.

3.2 COMPACTION: Compact each layer to a density of not less than 95 percent of the maximum density, as determined by AASHTO T180-74. Random tests for compacted depth will be made during the progress of the work.

3.3 SURFACE FINISHING:

A. Use a smooth steel wheel roller for the final rolling of top surface base course. Water surface and evenly spread loose stones before final rolling. Make minimum of two complete passes over area to embed stones. Correct soft spots developed during rolling.

B. Compacted base course surface shall be smooth, free from waves and other irregularities, and to grade elevations as shown on the drawings. Unsatisfactory portions of base course shall be removed, reworked, re-laid and re-rolled at no additional expense to the Owner.

3.4 MATERIAL ACCEPTANCE REQUIREMENTS: Acceptance will be based on periodic samples and tests taken following mixing and before laying.

3.5 TOLERANCES:

A. Surface: The Contracting Officer will test finished surface of the base course with a 10-foot straightedge or other device. The variation between any two flat plane contacts with the surface shall not exceed one inch. Any areas not complying with these tolerances shall be reworked to obtain conformity.

B. Width: Plan dimension, plus or minus .5 foot.

C. Thickness: Plan dimension, plus or minus .05 foot.

3.6 MAINTENANCE: Maintain base course in a satisfactory condition until surfaced or until final acceptance.

PART 4 - MEASUREMENT AND PAYMENT

4.1 AGGREGATE BASE COURSE: Payment shall be included in the bid schedule under ‘aggregate base course’. Measurement shall be by the square foot of aggregate surface for roads and parking to the specified depth. Incidental aggregate for building pads, trenches, and backfill shall be included in the item to which it relates. No separate measurement and payment shall be made.

END OF SECTION

SECTION 02601
TESTING OF GRAVITY SEWER LINES

PART 1 – GENERAL

1.1 DESCRIPTION:

A. The work of this section consists of leak testing gravity and pressure sewer lines and related valves and fittings. Rejected work shall be re-tested at the Contractor's expense.

B. Testing Methods: Gravity sewer lines - air test; pressure sewer lines - high pressure water test.

1.2 QUALITY ASSURANCE:

A. Flow meters shall record the actual volume plus or minus 2 percent.

B. Air test gauges shall be ANSI B40.1-80, Grade 3A (plus or minus 0.25 percent of full scale accuracy), 15 psi dial range.

C. Water test gauges shall be ANSI B40.1-80, Grade 2A (plus or minus 0.5 percent of full scale accuracy), dial range approximately twice the required test pressure.

1.3 SUBMITTALS: As specified in Section 01300.

A. Accuracy certification by approved independent testing laboratories for flow meters and test gauges. Certifications shall be dated no more than 90 days before actual system testing.

B. Before testing, provide the following information:

1. All Tests: Describe precautions that will be taken to protect system equipment that might be damaged under test pressures, and the proposed method for rerouting sewer flows where the system must remain in service.

2. Air Test: Describe the proposed method for testing where existing sewer service laterals enter the main being tested. Describe safety devices on air test equipment, and personnel safety precautions during air tests.

3. High Pressure Water Test: Describe the proposed method for disposal of water used in line testing.

1.4 PROJECT CONDITIONS:

A. Testing shall not be performed until each system has been flushed or thoroughly cleaned in accordance with procedures in the sections that describe line installation.

B. Water for Flushing and Testing: See Section 01510.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 GENERAL:

A. Perform testing in the Contracting Officer's presence after backfill and proper compaction of trenches. Where lines are installed under roadways and parking areas, perform tests after completion of final subgrade preparation and prior to application of surface courses. Joints and fittings may remain exposed for testing. Notify the Contracting Officer at least 48 hours prior to testing.

B. Prepare each section for testing, using adequate bracing; protect system equipment susceptible to damage by test pressures, and maintain services where required.

3.2 GRAVITY SEWER SYSTEMS:

A. Air Test: Test lines with low pressure air. Safety requires a regulator or relief valve on pressurizing equipment, set at 8 psig. No one will be allowed in manholes while there is air pressure against test plugs.

1. Plug all pipe outlets to resist test pressure. Give special attention to laterals.

2. Plug all other pipes in both upstream and downstream manholes and fill manholes with clear water to just above the line plugged for testing. Any bubbles appearing during the test indicate leakage past a plug or in part of the test equipment.

3. Compute the test pressure by multiplying 0.43 times the elevation difference (in feet) of the upstream manhole rim and the invert of the line under test at the downstream manhole. The result is in psig and may be rounded to the nearest half psig. The test pressure shall be not less than 3.5 psig, nor more than 6.0 psig. Total line length included in any test section shall not exceed 400 feet.

4. Supply air into the line until test pressure is attained. Allow at least 5 minutes for air temperature in the test section to stabilize.

5. Re-establish the test pressure, and start a stop watch. Determine the time required for pressure to drop 0.5 psig.

6. If the pressure does not drop during the stabilization period, and no additional air has been added, the section undergoing test will have passed without further testing.

7. The pipe section will also have passed if the time observed for the pressure to drop 0.5 psig is greater than that determined by using the following table:

Pipe Size, Inches	**Time**
4	4 Minutes - 0 Seconds
6	6 Minutes - 0 Seconds
8	8 Minutes – 0 Seconds

When a combination of more than one pipe size is under test, the calculated time for the larger pipe shall apply.

3.3 PRESSURE SEWER LINES:

See procedures for testing in Section 02602.

PART 4 - MEASUREMENT AND PAYMENT

4.1 TESTING OF SEWER LINES: Payment will be included in the Bid Schedule for which the work relates.

END OF SECTION

SECTION 02602
TESTING AND DISINFECTING WATER LINES

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section describes the requirements for pressure and leak testing, and disinfecting of water mains and appurtenances, including but not limited to, air release valve assemblies, blow-off valve assemblies, fire hydrant assemblies, service assemblies, pressure reducing and pump stations, altitude valve stations, and all other appurtenances.

B. This section does not include disinfecting procedures for water storage tanks. If required, disinfecting of storage tanks is described elsewhere in these specifications.

C This work shall consist of filling the water main and appurtenances with water and bleeding off all entrapped air, allowing the pipe line to soak, making all connections to the water main for expelling air and for testing equipment; running the test, visually inspecting exposed appurtenances, locating and repairing all leaks, re-testing, application of disinfectant, and flushing operations.

D. Materials furnished for this work shall include, but not be limited to, pipe and fittings for connections to the main, pumps, pressure regulator, a calibrated water storage tank, disinfectant, and all other materials, fittings and pipelines required to perform the tests and make the necessary repairs.

1.2 REQUIRED WORK SEQUENCE

A. The pressure test and the test for allowable leakage shall be performed simultaneously. Testing shall not commence until the water main and all appurtenances have been completely installed, up to and including compaction of road aggregate base. The Contractor may, at any time, perform his own pressure and leak test. However, these tests will in no way offset the requirement for a final pressure and leak test.

B. After successfully testing the water main and appurtenances, they may then be flushed and disinfected.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 GENERAL:

A. This section shall consist of testing the water main and appurtenances for both pressure and leakage requirements. These tests will be run simultaneously.

B. Prior to testing, the water main shall be slowly and carefully filled with water. All air shall be expelled slowly from the pipe and appurtenances in a manner so as not to create excessive surge pressures. All appurtenances shall be left on during the testing procedure.

C. The Contractor may, at his own risk, test against new or existing valves. Suspected leaking of these valves will not be accepted as a reason for having not passed the leakage test requirements. These valves shall either be repaired or replaced prior to the start of another testing sequence. If an existing valve is suspected of leaking, the Contractor may repair or replace the valve at his own expense, or disconnect the water main from the valve, install a bulkhead, and retest.

3.2 TEST SECTION LENGTH:

A. The length of water main being tested at any one time shall not exceed 2,000 feet unless otherwise approved by the Contracting Officer, or allowed in the Special Conditions of this contract.

3.3 TESTING EQUIPMENT:

A. The Contractor shall be responsible for supplying, maintaining, and operating all testing equipment. In general, the testing equipment configuration shall consist of a pump receiving water from a calibrated storage tank. The pump discharge shall enter the water main through a tap or appurtenance. A pressure sustaining valve capable of being adjusted within the required pressure ranges shall be placed on a tee located in the pump discharge line. Discharge from the pressure sustaining valve shall return to the calibrated storage tank. Other types or configurations of testing equipment shall be subject to the Contracting Officer's approval. The pressure pump and pressure sustaining valve shall remain in operation continuously throughout the test period.

3.4 TEST PRESSURE:

A. The test pressure shall be 150 percent of the working pressure, as calculated for the lowest elevation of the test section, or 150 psi, whichever is greatest. The pressure maintained at the pump shall be adjusted for the difference in elevation between the lowest elevation of the test section and the pump location.

3.5 TEST DURATION:

A. The test duration shall be 2 hours. Pressure in the water main shall be maintained as near the calculated test pressure as possible for the full two hour duration. The pressure pump and pressure sustaining valve shall remain in operation continuously throughout the duration of the test.

3.6 REPAIRS:

A. During the pressure and leakage test, all accessible appurtenances shall be inspected for visual signs of leakage. All visual leaks shall be corrected immediately, regardless of the amount of leakage and the test shall be run again for its full duration. Should

the pressure and leakage test fail, the Contractor shall begin to investigate all areas of suspected leakage and shall make all repairs necessary in order to affect a successful test. All repair methods shall be subject to Contracting Officer approval. All leaks detected shall be repaired to a water tight condition. All repairs made shall be re-tested in accordance with these specifications. All repairs shall be made and a successful test accomplished prior to taking bacteriological samples.

3.7 DISINFECTING:

A. The interior of all water mains and appurtenances shall be disinfected in accordance with AWWA C651 and these specifications. Disinfection requirements shall include preventive and corrective measures during construction, forms of chlorine and methods of application, final flushing and bacteriological tests.

B. The methods and techniques described in these specifications are minimum requirements only. The Contractor shall be solely responsible for the methods and techniques used to successfully disinfect the water mains and appurtenances and for disposing of the highly chlorinated water during flushing operations.

C. Precautions shall be taken to protect the interior of water mains and appurtenances against contamination. The open ends of all water main laid in the trench shall be closed with water tight plugs when pipe laying has stopped. Stockpiled pipe and appurtenances shall also be protected from contamination.

D. If dirt or other contaminates enter the water main or appurtenances and, in the opinion of the Contracting Officer, the contaminate will not be removed by the flushing operation, the interior surfaces shall be cleaned by mechanical means.

E. Water mains and appurtenances flooded during construction shall be cleared of flood water, flushed with potable water, isolated, and filled with chlorinated water so that at the end of a 24-hour holding period, the free chlorine residual is not less than 25 mg/L. The chlorinated water shall be flushed as described under Final Flush of these specifications.

3.8 METHODS OF CHLORINATION: Two methods of chlorination are accepted: tablets, and continuous feed. The slug method described in AWWA C651 will be allowed only for emergency use and for rapid chlorination for line breaks.

A. Tablet Method:

1. This method may be used only if the mains and appurtenances are kept clean and dry during construction. The placing of calcium hypochlorite granules in addition to the tablets during construction is optional.

2. Calcium hypochlorite, 65 percent, 5 gram tablets shall be attached to the top inside surface of each length of pipe immediately prior to installation with a food-grade adhesive. Use only Permatex Form-a-Gasket No. 2, or Permatex Clear RTV Silicon Adhesive Sealant, or approved equal. Do not use Permatex Form-a-Gasket No. 1. The number of tablets for each pipe section shall be calculated as the following:

$$N = .0012d^2L$$

Where:

N = Number of 5 gram tablets required for each pipe section, rounded to the next higher integer.
d = Nominal pipe diameter in inches. L = Length of each pipe section in feet.

3. When installation has been completed, the water main shall be filled with water at a rate so as not to create a velocity of more than one ft/sec. All air pockets shall be eliminated. The heavy chlorine solution shall remain in the mains at least 24 hours. If water temperatures are below 41□ F., it shall remain for at least 48 hours.

B. CONTINUOUS-FEED METHOD:

1. This method shall consist of filling the completed mains and appurtenances to remove all air pockets, flushing to remove particulates, and refilling the mains with potable water chlorinated so that after a 24- hour holding period in the mains, there will be a free chloride residual of not less than 10 mg/L.

2. The methods and techniques used for preliminary flushing and chlorinating the mains shall be as described in Section 5.2 of AWWA C651. The placing of calcium hypochlorite granules during construction is optional.

3.9 FINAL FLUSHING:

A. The heavily chlorinated water shall be flushed from the mains and appurtenances and shall not remain in the mains more than 48 hours beyond the times required in this section. The heavily chlorinated water shall be flushed from the mains and appurtenances until chloride measurements show that the concentrations in the water leaving the main is no higher than that generally prevailing in the system, but not more than 1.0 mg/L.

B. The environment to which the chlorinated water is to be discharged shall be inspected. The Contractor shall be solely responsible for any damage caused by the discharge of heavily chlorinated water. If there is any question that the chlorinated discharge will cause damage to the environment, then a reducing agent shall be applied to the water to be wasted to neutralize thoroughly the chlorine residual remaining in the water. Reducing agents and their use shall comply with AWWA C651, Appendix B. Where necessary, federal state and local regulatory agencies should be contacted to determine special provisions for the disposal of heavily chlorinated water.

C. Upon completion of the disinfection process, water samples shall be tested for bacteriological quality in accordance with AWWA ‘Standard Methods for the Examination of Water and Wastewater’ and shall show the absence of coliform organisms.

D. Bacteriological samples shall be collected by the Contractor and tested at a laboratory approved by the Contracting Officer. The number and location of samples shall be determined by the Contracting Officer. Should any of the samples prove positive, the Contractor shall repeat the disinfecting process and retest.

3.10 REDISINFECTION:

A. If the initial disinfection fails to produce satisfactory bacteriological samples the main may be re-flushed and shall be re-sampled. If these second check samples continue to show the presence of coliform organisms, then the main shall be re-chlorinated by the continuous-feed method of chlorination until satisfactory results are obtained.

PART 4 - MEASUREMENT AND PAYMENT

4.1 TESTING AND DISINFECTING OF WATER LINES: Payment shall be included in the bid schedule under ‘Water Service’. No separate payment shall be made for testing and disinfecting.

END OF SECTION

SECTION 03306
STRUCTURAL CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION:

A. The work of this section consists of furnishing and placing cast-in-place concrete for:

1. 4,600 square-foot pre-engineered metal building footings, foundation and floor slab.

2. 580 square-foot for doors slab and roll up doors apron.

3. Miscellaneous concrete for stoops and walkway.

1.2 SUBMITTALS: As specified in Section 01300.

A. In compliance with Paragraph 5.3.2 of ASTM C94-90, furnish statement of composition of concrete mix and evidence that mix meets specified quality.

1.3 QUALITY ASSURANCE:

A. Material sampling shall be the responsibility of the Contractor in accordance with Section 01050. Testing shall be at the discretion of the Contracting Officer.

B. The Contractor shall provide concrete mix design and certification in accordance with Section 01050 and Section 01300, acceptable to the Contracting Officer. The Contractor shall take, prepare and cure samples and do all field and laboratory testing, as required. Testing shall comply with ASTM C94-90.

1. Strength Tests: Strength test cylinders shall be made from each 25 cubic yards of concrete or fraction thereof each day, as determined by the Contracting Officer. For each test, two compression cylinders shall be molded, one to be used for a 7-day test.

2. Air Content and Slump Tests: At the time samples are taken for strength tests, the Contracting Officer may make slump and air content tests.

1.4 PROJECT CONDITIONS: Place concrete only when nighttime temperatures are above 35 degrees F, unless it is protected from freezing.

PART 2 - PRODUCTS

2.1 FORMS:

A. Softwood plywood: PS 1, Grade B-B, Class 1 plyform, mill-oiled and sanded on both sides.

B. Lumber: Douglas Fir-Larch, No. 2 grade, S4S, or Southern Yellow Pine, No. 2, S4S. Boards shall be 6 inches or more in width. Grade stamp shall be clearly visible.

2.2 CONCRETE REINFORCEMENT:

A. Reinforcing steel: ASTM A615; reinforcing bars of size No. 4 or smaller may be 40 grade or 60 grade, while bars size No. 5 or larger shall be 60 grade. All rebar to be deformed billet steel bars, unfinished. All splices shall not be less than 30 bar diameters or the larger bar. Horizontal laps in adjacent bars shall be staggered 5 foot, 0 inch minimum.

B. Welded wire fabric: 6 x 6 w1.4 x w1.4, ASTM designation A185.

2.3 CEMENT: ASTM C150-84, Type IA, Portland Cement, free from lumps and other defects..

2.4 AGGREGATE: Free from oil, alkali, organic matter, or other deleterious substances. Aggregate may consist of sand and gravel separately batched at construction site, central batching plant combined sand and gravel, or pit-run gravel, as approved. Well graded in accordance with the following table:

Percentage by Weight Passing Laboratory Sieves Having Square Openings with Dimensions in Inches as Shown

Screen Size	**No. 4 to 1-1/2 Inch**	**No. 4 to 1 Inch**	**Sand**	**Combined (or Pit Run)**
1-1/2 inch	95-100			95-100
1 inch		90-100		90-100
3/4-inch	35-70			60-80
1/2-inch		25-60		55-75
3/8-inch	10-30			45-60
No. 4	0-5	0-10	95-100	40-50
No. 16			45-80	15-30
No. 30			25-55	10-20
No. 50			5-30	2-10
No. 100			0-10	0-4
No. 200			0-5	0-2
	For Use In: Sections greater than 6 inches or flat slabs	For Use In: Sections 6 inches or under or flat slabs		For Use In: Any sections or flat slabs

2.5 WATER: Potable.

2.6 COMPRESSIVE STRENGTH: Minimum 3,000 psi at 28 days.

2.7 CURING COMPOUND: As approved.

2.8 FIBER ADDITIVE: 100% virgin polypropylene fibers containing no reprocessed olefin materials and specifically manufactured to an optimum gradation for use as a concrete secondary reinforcement. Minimum application rate shall be 1.5 lb./cubic yard of concrete. Fibrous concrete reinforcement shall be as manufactured by Fibermesh Corporation.

2.9 HARDENER: Concrete hardener shall be water-based magnesium and zinc fluosilicate compound diluted 50/50 prior to use.

PART 3 - EXECUTION

3.1 PREPARATION OF SUBGRADE: Excavate to required depth. Remove soft, yielding material and replace with select fill. Compact to a density of not less than 95 percent of the maximum density, as determined by ASTM 1557, Method C.

3.2 BASE COURSE: Place and compact base course to a density of not less than 95 percent of the maximum density, as determined by ASTM 1557, Method D.

3.3 FORMS: Construct true to line and grade, sufficiently rigid to prevent deformation under load or vibration placement of concrete. Clean and oil forms before placing concrete.

3.4 REINFORCING STEEL: Clean, place and secure, using metal chairs, spacers, or other approved devices. Tie wire, 18-gauge minimum, black annealed wire. Bending, splicing and protection, ANSI/ACI 318-83. Provide dowels in foundations for all vertical bars. Place reinforcement as indicated or directed.

3.5 PROPORTIONING AND CONTROL: Concrete, minimum of six 94-pound sacks of cement per cubic yard of concrete. Maximum allowable net water content, including water in aggregate, 6-1/2 gallons of water per sack of cement.

Determine consistency in the field by the slump test, ASTM C143-78. Slump for vibrated concrete, 2 to 4 inches; for non-vibrated concrete, 2 to 5 inches.

3.6 MIXING: Mix cement, aggregate and water in an approved mechanical mixer for a minimum of 1-1/2 minutes before concrete placement. For small quantities, hand mixing may be permitted with approval. Remove entire content of drum before filling with materials for a succeeding batch. Mix concrete only in quantities required for immediate use. Re-tempering of concrete will not be permitted.

3.7 AIR ENTRAINMENT: Concrete shall contain 3 – 5% Air Content. Entrainment additive shall be AEA-15, as manufactured by Sika Corporation or equal.

3.8 PLACING: With minimum handling, place concrete within 30 minutes after mixing. Do not drop freely more than 5 feet. Place concrete footings on surfaces free of mud, loose or unsound rock, or other detrimental substances. Thoroughly tamp or vibrate concrete in

forms.

3.9 FORMS REMOVAL: After concrete has set minimum of 12 hours, remove forms when and as directed.

3.10 CURING: Prevent rapid drying by covering exposed surfaces with craft paper, mats, earth, wet burlap or an approved membrane curing compound for at least 7 days.

3.11 PROTECTION: After placement in forms, maintain concrete at a temperature of 50 degrees F. for a period of 72 hours, and at a temperature above 32 degrees F. for an additional period of 3 days.

3.12 JOINTS: Construct joints true to line with faces perpendicular to surface.

A. Isolation joints: Separate walks and slabs from walls, stairways and other structures, using expansion joint fillers.

B. Contraction (control) joints: Space slab joints to provide 100 to 120 square feet of slab area between joints or as shown on the drawings. Space walk joints at intervals about equal to width of walk to a depth of one-fourth the slab thickness. Space curb and gutter joints not over 12 feet 6 inches on center, and align them with sidewalk joints. Contraction joints may be either sawn or tooled. Crack control joints at column footings shall be as shown on the drawings or as recommended by the building manufacturer.

1. Sawn: Cut with a power saw fitted with an abrasive or diamond blade within 4 to 12 hours after walk has been placed and finished. Use sawn joints on exposed aggregate.

2. Tooled: Form plane of weakness by inserting and later removing a metal divider, finish with an edger or a groover, or by saw cutting a previously tooled joint.

EXTRUDED CURB CONSTRUCTION:

3.12 The Contractor shall lay out the face of all curbing for approval by the Contracting Officer prior to commencement of curb work.

3.13 The surface of the pavement shall be thoroughly cleaned, free from dust, dried dirt, loose material and oil. The two part adhesive shall be mixed and applied to the pavement surface per manufacturer’s recommended rate of application and instructions.

3.14 Concrete shall be fed into the extruding machine at a uniform rate. The machine shall be operated under sufficient uniform restraint to forward motion to produce a well compacted mass of concrete free of surface voids or pits larger than 3/16- inch. Finishing with a brush application of grout will not be permitted. Immediately after the curb is extruded and while concrete is wet and workable, the curb shall have full depth, hand sawn or cut control joints, 1/16” to 1/8” wide, tooled joint edges on top and face of curb. Control joints shall be at 10-foot spacing and at 5-foot spacing on radii on 5 feet or less.

3.15 The pigmented curing compound shall be applied to all exposed surfaces (back, top, curb face and ends) of the curb following the control joint finishing operation, immediately after the moisture sheen begins to disappear from the surface, but before any drying shrinkage or craze cracks begin to appear, with atomizing spray equipment at the manufacturer's rate of application.

PART 4 - MEASUREMENT AND PAYMENT

4.1 PAYMENT: Payment will be included in the bid schedule under 'Concrete'.

4.2 MEASUREMENT: Measurement shall be as follows:

A. 6" engine bay slab..... Square foot

B. Engine bay footings ..... Lump sum

C. Retaining wall ..... Square foot of outside vertical face

D. Stoops and miscellaneous concrete..... No separate Measurement or payment. Payment shall be included with structure.

E. 4" office slab and footings ..... Square foot

END OF SECTION

SECTION 05500
METAL FABRICATIONS

PART 1 – GENERAL

1.1 SCOPE:

A. This work shall consist of providing and installing all metal work such as handrails, gates and miscellaneous structures shown on the drawings. Work includes materials, fabrication, accessories and performance of all work necessary for construction of project, as indicated.

B. Definition: Metal fabrication include items made from iron and steel shapes, plates, bars, strips, tubes, pipes and castings which are not a part of structural steel or other metal systems specified elsewhere.

PART 2 – PRODUCTS

2.1 FERROUS METALS:

A. Metal Surfaces, General: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller mark, rolled trade names and roughness.

B. Steel Plates, Shapes, and Bars: ASTM A36, Bolts ASTM A307.

C. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A47, or cast steel, ASTM A27. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A153.

D. Handrails: Smooth surface 1.5 inch nominal diameter Schedule 40 aluminum tubing, conforming to the requirements of the Americans with Disabilities Act. Material as supplied by R.B. Wagner, Inc. or approved equal.

2.2 GROUT:

A. Metallic Grout: Pre-mixed, factory-packaged, ferrous aggregate grout complying with COE CRD-C588, Type M.

B. Non-shrink, Non-Metallic Grout: Pre-mixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.

2.3 PAINT:

A. Shop Primer for Ferrous Metal: Fast-curing, lead-free, abrasion resistant, rust-inhibitive primer selected for compatibility with substrates and with types of alkyd-type finish paint systems indicated, and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

B. Powder coatings shall conform to the requirements of ASTM D2794, D522, and B117 and be in conformance with Powder Coating Institute (PCI) Practices.

2.4 FABRICATION, GENERAL:

A. Workmanship: Use materials of size and thickness indicated or if not indicated, as required to produce strength and durability in finished product for use intended. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type or materials indicated or specified for various components of work.

B. Form exposed work true to line and level with accurate angles and surfaces 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.

C. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces.

D. 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 (countersunk) screws or bolts.

E. Provide for anchorage of type shown, coordinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

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

G. Galvanizing: Provide a zinc coating for those items shown or specified to be galvanized, as follows:

1. ASTM A153 for galvanizing iron and steel hardware.

2. ASTM A123 for galvanizing rolled, pressed and forged steel shapes, plates, bars and strip 1/8" thick and heavier.

3. ASTM A386 for galvanizing assembled steel products.

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

I. Shop Painting:

1. Apply shop primer to surfaces of metal fabrications except those that are galvanized or as indicated to be embedded in concrete or masonry, unless otherwise indicated.

PART 3 – EXECUTION

3.1 PREPARATION:

A. Field Measurements: Take field measurements prior to preparation of fabrications. Where possible, do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work.

B. 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.

3.2 INSTALLATION, GENERAL:

A. 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.

B. 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.

3.3 SETTING LOOSE PLATES:

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

3.4 ADJUSTING AND CLEANING:

A. 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 Section 09900, “Painting” of these specifications.

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

PART 4 – MEASUREMENT AND PAYMENT

4.1 PAYMENT:

A. Payment shall be included in the Bid Schedule under the item to which this work applies. No separate measurement or payment will be made.

END OF SECTION

SECTION 06100
CARPENTRY

PART 1 – GENERAL

1.1 DESCRIPTION:

A. The work described herein shall include framing, sheathing, blocking, backing, metal fasteners, connections and all other miscellaneous work normally associated with rough and finish building carpentry.

1.2 CODES AND STANDARDS:

A. Materials and installation practices shall comply with applicable building codes and industrial construction standards.

1.3 SUBMITTALS:

A. As required by the Engineer to define or clarify product compliance with specifications.

B. Material and shop drawings to show compatibility with pre-engineered metal building per Section 13121.

PART 2 – PRODUCTS

2.1 LUMBER: All lumber shall be grade-stamped WCLIB (West Coast Lumber Inspection Bureau), WWPA, and S4S except where shown as rough sawn.

A. Beams, rafters and framing material shall be Douglas Fir (D.F.) construction grade, free of pitch streaks, knotholes, splits or checks longer than the wide face dimension and with a moisture content not exceeding 20%.

B. Light metal framing materials shall be 14, 16 and 18 gauge structural steel framing members fabricated from cold-formed slit steel conforming to ASTM A570 Grade 50, with a minimum yield point of 50,000 psi. All components shall be coated with a rust inhibitive paint.

C. All lumber in contact with concrete shall be treated with chromated copper arsenate, CCA, AWPA C2/C9.40.

D. Exterior siding shall be Colonial Roughsawn Hardie Plank or approved equal. Trim and fascia shall be fabricated from Hardie Board Stock or approved equal. All Hardie plank and Hardie board siding and trim shall have factory-applied sealer and primer and color plus factory finish. Color shall be Chestnut Brown.

2.2 CONSTRUCTION PANELS, (PLYWOOD), GENERAL:

A. Construction Panel Standards: Comply with PS 1 ‘U.S. Product Standard for Construction and Industrial Plywood’ for plywood construction panels and, for

products not manufactured under PS 1 provisions, with APA PRP-108.

B. Trademark: Furnish construction panels that are each factory-marked with APA trademark evidencing compliance with grade requirements.

2.3 CONCEALED PERFORMANCE-RATED CONSTRUCTION PANELS:

A. General: Where construction panels are indicated for the following concealed types of applications, provide APA Performance-Rated Panels complying with requirements designated under each application for grade designation, span rating, exposure durability classification, edge detail (where applicable), and thickness.

B. Trademarks: Factory-mark each construction panel with APA trademark evidencing compliance with grade requirements.

C. Structural Plywood for roof and wall sheathing shall be Structural I, Grade C- D, exterior glue, or interseal oriented stran board thicknesses as shown on drawings.

2.4 CONSTRUCTION PANELS FOR BACKING:

A. Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire-retardant-treated plywood panels with grade designation, APA C- D PLUGGED EXPOSURE 1, in thickness indicated, or, if not otherwise indicated, not less than 15/32 inch.

2.5 MOISTURE BARRIER:

A. Asphalt-saturated organic felt complying with ASTM D 226, Type I (No. 15 asphalt felt), unperforated, or,

B. Polyethylene sheet, 0.0061 inch thick, formed by spinning continuous strands of fine high density polyethylene interconnected fibers and bonding them together by heat and pressure; with a moisture vapor transmission rate of 4 grams/square meter/24 hours. ASTM E96, procedure B; flame spread and smoke developed ratings of 5 and 10 per ASTM E84. For use at exterior walls.

1. Available Products: Subject to compliance with requirements, air infiltration barriers that may be incorporated in the Work include, ‘Tyvek Housewrap’, Fibers Department, DuPont Company or approved equal.

C. 6 Mil (.006) polyethylene sheeting 6208 complying with PS 17-69.

2.6 METAL FASTENERS AND CONNECTIONS:

A. Provide joist hangers, straps, post anchors, straight bolts, washers and stock ironwork, as required to securely connect members. Fastenings for exterior work shall be galvanized or stainless steel. Nails and nailing shall be the sizes and numbers noted on drawings or as specified by the building supplier. Connections between members shall be tight, accurate and secure. Place fasteners without splitting wood and pre-drill, if required. Drill bolt holes the same size as the bolt diameter. Drill holes for lag

screws the same size as the thread root diameter and counterbore, the same depth and diameter as the shank. Turn lag screws into place; do not drive. Attachment of collateral material to metal framing shall be with self-tapping metal screws of the size and type for the purpose intended.

B. Provide bolts and lag screws with washers under every head and nut bearing upon wood. Tighten bolts and lag screws at installation; carefully re-tighten just prior to closing in, or at the completion of the project. Wax or other lubricants are not permitted on nails, lag screws or other fasteners dependent upon friction for holding power.

2.7 CARPENTERS IRON WORK:

A. Provide bent or otherwise custom fabricated bolts, tie rods, angles, channels, plates, pipe, tubes, anchors, or other miscellaneous steel, as required for framing, bracing and supporting woodwork. Hot dip galvanize steel after fabrication.

PART 3 – EXECUTION

3.1 SHORING AND BRACING: Furnish, locate, and install shoring and bracing as required for adequate support and safety. Shores and braces shall remain in place 15 days after masonry has set, unless earlier removal is approved. Remove temporary supports when no longer required.

3.2 WORKMANSHIP: Install wood and siding materials level, plumb and true, with members neatly and accurately scribed in place. Apply trim in lengths as long as practicable. Bevel butt joints together; miter exterior angles; cope interior angles. Set for putty, all exposed nails for finish, including exposed plywood. Exposed surfaces shall be free from tool marks, torn grain, cross seating, or any workmanship defects that cannot be concealed by the specified paint finish. Fasteners for siding products shall be in accordance with manufacturer’s recommendations.

3.3 MILLWORK INSTALLATION: Install millwork only after concrete and other wet operations have thoroughly dried. Millwork must be primed or sealed prior to installation. Reseal cut surfaces, edges and ends in an approved manner prior to installation.

PART 4 – PAYMENT

4.1 PAYMENT: Payment for costs incurred under this section shall be included in the Bid Schedule under ‘60' x 40' engine bay’ and ‘20' x 30' office addition’. No separate measurement shall be made.

END OF SECTION

SECTION 07900
CAULKING AND SEALANTS

PART 1 – GENERAL

1.1 DESCRIPTION: Caulking and sealant includes, but is not necessarily limited to, work required to provide a positive barrier against penetration of moisture at all joints and/or intersections of two materials, similar or dissimilar (except at operable portions of doors) and at all voids, gaps, or spaces in the exterior wall, where required to maintain a watertight structure, avoiding drafts and excluding insects.

PART 2 – PRODUCTS

2.1 INTERIOR CAULKING:

A. Acrylic latex, single component, non-sagging paintable. AC-20, Pecora; Sonolac, Sonneborn; or approved equal.

2.2 EXTERIOR CAULKING:

A. High quality paintable caulking that comply with either ASTM C 834 or ASTM C 920.

2.3 SEALANT, INTERIOR AND EXTERIOR:

A. Use any of the following sealants for applications listed by the manufacturer:

1. Two part polyurethane-based: Synthetic rubber, non-sagging, TT227E (Type II): Pecora “Dynatrol”, Sonneburn “Sonolastic NPIIII”, or approved equal.

2. One part polyurethane-based: Synthetic rubber, non-sagging, TT-S-230C (Type II): Sika Chemical “Sikaflex”, Sonneborn “Sonolastic NPI”, Tremco “Dymonic”, or approved equal.

3. One part silicone: Non-sagging, conforming to TT-S-1543A (Type II): Silpruf, General Electric; 790, Dow Corning; or approved equal.

2.4 OTHER MATERIALS:

A. Void Filler: Single component urethane foam, air curing to 2-pound density. Closed-cell, semi-rigid, joint filler; Coplanar Corp. “Polycel One”, or approved equal.

B. Joint Backing: Non-absorbent, non-staining, closed or open cell polyethylene foam joint backing rod; Etha-Form closed cell polyethylene; Denver Foam open cell polyethylene; or approved equal.

C. Primer: As recommended by, and of the same manufacturer, as the manufacturer of the specific caulking or sealant being used.

PART 3 – EXECUTION

3.1 GENERAL: Preparation of joints, priming, storage and handling of sealants and particular methods of installation shall conform to recommendations of sealant manufacturer for each type of installation.

3.2 JOINT CLEANING: Regardless of type sealant used, make joints clean, remove loose and foreign material, paint, lacquer and incomplete material, and clean surfaces with surface conditioner recommended by manufacturer for type of sealant used.

3.3 JOINT PRIMING:

A. Prime porous surfaces to receive polysulfide or silicone sealant. In all cases, prime contact surfaces as recommended by manufacturer for each type of sealant for each location. Omit primer in cases where surface conditioner also acts as primer, subject to approval in each case.

B. Apply primer to surfaces to which sealant must adhere. Do not apply primer to back up material, nor to surfaces exposed after the sealant is installed. Neatly terminate primer to edge of joint where intimate sealant contact is mandatory. Apply bond breaker where needed to effect nonadhesion of sealant to backing.

3.4 SEALANT DEPTH: Unless otherwise shown, sealant depth shall be ½ to 1 times joint width, but not less than ¼" or more than ½" unless otherwise required in special cases.

3.5 SEALANT INSTALLATION:

A. Apply solid and continuous bead or bed of sealant to fill joint without voids. Confine sealant to joint or area to be sealed and finish to neat straight line.

PART 4 – PAYMENT

4.1 PAYMENT:

A. Payment shall be included in the Bid Schedule under "Engine Bay and Office Addition". No separate measurement and payment shall be made.

END OF SECTION

SECTION 08110
DOORS AND FRAMES

PART 1 – GENERAL

1.1 DESCRIPTION: The work described herein consists of furnishing all materials, equipment and labor necessary for the installation of metal doors, architectural finish hardware, including but not limited to hinges, latches, locks, deadlocks, exit devices and closure and holders.

1.2 SUBMITTALS:

A. Catalog data on doors, door frames and finish hardware prior to any ordering or purchasing, quality standard NWWDA I.S.1-A.

B. Manufacturer installation procedures.

1.3 RELATED SECTIONS:

A. 06100 – Carpentry.

B. 13121 – Pre-Engineered Building.

PART 2 – PRODUCTS

2.1 METAL DOORS:

A. Metal doors shall be flush type, beveled edge with honeycomb, styrene or urethane core, and/or steel stiffened as specified. Doors shall be 3’-0” x 6’-8” x 1-3/4 inches. Type A, exterior entrance doors and all required fire-rated doors shall be extra heavy duty construction with 16-gauge face sheets and galvannealed steel. Type B metal interior doors, office and restroom, shall be heavy duty construction with 18 gauge face sheets. All doors shall be Steelcraft ‘L’ series or approved equal.

B. Doors shall be factory prepared and reinforced for all types of specified architectural hardware, including but not limited to: hinges, latches and locks, deadlocks, exit devices, and closures and holders.

Doors and hardware preparation and reinforcement shall be in accordance with ANSI A250.6 – 1997 and ANSI/DH1 A115.

2.2 FRAMES:

A. Frames shall be either flush or drywall frames, 14 or 16-gauge steel, depending on application and usage. All exterior entrance doors shall be galvannealed flush frames with weatherstrip. Interior frames shall be drywall frames. All frames shall meet the requirements of ANSI A250.8-199: Frames shall be Steelcraft F14/F16 Series flush frames or Dw16 Series drywall frames or approved equal.

B. Frames shall have a factory applied baked-on primer for field applied finish paint. Frames shall be factory-prepared and reinforced for all types of specified hardware, including but not limited to: Mortised hinges, 2 per door, latches and locks, deadlocks, exit devices and closures.

C. Doors shall have the following clearances: 1/16" to 1/8" on hinge sides; 1/8" at top and lock side; 5/8" at bottom. Do not trim more than ¼" from any edge of door.

2.3 FINISH HARDWARE

A. All locksets, door latches, exit devices and closures shall be in compliance with ADA standards.

B. Door Hardware:

1. Type A exterior metal door:

   a. Hinges: full-mortised, 4-1/2-inch three per door.

   b. Lockset: Standard duty commercial keyed level lock, UL listed, ANSIA 156.2 Series, 4000 Grade 2, Schlage AL series or approved equal.

   c. Deadbolt: Heavy duty commercial UL listed, ANSI A156.5, Grade 1, single cylinder, Schlage B Series or approved equal.

   d. Door closers shall be parallel arm with 180 degree swing, auxiliary stop, hold open, UL listed, ANSI A156.4, Grade one, LCN 1070 Series or approved equal.

   e. Door kickplates shall be 10" high, .064 inch thickness and the width of the door; brushed stainless steel finish, as manufactured by Builders Brass or approved equal.

2. Type B interior metal door:

   a. Hinges: Full-mortised, 4-1/2 inch, three per door.

   b. Lockset: Standard duty commercial keyed lever lock, UL listed, ANSI A156.2, Series 4000, Grade 2, Schlage AL Series or approved equal.

   c. Door closers shall be parallel arm with 180 degree swing, auxiliary stop, hold open, UL listed, ANSI A156.4, Grade one, LCN 1070 series or approved equal.

3. Type B interior metal door, restroom.

   a. Hinges: Full-mortised, 4-1/2 inch, three per door.

   b. Door Latch: Standard duty commercial, lever handle restroom door latch

with push button lock that can be unlocked from the inside by pushing down on door lever, Grade 2.

c. Door closers shall be parallel arm with 180 degree swing, ANSI A156.4, Grade one, LCN 1070 series or approved equal.

2.4 KEYING

A. The door handles and deadlocks shall be as manufactured by Schlage. The Contracting Officer will be consulted to establish the keying required and the locks will be master-keyed at the factory.

B. The keys shall be stamped with the appropriate code numbers and tagged for identification. Provide two (2) keys for each lock.

C. The keys shall be delivered to the Contracting Officer, accompanied by a list of identification numbers for all keys.

PART 3 – EXECUTION

3.1 EXAMINATION:

A. Verify that opening sizes and tolerances are acceptable.

3.2 DOOR AND FRAME INSTALLATION:

A. Passage doors shall open as shown on the Plans and shall operate freely without noticeable binding or drag. Each door shall have at least three hinges recessed into the frame and door. The lock and latch shall be installed in the door to provide positive engagement of the locking device without excessive manual pressure. The lock shall be key-operated from the outside and capable of being opened from the inside without a key. The door locks shall be keyed to Owner's requirements. All hardware shall be matched in material and finish.

PART 4 – PAYMENT

4.1 Payment shall be included in the Bid Schedule under the building receiving the doors. No separate measurement or payment shall be made.

END OF SECTION

SECTION 08331
OVERHEAD ROLLING DOORS

PART 1 - GENERAL

1.1 DESCRIPTION: This section consists of supplying and installing 14' x 14’ insulated heavy-duty rolling service doors in the engine bay, with electrical door operators and ground level chain hoist.

1.2 SECTION INCLUDES:

A. Overhead rolling door, and operating hardware.

1.3 RELATED SECTIONS:

A. Section 08710 - Door Hardware:

B. Section 13121 - Metal building.

C. Section 09900 - Painting:

D. Section 16010 - Electrical.

1.4 DESIGN REQUIREMENTS:

A. Design door assembly to withstand wind/suction load of 90 psf, without undue deflection or damage to door or assembly components. Design wind speed for Delta County is 80 mph.

1.5 SUBMITTALS:

A. Product Data: Submit manufacturer’s product data and installation instructions for each type of rolling door. Include both published data and any specific data prepared for this project.

B. Shop Drawings: Submit shop drawing for approval prior to fabrication. Include detailed plans, elevations, details of framing members, required clearances, anchors, and accessories. Include relationship with adjacent materials.

C. Maintenance Data: Indicate lubrication requirements and frequency, periodic adjustments required.

1.6 REGULATORY REQUIREMENTS:

A. Conform to applicable local code for wind and seismic rating.

1.7 QUALITY ASSURANCE:

A. Manufacturer: Rolling doors shall be manufactured by a firm with a minimum of five years experience in the fabrication and installation of rolling doors. Manufacturers proposed for use, which are not named in these specifications, shall submit evidence of ability to meet performance and fabrication requirements specified, and include a list of five projects of similar design and complexity completed within the past five years.

B. Installer: Installation of rolling doors shall be performed by the authorized representative of the manufacturer.

C. Single-Source Responsibility: Provide doors, guides, motors, and related primary components from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.

D. Pre-Installation Conference: Schedule and convene a pre-installation conference just prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

1.8 DELIVERY, STORAGE AND HANDLING:

A. Deliver materials and products in labeled protective packages. Store and handle in strict compliance with manufacturer’s instructions and recommendations. Protect from damage from weather, excessive temperatures and construction operations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Rolling Doors: 625 Series Stormtite Insulated Service Doors as manufactured by Overhead Door Corporation. 14-foot by 14-foot roll-up doors with electrical operator with remote control and emergency chain hoist.

2.2 MATERIALS:

A. Curtain: Interlocking roll-formed slats as specified following. Endlocks shall be attached to each end of alternate slats to prevent lateral movement.

1. Flat profile type F-2651 for doors up to 40' 0" wide. The front slat shall be fabricated of 22 gauge galvanized steel. The back slat shall be 24 gauge galvanized steel.

2. Slat cavity shall be filled with CFC-free foamed-in-place, polyurethane insulation.

B. Finish:

1. Galvanized Steel: Slats and hood shall be galvanized steel in accordance with ASTM A525 and receive rust-inhibitive, roll coating process, including bonderizing, 0.2 mils thick baked-on prime paint, and 0.6 mils thick baked-on powder coated top coat. Non-galvanized exposed ferrous surfaces shall receive one coat of rust-inhibitive primer.

2. Color: (Powder coating finish in color as selected by Contracting Officer, from manufacturer's standard colors).

3. Windload Design: 90 PSF.

4. Weatherseals: Vinyl bottom seal, exterior guide and internal hood seals.

5. Bottom Bar: Two prime painted steel (galvanized steel) angles, thickness 1/8" bolted back to back to reinforce curtain in the guides.

6. Guides: Three (galvanized) structural steel angles with minimum thickness of 3/16". Guides shall be weather-stripped with a vinyl weather seal at each jamb, on the exterior curtain side, and interior curtain side.

7. Brackets: Hot rolled steel (galvanized steel) to support counterbalance, curtain and hood.

8. Counterbalance: Helical torsion spring type designed for standard cycle (50,000 cycle) life design. Counterbalance shall be housed in a steel tube or pipe barrel, supporting the curtain with deflection limited to 0.03 per foot of span. Counterbalance shall be adjustable by means of an adjusting tension wheel.

9. Hood: Galvanized steel, 24 gauge hood with intermediate supports as required. Provide with internal hood baffle weatherseal.

10. Manual Operation: Chain hoist.

11. Electric Motor Operation: Provide UL listed electric operator, size as recommended by manufacturer to move door in either direction at not less than 2/3 foot nor more than 1 foot per second. Model RG+, heavy duty, bolt-driven commercial operator with ground level chain hoists for emergency or hand operation.

    (a) Sensing Edge Protection: (Electric sensing edge).

    (b) Operator Controls: Push-button operated control stations with open, close and stop buttons for surface mounting, for interior location with remote control.

    (c) Locking: Interior slide bolt for electric operation with interlock switch.

    (d) Wall Mounting Condition: Between jambs mounting.

PART 3 - EXECUTION

3.1 PREPARATION:

A. Take field dimension and examine conditions of substrates, supports, and other conditions under which this work is to be performed. Do not proceed with work until unsatisfactory conditions are corrected.

3.2 INSTALLATION:

A. Strictly comply with manufacturer's installation instructions and recommendations. Coordinate installation with adjacent work to ensure proper clearances and allow for maintenance.

B. Instruct Owner's personnel in proper operating procedures and maintenance schedule.

3.3 ADJUSTING AND CLEANING:

A. Test rolling doors for proper operation and adjust as necessary to provide proper operation without binding or distortion.

B. Touch-up damaged coatings and finishes and repair minor damage. Clean exposed surfaces using non-abrasive materials and methods recommended by manufacturer of material or product being cleaned.

PART 4 – MEASUREMENT AND PAYMENT

4.1 Payment for this item shall be included in the costs described in the Bidding Schedule under '60x40 Engine Bay'. No separate measurement or payment shall be made.

END OF SECTION

SECTION 08520
WINDOWS

PART 1 – GENERAL

1.1 DESCRIPTION:

A. The work described in this section consists of furnishing all materials, equipment and labor necessary for the installation of windows, screens, opaque panels and operating hardware.

1.2 RELATED SECTIONS:

A. Section 13121 – Metal Buildings.

B. Section 07900 – Caulking and Sealants: Perimeter sealant and back-up materials.

1.3 SUBMITTALS:

A. Product Data: Submit manufacturer's product data and installation instructions for each type of window supplied. Provide dimensions, information on materials, fabrication, glazing, hardware and weather stripping, anchors and accessories.

1.4 FIELD MEASUREMENTS:

A. Verify field measurements are as instructed by the manufacturer.

1.5 COLOR SAMPLES:

A. Submit product color samples for selection by Contracting Officer.

PART 2 – PRODUCTS

2.1 WINDOWS:

A. Materials: Windows shall be fabricated from extruded, high-impact-resistant, rigid (PVC) polyvinylchloride as specified in AAMA 303-99 with a nominal wall thickness of .075.

B. Construction: Nominal depth of frames shall be 3-3/8". Frame and vent members shall be mitered and electrically heat-fused to provide a fully welded corner assembly.

C. Finish: All window frame members shall have an integral color extruded throughout the profiles. All exposed PVC surfaces shall be smooth and glossy and uniform in appearance. Standard finishes shall be either white or almond.

D. Glass and Glazing: All glass within the office addition shall be Solarban 60, solar

control Low-E and shall conform to the requirements set forth in the International Building Code with regard to glass thickness and safety glazing. Sealed insulating glass shall be dual-glazed ¾" overall and certified to meet a IGMA 'A' level rating. All glazing shall be of an exterior drop-in design, utilizing closed-cell foam tape to provide superior sealing while still allowing field replacement. Exterior glazing beads shall be extruded from the same formulation as basic frame members.

E. Hardware: The primary lock on the vent shall be a zinc-die-cast, cam-type located at the center of the vent interlock and shall engage into a keeper within the meeting rail. The ventilation stop shall be located at the vent interlock and shall engage slots in the frame sill. Vents shall be equipped with two nylon roller housings containing two acetal rollers each. All fasteners shall be of a corrosion-resistant material compatible with rigid PVC.

F. Weather Stripping: Vent shall be weather-stripped around the panel perimeter with a fin-type, silicone-treated, pile weather stripping.

G. Screens: Screen frames are to be assembled from .020" thick tubular roll- formed aluminum sections fitted with 18" x 14" fiberglass mesh. All screens shall have pull tabs and leaf springs for release and containment.

2.2 TYPE OF WINDOWS AND MANUFACTURER:

A. Type 1. XO vinyl horizontal sliding window, standard half-vent with dual- glazing, clear or obscure, and screens. Viking Model 9100 or approved equal. Type 1A, XOX standard double horizontal sliding window, with dual glazing, clear or obscure, and screens, Viking Model 9100 or equal.

B. Type 2. Vinyl fixed window with dual-glazing, clear or obscure. Viking Model 9600 or approved equal.

2.3 PERFORMANCE REQUIREMENTS:

A. Provide double pane windows to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall as measured in accordance with ASTM E330.

B. Performance: Windows shall be tested and certified under the requirements of AAMA/NWWDA 101/1.S.2-97 covering structural, air and water performance for windows. Windows shall bear an AAMA label indicating compliance for a Class C-30 rating (windows over 5 feet high are rated at LC25). Windows shall be tested, certified and labeled with U-factors in accordance with NFRC 100-97 specifications for thermal transmittance. Windows shall be tested and certified to CMBSO/CAWM 301-90 specifications for Forced Entry.

PART 3 – EXECUTION

3.1 INSTALLATION:

A. Install window frames, glass and glazing, and hardware in accordance with manufacturer's instructions.

B. Installation: All windows must be installed and shimmed plumb, square, and level prior to fastening into the building structure. Full support must be provided under the entire length of the sill at both the interior and exterior surfaces. Flash and caulk around the window perimeter in accordance with local building codes and good construction practices. Caution: The use of any insulating material or shims between the frame and rough opening of a window or patio door that causes the frame to bow or impedes the product's operation will not be allowed.

C. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

D. Coordinate attachment and seal of perimeter air and vapor barrier materials.

3.2 CLEANING:

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

C. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

PART 4 – MEASUREMENT AND PAYMENT

4.1 Payment for costs incurred under this section shall be included in the Bid Schedule under '60x40 Engine Bay' and '20x30 Office Addition'.

END OF SECTION

SECTION 09250
GYPSUM BOARD

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This work consists of furnishing and installing all gypsum board, including all materials, labor, equipment and incidentals necessary for the work.

B. This Section includes the following type of gypsum board construction:

1. Gypsum board, nail, and/or screw attached to wood framing or screw attached to metal furring members/framing.

C. Wood framing is specified in the following Division 6 sections:

1. Section 06100 - " Carpentry".

1.2 DEFINITIONS

A. Gypsum Board Construction Terminology: Refer to ASTM C 11 and GA 505 for definitions of terms for gypsum board construction not otherwise defined in this section or other referenced standards.

1.3 QUALITY ASSURANCE

A. Fire-Resistance Ratings: Where indicated, provide materials and construction which are identical to those of assemblies whose fire resistance rating has been determined per ASTM E 119 by a testing and inspecting organization acceptable to authorities having jurisdiction.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic and other causes. Neatly stack gypsum boards flat to prevent sagging.

C. Handle gypsum boards to prevent damage to edges, ends and surfaces. Do not bend or otherwise damage metal corner beads and trim.

1.5 PROJECT CONDITIONS:

A. Environmental Conditions, General: Establish and maintain environmental conditions for application and finishing gypsum board to comply with ASTM C 840 and with gypsum board manufacturer's recommendations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include the following or approved equal:

1. Gypsum Boards and Related Products:

a. Georgia-Pacific Corp.
b. Gold Bond Building Products Div., National Gypsum Co.
c. United States Gypsum Co.

2.2 GYPSUM BOARD:

A. General: Provide gypsum board of types indicated in maximum lengths available to minimize end-to-end joints.

B. Gypsum Wallboard: ASTM C 36, and as follows:

1. Type: Regular, unless otherwise indicated.

2. Type: Type X for fire-resistance-rated assemblies.

3. Edges: Tapered.

4. Thickness: 1/2", except fire wall installations.

2.3 STEEL FRAMING COMPONENTS:

A. General: Provide components which comply with ASTM C 754 for materials and sizes, unless otherwise indicated.

B. Channels: Cold-rolled steel, 0.0598 inch minimum thickness of base (uncoated) metal and 7/6 inch wide flanges, protected with rust-inhibitive paint, and as follows:

1. Carrying Channels: 1-1/2 inch deep, 475 lbs per 1000 ft., unless otherwise indicated.

C. Steel Rigid Furring Channels: ASTM C 645, hat-shaped, depth of 7/8 inch, and minimum thickness of base (uncoated) metal as follows:

1. Thickness: 0.0179 inch, unless otherwise indicated.

D. Wire for Hangers and Ties: ASTM A641, Class 1 zinc coating, soft temper.

2.4 WOOD FRAMING COMPONENTS:

A. Conform to the requirement of Section 06100, ‘Carpentry’.

2.5 TRIM ACCESSORIES:

A. Cornerbead and Edge Trim for Interior Installation: Provide corner beads, edge trim and control joints which comply with ASTM C 1047 and requirements indicated below:

1. Material: Formed metal, plastic or metal combined with paper, with metal complying with the following requirement:

a. Sheet steel zinc-coated by hot-dip process.

2. Edge trim shapes indicated below by reference to designations of Fig. 1 in ASTM C 1047:

a. "LC Bead", unless otherwise indicated.
b. "L" Bead where indicated.
c. "U" Bead where indicated.

2.6 GYPSUM BOARD JOINT TREATMENT MATERIALS

A. General: Provide materials complying with ASTM C 475, ASTM C 840, and recommendations of manufacturer of both gypsum board and joint treatment materials for the application indicated.

B. Joint Tape: Paper reinforcing tape, unless otherwise indicated.

C. Setting-Type Joint Compounds: Factory-prepackaged, job-mixed, chemical-hardening powder products formulated for uses indicated.

1. Where setting-type joint compounds are indicated for use as taping and topping compounds, use formulation for each which develops greatest bond strength and crack resistance and is compatible with other joint compounds applied over it.

2. For prefilling gypsum board joints, use formulation recommended by gypsum board manufacturer for this purpose.

3. For filling joints and treating fasteners of water-resistant gypsum backing board behind base for ceramic tile, use formulation recommended by gypsum board manufacturer for this purpose.

D. Drying-Type Joint Compounds: Factory-prepackaged vinyl-based products complying with the following requirements for formulation and intended use.

1. Ready-Mix Formulation: Factory-premixed product.

2. Taping compound formulated for embedding tape and for first coat over fasteners and flanges of corner beads and edge trim.

3. Topping compound formulated for fill (second) and finish (third) coats.

4. All-purpose compound formulated for use as both taping and topping compound.

2.7 MISCELLANEOUS MATERIALS

A. General: Provide auxiliary materials for gypsum drywall construction which comply with referenced standards and the recommendations of the manufacturer of the gypsum board.

B. Gypsum Board Nails: ASTM C 514.

C. Asphalt Felt: ASTM D 226, Type I (No. 15).

D. Concealed Acoustical Sealant: Nondrying, nonhardening, nonskinning, nonstaining, nonbleeding, gunnable sealant complying with requirement specified in Division-7 section "Joint Sealers."

E. Sound Attenuation Blankets: Unfaced mineral fiber blanket insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665 for Type I (blankets without membrane facing); and as follows:

1. Mineral Fiber Type: Fibers manufactured from glass or slag.

2.8 GLASS MESH MORTAR UNIT FINISHING MATERIALS

A. Tape and joint compounds as recommended by glass mesh mortar unit manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to which drywall construction attaches or abuts, preset hollow metal frames, cast-in-anchors, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of drywall construction. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 APPLICATION AND FINISHING OF GYPSUM BOARD, GENERAL

A. Gypsum Board Application and Finishing Standard: Install and finish gypsum board to comply with ASTM C 840.

B. Locate exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than 24 inches in alternate courses of board.

C. Install wall/partition boards in manner which minimizes the number of end-butt joints or avoids them entirely where possible.

D. Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16 inch open space between boards. Do not force into place.

E. Located either edge or end joints over supports, except in horizontal applications or where

intermediate supports or gypsum board back-blocking is provided behind end joints. Position boards so that like edges abut, tapered edges against tapered edges and mill-cut or field-cut ends against mill-cut or field-cut ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.

F. Attach gypsum board to supplementary framing and blocking provided for additional support at openings and cutouts.

G. Spot grout hollow metal door frames for solid core wood doors, hollow metal doors and doors over 32 inches wide. Apply spot grout at each jamb anchor clip just before inserting board into frame.

H. Isolate perimeter of non-load-bearing drywall partitions at structural abutments. Provide 1/4" to 1/2" space and trim edge with "U" bead edge trim. Seal joints with acoustical sealant.

I. Floating Construction: Where feasible, including where recommended by manufacturer, install gypsum board over wood framing, with "floating" internal corner construction.

J. Space fasteners in gypsum boards in accordance with referenced gypsum board application and finishing standard and manufacturer's recommendations.

K. Finish Surface: Finish texture of wall and ceiling surfaces shall be ‘orange peel’.

3.3 METHODS OF GYPSUM BOARD APPLICATION:

A. Single-Layer Application: Install gypsum wallboard as follows.

1. On ceilings apply gypsum board prior to wall/partition board application to the greatest extents possible. Stagger all joints and seams.

2. On partitions/walls apply gypsum board to minimize seams, and provide sheet lengths which will minimize end joints.

3. Wall Tile Base and Wainscoat: Where drywall is base for thin-set ceramic tile and similar rigid applied wall finishes, install gypsum backing board.

a. In "dry" areas install gypsum backing board or wallboard with tapered edges taped and finished to produce a flat surface.

b. In ‘wet areas’ install ‘greenboard’ gypsum units and treat joints to comply with manufacturer's recommendations for type of application indicated.

B. Single-Layer Fastening Methods: Apply gypsum boards to supports as follows:

1. Fasten to wood supports with single nailing or drywall screws.

2. Fasten to steel framing with adhesive and supplementary screws.

C. Double-layer Application: Install gypsum backing board for base layer and gypsum wallboard for face layer.

3.4 INSTALLATION OF DRYWALL TRIM ACCESSORIES:

A. General: Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges to comply with manufacturer's recommendations.

B. Install corner beads at external corners.

C. Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed, and except where plastic trim is indicated. Provide type with face flange to receive joint compound except where "U-bead" (semi-finishing type) is indicated.

1. Install "LC" bead where drywall construction is tightly abutted to other construction and back flange can be attached to framing or supporting substrate.

2. Install "L" bead where edge trim can only be installed after gypsum board is installed.

3. Install U-type trim where edge is exposed, revealed, gasketed, or sealant-filled (including expansion joints).

3.5 FINISHING OF DRYWALL:

A. General: Apply joint treatment at gypsum board joints (both directions), flanges of corner bead, edge trim, and control joints; penetrations; fastener heads, surface defects and elsewhere as required to prepare work for decoration.

B. Prefill open joints and rounded or beveled edges, if any, using setting-type joint compound.

C. Apply joint tape at joints between gypsum boards, except where trim accessories are indicated.

D. Finish interior gypsum wallboard by applying the following joint compounds in 3 coats (not including prefill of openings in base), and sand between coats and after last coat:

1. Embedding and First Coat: Ready-mix drying-type all-purpose or taping compound.

2. Fill (Second) Coat: Ready-mix drying-type all-purpose or topping compound.

3. Finish (Third) Coat: Ready-mix drying-type all-purpose or topping compound. Texture shall be ‘orange peel’.

E. Base for Acoustical Tile: Where gypsum board is indicated as a base for adhesively applied acoustical tile, install tape and 2-coat compound treatment without sanding.

F. Water-Resistant Backing Board Base for Ceramic Tile: Finish joints between water-resistant backing board with tape and setting-type joint compound to comply with gypsum board manufacturer's recommendations and installation standards.

3.6 PROTECTION:

A. Provide final protection and maintain conditions, in a manner suitable to Installer, which ensures gypsum drywall construction being without damage or deterioration at time of Substantial Completion.

PART 4 – MEASUREMENT AND PAYMENT

4.1 MEASUREMENT:

A. Measurement shall be included in the Bid Schedule under ‘20x30 Office Addition’.

B. No separate measurement and payment shall be made.

END OF SECTION

SECTION 09650
VINYL FLOORING

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This work consists of providing all materials, equipment and labor for the installation of vinyl flooring. Sheet vinyl flooring and accessories shall be installed in restrooms, office and conference room areas as shown on drawings and in schedules.

1.2 QUALITY ASSURANCE:

A. Manufacturer: Provide each type of vinyl flooring and accessories as produced by a single manufacturer, including recommended primers, adhesives, sealants, and leveling compounds.

B. Fire Test Performance: Provide flooring which complies with the following fire test performance criteria as determined by an independent testing laboratory acceptable to authorities having jurisdiction.

1. Critical Radiant Flux (CRF): Not less than 0.45 watts per sq. cm. Rating per ASTM E 648 and NFPA 253.

2. Flame Spread: Not more than 75 per ASTM E 84.

3. Smoke Developed: Not more than 450 per ASTM E 662.

1.3 SUBMITTALS:

A. Product Data: Submit manufacturer's technical data for each type of flooring adhesives and accessory.

B. Samples for Initial Selection Purposes: Submit manufacturer's standard color charts in form of actual sections of flooring, including accessories, showing full range of colors and patterns available, for each type of flooring required.

C. Samples for Verification Purposes: Submit the following samples of each type, color, and pattern of flooring required, showing full-range of color and pattern variations.

1. Full size rubber base samples.

D. Maintenance Instructions: Submit two copies of manufacturer's recommended maintenance practices for each type of resilient flooring and accessory required.

1.4 PROJECT CONDITIONS:

A. Maintain minimum temperature of 65° F (18° C) in spaces to receive flooring for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. Store flooring materials and adhesives in spaces where they will be installed for at least 48 hours before beginning installation. Subsequently, maintain minimum

temperature of 55° F (13° C) in areas where work is completed.

B. Install flooring and accessories after other finishing operations, including painting, have been completed. Do not install flooring over concrete slabs until the latter have been cured and are sufficiently dry to achieve bond with adhesive as determined by flooring manufacturer's recommended bond and moisture test.

PART 2 - PRODUCTS

2.1 SHEET VINYL FLOORING:

A. Flooring for restrooms, office and conference room areas shall be a commercial grade sheet vinyl with a PVC or felt backing for use on concrete subfloors. Nominal overall thickness 0.080 inches (2 mm), with a minimum wear layer 0.050 inches (1.27 mm) Type II, Grade 1. Flooring shall meet ADA standards for slip resistance. Flooring shall be LG Chem Constellation Series, Lyra in Armstrong Commercial Flooring or approved equal.

2.2 VINYL FLOORING COLORS AND PATTERNS:

A. Provide color and patterns as indicated, or if not otherwise indicated, as selected by Contracting Officer from manufacturer's standards.

2.3 WALL BASE:

A. Wall base shall be a color-integrated vinyl or rubber wallbase, four inches high. Submit color charts to coordinate with flooring.

2.4 ADHESIVES:

A. Flooring and wall base adhesives as recommended by the manufacturer for use on the substrate being applied.

PART 3 - EXECUTION

3.1 INSPECTION:

A. Require Installer to inspect subfloor surfaces to determine that they are satisfactory. A satisfactory subfloor surface is defined as one that is smooth and free from cracks, holes, ridges, coatings preventing adhesive bond, and other defects impairing performance or appearance.

B. Perform bond and moisture tests on concrete subfloors to determine if surfaces are sufficiently cured and dry as well as to ascertain presence of curing compounds.

C. Do not allow resilient flooring work to proceed until subfloor surfaces are satisfactory.

3.2 PREPARATION

A. Prepare subfloor surfaces as follows:

1. Before placing, scrape, broom clean and vacuum the subfloor to remove all dirt, debris and lumps.

2. Use leveling and patching compounds as recommended by resilient flooring manufacturer for filling small cracks, holes and depressions in subfloors.

3. Remove coatings from subfloor surfaces that would prevent adhesive bond, including curing compounds incompatible with resilient flooring adhesives, paint, oils, waxes and sealers.

B. Broom clean and vacuum surfaces to be covered, and inspect subfloor.

C. Apply concrete slab primer, if recommended by flooring manufacturer, prior to application of adhesive. Apply in compliance with manufacturer's directions.

3.3 INSTALLATION, GENERAL

A. Install flooring using method indicated in strict compliance with manufacturer's printed instructions. Extend flooring into toe spaces, door reveals, and into closets and similar openings.

B. Scribe, cut, and fit resilient flooring to permanent fixtures, built-in furniture and cabinets, pipes, outlets and permanent columns, walls and partitions.

C. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other non-permanent marking device.

D. Install flooring on covers for telephone and electrical ducts, and similar items occurring within finished floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on these covers. Tightly cement edges to perimeter of floor around covers and to covers.

E. Tightly cement flooring to subbase without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections. Hand roll flooring at perimeter of each covered area to assure adhesion.

3.4 CLEANING AND PROTECTION

A. Perform following operations immediately upon completion of resilient flooring:

1. Sweep or vacuum floor thoroughly.

2. Do not wash floor until time period recommended by flooring manufacturer has elapsed to allow flooring to become well-sealed in adhesive.

3. Damp-mop floor being careful to remove black marks and excessive soil.

4. Remove any excess adhesive or other surface blemishes, using appropriate cleaner recommended by flooring manufacturers.

B. Protect flooring against damage during construction period to comply with vinyl flooring manufacturer's directions.

1. Apply protective floor polish to vinyl flooring surfaces free from soil, excess adhesive or surface blemishes. Use commercial available metal cross-linked acrylic product acceptable to vinyl flooring manufacturer.

2. Protect vinyl flooring against damage from rolling loads for initial period following installation by covering with plywood or hardboard. Use dollies to move stationary equipment or furnishings across floors.

3. Cover vinyl flooring with undyed, untreated building paper until inspection for substantial completion.

PART 4 – MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Measurement and payment shall be included in the Bid Schedule under ‘20x30 Office Addition’.

B. No separate measurement and payment shall be made.

END OF SECTION

SECTION 09900
PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. Surface preparation and field application of paints and coatings.

1.2 REFERENCES:

A. ASTM D16 - Definitions of Terms Relating to Paint, Varnish, Lacquer and Related Products.

B. ASTM D2016 - Test Method for Moisture Content of Wood.

C. AWWA (American Water Works Association) - C204 - Chlorinated Rubber- Alkyd Paint Systems for the Exterior of Above Ground Steel Water Piping.

D. NACE (National Association of Corrosion Engineers) - Industrial Maintenance Painting.

E. NPCA (National Paint and Coatings Association) - Guide to U.S. Government Paint Specifications.

F. PDCA (Painting and Decorating Contractors of America) - Painting - Architectural Specifications Manual.

G. SSPC (Steel Structures Painting Council) - Steel Structures Painting Manual.

1.3 DEFINITIONS:

A. Conform to ASTM D16 for interpretation of terms used in this section.

1.4 SUBMITTALS:

A. Product data: Provide data on all finishing products.

B. Samples: Submit two samples, 1 x 2-inch in size, illustrating selected colors for each surface finishing product scheduled.

C. Manufacturer’s Instructions: Indicate special surface preparation procedures and substrate conditions requiring special attention.

1.5 DELIVERY, STORAGE AND HANDLING:

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container label to include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, clean-up requirements, color designation and instructions for mixing and reducing.

C. Store paint materials at a minimum ambient temperature of 45 degrees F. (7 degrees C.) and a maximum of 90 degrees F. (32 degrees C.), in ventilated area, and as required by the manufacturer's instructions.

1.6 ENVIRONMENTAL REQUIREMENTS:

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

C. Minimum Application Temperatures for Latex Paints: 45 degrees F. (7 degrees C.) for interiors; 50 degrees F. (10 degrees C.) for exterior; unless required otherwise by the manufacturer's instructions.

D. Minimum Application Temperature for Varnish Finishes: 65 degrees F. (18 degrees C.) for interior or exterior, unless required otherwise by the manufacturer's instructions.

PART 2 PRODUCTS

2.1 MATERIALS:

A. Paint materials shall be by a major manufacturer such as Fuller, Dunn Edwards, Pittsburg Paints, Sherwin-Williams or approved equal. All exposed metal shall be factory-primed or field primed prior to finish coat application. Colors shall be approved by the Contracting Officer prior to application.
Exterior Hardie plank and Hardie panel shall be factory-primed and painted as specified in Section 06100. Roofing materials shall be factory-painted per specification.

B. Coatings: Ready-mixed, except field catalyzed coatings. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating; good flow and brushing properties; capable of drying or curing free of streaks or sags.

2.2 FINISHES:

A. Refer to schedule at the end of section for surface finish and color schedule.

PART 3 EXECUTION

3.1 EXAMINATION:

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. Test shop applied primer for compatibility with subsequent cover materials.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:

1. Masonry, Concrete, and Concrete Unity Masonry: 12 percent.
2. Exterior Wood: 15 percent, measures in accordance with ASTM D2016.
3. Concrete Floors: 8 percent.

3.2 PREPARATION:

A. Remove electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.

B. Correct defects and clean surfaces which affect work of this section.

C. Seal with shellac and seal marks which may bleed through surface finishes.

D. Impervious surfaces: Remove mildew by scrubbing with solution of tri- sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

E. Aluminum surfaces scheduled for paint finish: Remove surface contamination by steam or high pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.

F. Concrete floors scheduled to receive sealer/hardener: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.

G. Gypsum board surfaces: Fill minor defects with filler compound. Spot prime defects after repair.

H. Galvanized surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.

I. Concrete and unit masonry surfaces scheduled to receive paint finish: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.

J. Plaster surfaces: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and

neutralize high alkali surfaces.

K. Uncoated steel and iron surfaces: Remove grease, mill scale, weld splatter, dirt and rust. Where heavy coatings of scale are evident, remove by hand or power tool, wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts and nuts are similarly cleaned. Spot prime paint after repairs.

L. Shop-primed steel surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.

M. Interior wood items schedule to receive paint finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats.

N. Interior wood scheduled to receive transparent finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats.

O. Exterior wood scheduled to receive paint finish: remove dust, grit and foreign matter. Seal knots, pitch streaks and sappy sections. Fill nail holes with tinted exterior caulking compound after prime coat has been applied.

P. Exterior wood scheduled to receive transparent finish: Remove dust, grit and foreign matter; seal knots, pitch streaks and sappy sections with sealer. Fill nail holes with tinted exterior caulking compound after sealer has been applied.

Q. Wood and metal doors scheduled for painting: Seal top and bottom edges with primer.

3.3 APPLICATION:

A. Apply products in accordance with manufacturer’s instructions.

B. Do not apply finishes to surfaces that are not dry.

C. Apply each coat to uniform finish.

D. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.

E. Sand metal lightly between coats to achieve required finish.

F. Vacuum clean surfaces free of loose particles. Use tack cloth just prior to applying next coat.

G. Allow applied coat to dry before next coat is applied.

H. Where clear finishes are required, tint fillers to match wood. Work fillers into the

grain before set. Wipe excess from surface.

I. Prime concealed surfaces of interior and exterior woodwork with primer paint.

J. Prime concealed surfaces of interior woodwork scheduled to receive stain or varnish finish with gloss varnish reduced 25 percent with mineral spirits.

K. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

L. Prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, except where items are prefinished.

M. Paint interior surfaces that are visible through grilles and louvers with one coat of flat black paint. Paint dampers exposed behind louvers and grilles to match face panels.

N. Paint exposed conduit and electrical equipment occurring in finished areas.

O. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.

P. Color code equipment, piping, conduit, and exposed duct work in accordance with requirements color schedule.

Q. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 CLEANING:

A. Collect waste material which may constitute a fire hazard, place in closed metal containers and remove daily from site.

B. Remove any spilled paint.

3.5 SCHEDULE - EXTERIOR SURFACES:

A. Exterior Fiber Cement Lap Siding and Trim:

1. Factory applied sealer.
2. Factory applied finish.
3. Touch-up shall be as recommended by the manufacturer.

B. Wood - Painted (beams, frames, sills, fascias, soffits):

1. One coat of latex primer sealer.
2. Two coats of latex enamel semi-gloss.

C. Wood - Transparent:

1. One coat of clear sealer.
2. Two coats of transparent varnish.

D. Steel - Unprimed (miscellaneous):

1. One coat of alkyd primer.
2. Two coats of alkyd enamel, semi-gloss.

E. Steel - Shop Primed (doors and frames):

1. Touch up with zinc chromate primer, W711 Van Prime.
2. Two coats of acrylic enamel, semi-gloss, W901 Permsheen.

F. Steel - Galvanized:

1. One coat galvanized primer.

2. Two coats of alkyd semi-gloss.

G. Concrete Masonry Units:

1. Two coats solvent base penetrating sealer.

3.6 SCHEDULE - INTERIOR SURFACES:

A. Wood – Painted (beams, frames, sills, ceilings, plywood sheathing, trim):

1. One coat of latex prime sealer.
2. One coat of latex enamel, semi-gloss.

B. Steel - Unprimed:

1. One coat of alkyd primer.
2. One coat of alkyd enamel, semi-gloss.

C. Steel - Primed:

1. Touch-up with alkyd primer.
2. One coat of alkyd enamel, semi-gloss.

D. Steel - Galvanized:

1. One coat galvanized primer.
2. One coat of alkyd enamel, semi-gloss.

E. Aluminum - Mill Finish:

1. One coat etching primer.
2. One coat of alkyd enamel, semi-gloss.

I. Gypsum Board Interior Walls/Ceiling.

1. One coat latex primer.

2. One coat semi-gloss latex enamel.

3.7 SCHEDULE – COLORS:

A. Colors shall be specified by the Contracting Officer from samples submitted by the Contractor for each of the following:

Chestnut Brown	Exterior surface; recommend factory finish
N/A	Beams
N/A	Columns and frames
Forest Green	Fascia, trim
Light Brown	Doors and Overhead doors
Off White	Interior walls/Ceilings
Off White	Office/Day room
N/A	Interior – engine garage
Forest Green	Roofing (match existing buildings on site)

PART 4 MEASUREMENT AND PAYMENT

4.1 Payment shall be included in the Bid Schedule under the item requiring painting. No separate measurement or payment shall be made.

END OF SECTION

SECTION 09986
SANITARY WAINSCOT PANELS

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section consists of furnishing and installing 4’ high FRP wainscot panels on all walls in the office area restrooms.

1.2 SECTION REQUIREMENTS:

A. Submittals: Product Data and material Samples.

B. Provide finishes with flame-spread and smoke-developed ratings of 25 or less and 450 or less, respectively, when tested according to ASTM E 84.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Fiberglass reinforced panel (FRP) with color matched molding and attachment accessories at Toilet/shower rooms: Textured, wainscot panels; color as selected by Contracting Officer from manufacturer’s standard colors.

1. Adhesive: Recommended by the manufacturer for use with material on the substrate indicated.

2. Acceptable Manufacturers:

a. Glasteel
b. Glasbord
c. Lasco
d. Approved equal

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install components level, plumb, and true to line without distortions.

B. Apply panels and accessories in accordance with manufacturer’s recommendations.

C. Apply sanitary wainscot panels with full spread of adhesive, unless otherwise recommended by manufacturer. Install full height with seams vertical.

PART 4 – MEASUREMENT AND PAYMENT

A. Measurement shall be included in the Bid Schedule under ‘20x30 Office Addition’.

B. No separate measurement and payment shall be made.

END OF SECTION

SECTION 10800
TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 SCOPE:

A. This work consists of providing toilet and bath accessories.

B. This Section includes the following toilet accessory items:

1. Toilet tissue dispenser.
2. Paper towel dispenser.
3. Grab bar.
4. Soap dispenser
5. Seat cover dispenser
6. Mirror
7. Signage

1.2 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Section 01300 - Submittals.

B. Product Data for each toilet accessory item specified, including details of construction relative to materials, dimensions, gauges, profiles, method of mounting, specified options, and finishes.

1.3 PROJECT CONDITIONS:

A. Coordination: Coordinate accessory locations, installation, and sequencing with other work to avoid interference and to assure proper installation, operation, adjustment, cleaning, and servicing of toilet accessory items.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering toilet accessories that may be incorporated in the Work include, but are not limited to, the following:

1. A & J Washroom Accessories.

2. American Specialties, Inc.

3. Bobrick Washroom Equipment, Inc.

4. Bradley Corporation.

5. General Accessory Manufacturing Co.

6. Seachrome Corporation.

2.2 MATERIALS, GENERAL:

A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 22-gauge (.034-inch) minimum thickness, unless otherwise indicated.

B. Sheet Steel: Cold-rolled, commercial quality ASTM A 366, 20-gauge (.040-inch) minimum, unless otherwise indicated. Surface preparation and metal pretreatment as required for applied finish.

C. Galvanized Steel Sheet: ASTM A 527, G60.

D. Mirror Glass: Nominal 6.0 mm (0.23 inch) thick, conforming to ASTM C 1036, Type I, Class 1, Quality q2, and with silvering, electro-plated copper coating, and protective organic coating.

E. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.

F. Fasteners: Screws, bolts, and other devices of same material as accessory unit or of galvanized steel where concealed.

G. Keys: Unless otherwise indicated, provide universal keys for access to toilet accessory units requiring internal access for servicing, resupply, etc. Provide minimum of six (6) keys to Owner's representative and obtain receipt.

2.3 TOILET TISSUE DISPENSERS:

A. Double-Roll Dispenser: Size to accommodate two separate rolls of core type tissue to 5-inch diameter.

1. Fabrication: Molded plastic spindle with die-cast, satin-finished aluminum bracket, designed for surface mounting.

2.4 TOWEL DISPENSER:

A. Satin finish stainless steel, surface-mount unit with fold-down loading door. Capacity 400 C-fold towels. Size to be approximately 11” wide, 13” high, 4” deep. Model 4262 Contura Series, as manufactured by Bobric or approved equal.

2.5 GRAB BARS:

A. Stainless Steel Type: Provide grab bars with wall thickness not less than 18 gage (.050 inch) and as follows:

1. Mounting: Concealed, manufacturer's standard flanges and anchorages.

2. Clearance: 1-1/2 inches clearance between wall surface and inside face of bar.

3. Gripping Surfaces: Smooth, satin finish.

4. Heavy-Duty Size: Outside diameter of 1-1/2 inches.

2.6 SOAP DISPENSERS:

A. Liquid soap dispenser, wall-mounted, piston and spout type, capacity 40 fluid ounce with refill window. Bobric Classic Series B-2111 or approved equal.

2.7 SEAT COVER DISPENSERS:

A. Surface-Mounted Type: Fabricate of stainless steel with concealed opening at bottom for filling; capacity not less than 250 seat covers.

2.8 MIRROR UNITS:

A. Standard 1/4" thick plate glass, 18" X 36" with stainless steel frame.

2.9 SIGNAGE:

A. Restroom signage shall be unisex, handicap-accessible symbols measuring 6” x 9”. Mount on each restroom door at 60” AFF.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install toilet accessory units in accordance with manufacturers' instructions, using fasteners appropriate to substrate and recommended by manufacturer of unit. Install units plumb and level, firmly anchored in locations and at heights indicated.

B. Secure mirrors to walls in concealed, special hangers, toggle bolts, or screws. Set units plumb, level, and square at locations indicated, in accordance with manufacturer's instructions for type of substrate involved.

3.2 ADJUSTING AND CLEANING:

A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.

B. Clean and polish all exposed surfaces in strict accordance with manufacturer's recommendations after removing temporary labels and protective coatings.

PART 4 – MEASUREMENT AND PAYMENT

A. Measurement shall be included in the Bid Schedule under ‘Office Addition’.

B. No separate measurement or payment shall be made.

END OF SECTION

SECTION 13121
PRE-ENGINEERED METAL BUILDING

PART 1 – GENERAL

1.1 DESCRIPTION:

A. Work under this section includes all labor, materials, and engineering necessary to design, furnish and construct a metal building per these plans and specifications. Section includes: building structural steel frame (except slab and footings), ridge ventilator, passage and roll-up doors, flashing, trim, gutters and downspouts, translucent roof panels, and anchor bolts.

B. Structure shall be designed to accommodate standard wood-framed infill for exterior and interior wall sections with fiber cement lap siding for exterior finish. Proposals will be accepted for alternate framing methods to maintain architectural compatibility with existing structures on site.

1.2 RELATED SECTIONS:

A. Section 01050 – Field Engineering.

B. Section 01300 – Submittals.

C. Section 02210 – Site Grading.

D. Section 03306 – Structural Concrete.

E. Section 06100 – Carpentry.

F. Section 08110 – Doors and Frames.

G. Section 08331 – Overhead Rolling Doors.

H. Section 09900 – Painting.

1.3 DESIGN REQUIREMENTS:

A. Design structural system according to professionally recognized methods and standards and applicable building codes.

B. Design shall be by a structural or civil engineer licensed in the state of Colorado.

C. Building manufacturer shall be certified by AISC.

D. Design Loads:

1. Snow load: 30 psf.

2. Wind load: 90 mph, Exposure ‘C’.

3. Seismic Zone C.

E. Standards: The following standards shall apply:

1. Current International Building Code.

2. AISC (latest edition): “Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings”.

3. AISI (latest edition): “Specifications for the Design of Light Gauge Cold-Formed Steel Structural Members”

F. Design wall and roof panel system to withstand specified loads with deflection of 1/180 of span, maximum.

G. Anchor Bolts: Furnish anchor bolt diameters, calculated on the basis of stress in the steel bolt, to resist the column reactions inducted by the design loads on the structure. Anchor bolts and embedment requirements furnished by others.

1.4 SUBMITTALS:

A. Design Data: Provide detailed design criteria and calculations. Provide building reactions and loadings at foundations and footings for modification of foundation design, as necessary.

B. Certification: Manufacturer certification that the building conforms to the contract documents and manufacturer’s standard design procedures.

C. Shop Drawings: Show building layout, primary and secondary framing member sizes and locations, cross-sections, and product and connection details.

D. Product Data: Information on manufactured products to be incorporated into the project.

E. Color Charts: For selection of colors.

F. Anchor Bolt Drawings: Layouts with bolt diameters.

G. Specimen Warranty.

1.5 WARRANTY:

A. Provide manufacturer’s standard warranty for:

1. Standard warranty on materials and workmanship: 3 years.

2. Panel finish: 20 years (for roofing and exposed finishes).

PART 2 – MATERIALS

2.1 METAL MATERIALS:

A. Select materials and material yield strengths based on building design requirements; use the following unless required otherwise.

B. Structural Steel Plate, Bar, Sheet, and Strip for Use in Bolted and Welded Constructions: ASTM A 572/A 570, A 529, ASTM A 607 with minimum yield strength of 50,000 psi (345 Mpa).

C. Structural Steel Material for Use in Roll Formed or Press Broken Secondary Structural Members: ASTM A 570, or A 607 with minimum yield strength of 55,000 psi (380 Mpa.

D. Galvanized Steel Sheet for Roll Formed or Press Broken Roof and Wall Coverings, Trim and Flashing: ASTM A 653, with minimum yield strength of 50,000 psi (345 Mpa).

E. Galvalume Steel Sheet Used in Roll Formed or Press Broken Roof Covering: Aluminum-zinc alloy-coated steel sheet, ASTM A 792, with minimum yield strength of 50,000 psi (345 Mpa); nominal coating weight of 0.5 oz per sq. ft. (152 kg/sq m) both sides, equivalent to an approximate coating thickness of 0.0018 inch (0.05 mm) both sides.

F. Hot Rolled Steel Shapes: W, M and S shapes, angles, rods, channels and other shapes; ASTM A 572/A 529/A 500 or ASTM A 36 as applicable; with minimum yield strengths required for the design.

G. Structural Bolts and Nuts Used with Primary Framing: High strength, ASTM A 325 or A 490.

H. Bolts and Nuts Used with Secondary Framing Members: ASTM A 307.

I. Shop Coat: Manufacturer's standard rust inhibitive primer paint; manufacturer's standard color.

J. KXL Pre-Painted Finish: 1 mil (0.025 mm) Kynar 500 coating on exterior surface, or approved equal.

1. Color: As selected from manufacturer's full line.

2. Color: Exterior surfaces – Chestnut Brown; roofing – Forest Green.

3. Interior Finish: Off-White 0.5 mil (0.01 mm) washcoat as required by manufacturer.

2.2 FRAMING COMPONENTS:

A. Primary Framing: Rigid Frame (RF Series) solid web framing consisting of tapered or uniform depth rafters rigidly connected to tapered or uniform depth columns. Provide a clear span that supports the loads at bay spacing indicated (20-foot bays,

40-foot span).

B. Endwall Framing: Corner posts, endposts and beams.

C. Endwall Framing: Full frames with endposts, for future expansion.

D. Purlins: Zee-shaped; 6", 8" and 11" depth as required; with minimum yield strength of 55,000 psi; simple span or continuous span as required for design.

E. Girts: Zee- or Cee-shaped; 6", 8" and depth as required, with minimum yield strength of 55,000 psi (345 Mpa); simple span or continuous span as required for design. (Coordinate with in-fill and siding applications.)

F. Transbay Members: Open web, parallel chord, secondary joists; simple span, utilizing materials, sizes and yield strength as required.

G. Wind Bracing: Portal, torsional, diagonal bracing with or without diaphragm in accordance with manufacturer's standard design practices; utilizing rods, angles, and other members, with minimum yield strengths as required for design.

H. Primary Frame Flange Bracing: Attached from purlins or girts to the primary framing, minimum yield strength as required for design.

I. N. Base Angles: 2 inch x 3 inch x 0.059 inch steel angles, with minimum yield strength of 55,000 psi, anchored to the floor slab or grade beam with power driven fasteners or equivalent at a maximum spacing of 2 feet on center and not more than 6 inches from the end of any angle member.

J. Door Headers and Jambs: Zee- or Cee-shaped; depth as required; with minimum yield strength of 55,000 psi.

K. Sag Angles and Bridging: Steel angles, with minimum yield strength of 36,000 psi.

L. Fabrication: Fabricate according to manufacturer's standard practice. 1. Fabricate structural members made of welded plate sections by joining the flanges and webs by continuous automatic submerged arc welding process. 2. All welding operators and processes shall be qualified in accordance with the American Welding Society 'Structural Welding Code', AWS D1.1.3. Field connections. Prepare members for bolted field connections by making punched, drilled, or reamed holes in the shop.

M. Component Identification: Mark all fabricated parts, either individually or by lot or group, using an identification marking corresponding to the marking shown on the shop drawings, using a method that remains visible after shop painting.

N. Shop Coating: Finish all structural steel members using one coat of manufacturer's standard shop coat, after cleaning of oil, dirt, loose scale and foreign matter.

O. Package building components for shipping by common carrier.

2.3 ROOF PANEL COMPONENTS:

A. Roof Panels: SSR Standing Seam Roof Panels; 24 inches wide net coverage, with 3 inches high major ribs formed at the panel side laps, formed for field seaming using electrically operated seaming machine.

1. Side joints: Factory applied sealant for field seaming.

2. Material: Galvalume steel.

3. Thickness: 0.022" design base metal.

4. Thickness: 0.0273 design base metal.

5. Side laps: Two factory-formed interlocking ribs, with one weather sealed joint, mechanically field-seamed into place to form a double-fold 360 degree seam.

6. Length: Continuous from eave to ridge.

7. Endlaps, where required: 7 inches wide, located at a support member.

8. Finish: KXL pre-painted finish, standard color.

9. Panel-to-roof purlin structural attachments: SSR clips with movable tabs which interlock with seamed SSR panel ribs and provide for 1-5/8 inch of panel movement in either direction from center of clip to compensate for thermal effects.

B. Ridge assembly for high end of slopes: SSR ridge; draw-formed aluminum seam caps factory-attached to SSR ridge panels that are mechanically field- seamed together along the center of the ridge, utilizing only one weather sealed joint and providing a true expansion joint for panel movement.

C. Panel Fasteners:

1. For Galvalume and KXL finished PR roof panels: Stainless steel-capped carbon steel fasteners with integral sealing washer.

2. For wall panels: Coated carbon steel.

3. Color of exposed fastener heads to match the wall panel finish.

4. Concealed Fasteners: Self-drilling type of size as required.

5. Provide fasteners in quantities and location as required by the manufacturer.

D. Flashing and Trim: Match material and color of adjacent components. Provide trim at rakes, including peak and corner assemblies, high and low eaves, corners, bases, framed openings and as required or specified to provide weathertightness and a finished appearance. Flashing and trim shall be galvanized steel of not less than 26

gauge.

E. Plastic Parts: Glass fiber reinforced resin or thermoformed ABS (Acrylonitrile-Butidene-Styrene).

1. ABS: Minimum 1/8 inch thick.

2. Color: Manufacturer's standard color.

F. Sealants, Mastics and Closures: Manufacturer standard type.

1. Provide at roof panel endlaps, sidelaps, rake, eave, transitions and accessories as required to provide a weather resistant roof system; use tape mastic or gunnable sealant at sidelaps and endlaps.

2. Provide at wall panel rakes, eaves, transitions and accessories.

3. Closures: Formed to match panel profiles; closed cell elastic material, manufacturer's standard color.

4. Tape Mastic: Pre-formed butyl rubber-based, non-hardening, non-corrosive to metal; white or light gray.

5. Gunnable Sealant: Non-skinning synthetic elastomer.

G. Blanket Insulation: Glass fiber, with factory laminated facing material.

1. Glass fiber: odorless, neutral colored, long filament, flexible resilient, produced in compliance with the NAIMA 202 specifications.

2. Thermal Resistance: R-valves shall be R-19 for roof sections ad R-13 for wall sections.

3. Flame Spread Index: 25 or less, when tested in accordance with UL 723.

4. Smoke Developed Index: 50 or less, when tested in accordance with UL 723.

5. UL Classified.

6. Facing: White vinyl scrim polyester; 0.0025 inch (0.076 mm) thick PVC film, glass fiber scrim reinforcing, 0.0005 inch (0.013 mm) thick polyester film; permeance 0.02 perms (1.1 ng/Pa s sq m). Composite fiberglass and facing to meet flame spread of 25 or less, smoke developed of 50 or less, when tested in accordance with UL 723.

7. Provide facing 3 inches wider on both edges than blanket.

8. Width: As required for installation.

9. Use Blanket insulation at roof and walls.

2.4 ROOF ACCESSORIES:

A. Eave Gutters: Roll-formed 26 gauge (0.45 mm) steel sheet, with gutter straps, fasteners and joint sealant; manufacturer's standard color to match corner building trim.

1. Downspouts: 4 x 5 inches (100 by 125 m) in 10-foot (3050 mm) lengths, with downspout elbows and downspout straps; same color as wall panels.

B. Translucent Roof Panels: Tuf-Lite; UV stabilized thermosetting polyester resin reinforced with chopped and woven roving glass fiber; manufacturer's standard configuration.

1. Color: White, with textured exterior surface and minimum 50 percent light transmittance.

2. Self-Ignition Temperature: 650 degrees F. (343 deg C) or greater, when tested in accordance with ASTM D 1929.

3. Smoke Density Index: 450 or less, when tested in accordance with ASTM E 84, or 75 or less, when tested in accordance with ASTM D 2843.

4. Extent of Burning: One inch (25.4 mm) or less, when tested in accordance with ASTM D 635.

5. Rate of Burning: 2.5 inches (64 mm) per minute or less, when tested in accordance with ASTM D 635. Condensation Control Pan: Bonded to interior surface. Optional UL 90 rating is available.

C. Ridge Ventilators: 10 feet (3050 mm) long, 26 gauge (0.45 mm) Galvalume, with damper with chain and worm gear operator and bird screen, and base configured to match roof panel.

1. Throat Opening: 9 inches (229 mm).

2. Throat Opening: 12 inches (305 mm).

3. Connect individual vents to form continuous ridge vent with one operator for each 5 vents.

PART 3 – EXECUTION

3.1 EXAMINATION:

A. Verify that foundations are installed correctly.

B. Verify that anchor bolts are installed as indicated on anchor bolt shop drawings.

3.2 ERECTION:

A. Erect building system in accordance with manufacturer's instructions, erection drawings, and other erection documents.

B. Provide temporary bracing, shoring, blocking, bridging and securing of components as required during the erection process.

PART 4 – MEASUREMENT AND PAYMENT

4.1 PAYMENT:

A. Payment shall be included in the Bid Schedule under '60x40 Engine Bay' and '20x30 Office Addition', and includes all design, materials and labor associated with the completed, operational system.

END OF SECTION

SECTION 15500
HEATING VENTING AND AIR CONDITIONING

PART 1 GENERAL

1.1 DESCRIPTION: The work under this section consist of providing all labor and material and equipment necessary for the installation of a complete and operable Heating, Ventilation and Air Conditioning systems as shown on the drawings or specified in this Section. Provide any incidental work and materials not shown or specified to complete the project. Work includes but is not limited to the following:

A. Installation of a Unit Heaters in Bay 1 and 2.

B. Installation HVAC system in the Office and Conference room.

C. Installation of Gas piping system.

1.2 CODES AND STANDARDS: Work performed under this section shall meet the requirements of the following:

A. International Mechanical Code, 2018

B. International Plumbing Code, 2018

C. International Building Code, 2018

D. National Electric Code, 2017

E. National Fire Protection Association (NFPA)

F. Underwriters Laboratories (UL)

1.03 DEFINITIONS:

A. "Approved" and "Approval" means approval of the Contracting Officer.

B. "Listed" and "Listing" as defined by the International Mechanical Code (IMC).

C. "Provide" means furnish and install completely.

1.3 LICENSED CONTRACTOR: All work performed under this Section shall be performed by a licensed mechanical contractor. Prior to commencing work, the Contractor shall present a photostatic copy of his current license to the Contracting Officer.

1.4 RELATED SECTIONS:

A. Section 01300: Submittals

B. Section 16010: General Provisions Electrical

1.6 SUBMITTALS: The contractor shall submit to the Contracting Officer for approval three (3) copies of submittals and/or shop drawings for all specified materials within thirty days after award of the contract. The Contractor shall furnish catalog data, descriptive literature, manufacturer's drawings, owner's manuals and operation manuals for all materials and equipment installed. Products not specifically identified by brand name in these specifications require approval.

1.7 COORDINATION WITH OTHERS: The Contractor shall check work under this Division for interference with work under other divisions and shall cooperate in making relocations so as to avoid all such interferences The Contractor shall organize his work schedule to coincide with the work schedule of other Divisions so that all work may proceed as expeditiously as possible. If the Contractor substitutes any equipment for specified equipment, The Contractor shall be responsible for coordination between trades to insure compatibility with or between substituted items and existing, specified, or otherwise provided. Alternations required to achieve compatibility with or between substituted items, shall be accomplished without sacrifice of performance and at no additional cost to the Government.

1.8 DRAWINGS:

A. Intent and Limitations: The mechanical drawings are diagrammatic and indicate only the general character, approximate location, and extent of the work. Mechanical drawings do not attempt to show details of building construction which may affect the mechanical work. Examine architectural, structural, and electrical drawings to find how mechanical work may be affected. Install materials and equipment to conform to the available space while maintaining accessibility, clearances, and the requirements of the governing codes. Do not scale measurements from mechanical drawings

B. Actual Equipment and/or Substitutions: The drawings and layout may not necessarily suit the requirements of the particular manufacturer's equipment installed. Modify wiring, plumbing, ducting, and location as required to install the equipment properly. Submit shop drawings and performance calculations for approval prior to installation.

C. As-Built Drawings: Verify all changes from contract drawings in equipment locations or other pertinent information with the Contracting Officer. Record all changes on a set of drawings. Show the depth and dimensioned locations of concealed piping and utilities, including all control and shut-off devices, and all cleanouts. These as-built drawings shall be kept on the construction site throughout the construction period. They shall be updated with changes and approved by the Contracting Officer on a weekly basis before any progress pay estimates will be processed. At the conclusion of construction and before the final inspection, the Contractor shall furnish one clean, redrawn copy and the in-progress copy of the as-built drawings to the Contracting Officer.

PART 2 PRODUCTS

2.1 UNIT HEATERS:

A. Unit heaters shall be fan type, Energy saving gas fired, 60,000 or 75,000 BTU Input (see drawings sheet 18) and designed for suspension mounting. Thermal efficiency shall be 80% minimum by Dayton or approved equal. Features/accessories shall include:

1. Intermittent spark ignition.
2. 24 volt control with transformer, fan and limit controls, fan relay, and terminal strip.
3. Four-point suspension kit.
4. Electronic programmable thermostat, White-Rodgers 1F80-361 or approved equal.

2.2 FURNACES:

A. Furnace shall be high efficiency, condensing type, horizontal flow, gas fired with 92 percent A.F.U.E. rating efficiency of the furnace shall be achieved through a combination of electronic ignition system, 100 percent sealed combustion with direct vent utilizing 100 percent outdoor air. The design shall allow for the use of PVC pipe for venting. The condensate trap shall be installed outside the furnace cabinet with a separate drain connection. Any portion of the cabinet in contact with the circulating air stream shall be factory lined with sound/thermal insulation. The cabinet shall be constructed of galvanized steel with a baked enamel or powder coated finish. The furnace shall be supplied with filter, vent and intake roof termination kit, horizontal support frame kit, thermostat and control tab, evaporator coil tab and condensing unit tab, and diagnostic module. Furnace shall be Rheem model R92PA0601317MSA, 56,000 BTUH input with electronic programmable thermostat furnished by equipment manufacturer.

2.3 CASED EVAPORATOR COILS:

A. Cooling coils shall be factory matched to condensing units with published ARI ratings. Coils shall be copper tubes and aluminum fins, and designed for use with thermal expansion valve metering devices. Cabinets shall be factory assembled with ½" minimum fiberglass lining and a baked enamel coating over galvanized steel. Drain pan shall be constructed of non- corrosive materials with primary and secondary drain connections. All refrigerant and drain line connections shall be external to the cabinet allowing removal of cabinet inspection panel(s) without disturbing connections.

2.4 CONDENSING UNITS:

A. Condensing unit/cooling coil combinations shall be factory matched system, expansion valve combinations. ARI ratings; cooling capacity 23,800 BTUH, 14SEER.

B. Compressors shall be compliant scroll type with inherent overload and overcurrent protection, discharge muffler (or sound hood), and mounted in a separate insulated compartment, accessible through a removable side access panel.

C. Condenser coils shall be high-efficient outdoor coil, copper tube/enhanced fin coil.

D. Fan motors shall be quiet direct-drive, permanently lubricated, inherently protected, totally enclosed, and arranged for vertical discharge.

E. Refrigerant shall be R-410A.

F. The refrigerant circuit shall include brass service valves and gauge ports, high and low pressure switches, liquid line moisture indicator/sight glass, and filter drier.

G. The cabinet shall be constructed from galvanized steel with a baked-on enamel finish (powder paint). All wiring connections, controls, and compressor(s) shall be accessed through a single, side access panel.

H. Condensing Unit shall be Rheem RA1424WJ1NA (or approved equal) with expansion valve as recommended by manufacturer. Accessories shall be furnished by the equipment manufacturer. Accessories shall include thermal expansion valve, high and low pressure switches, and crankcase heater, high capacity dryer, thermostat control tab.

2.1 GAS VENTS:

A. Category I Appliances: The entire vent assembly including all fittings, supports, and accessories shall be a UL listed, Type B double wall gas vent assembly in compliance with UL Standard 441, and compatible with the appliance manufacturer's recommendations. No single wall vent or vent connector shall be used. Each component shall be of the same manufacturer, and shall bear the UL label. None of the components or accessories shall be fabricated unless expressly allowed in the vent manufacturer's instructions. Components include connectors, elbows, supports, roof flashing, caps and collars.

B. Direct Vent & Category IV appliances: All vent materials, wall penetrations, and terminal devices shall be as supplied or required by the appliance manufacturer for a listed assembly. Field fabricated components shall not be used. Where options exist for plastic piping materials, use schedule 40 PVC, if listed for use. Where options exist for either interior or exterior combustion air, use exterior combustion air. Combination intake and vent terminations shall be used unless otherwise shown.

2.2 DUCTWORK:

A. All ductwork/insulation systems materials and construction shall conform to NFPA 90A and 90B, and Underwriter's Laboratories Standard for Safety, Air Ducts – UL 181, Class 1 with the following fire hazard classification:

Flame Spread: not over 25 Fuel
Contributed: not over 50 Smoke
Developed: not over 50

B. Sheet metal: Sheet metal shall comply with ASTM A-525 with 1-1/4 ounce coating and shall bear the stamp of the manufacturer. Minimum thickness shall be 26 ga. including all elbows and fittings. All ductwork shall be constructed in accordance with the building code standards as contained in SMACNA "HVAC Duct Construction Standards, Metal and Flexible", latest edition. Pressure class shall be 1" unless shown otherwise. A copy of this manual shall be kept at the jobsite whenever work is in progress.
C. Contractor shall use vibration insolation mounting devices Neoprene by Ductmate or approved equal.

2.3 DUCT LINER:

A. Duct liner shall be 1-inch thick, 1-1/2 to 2 pound density fiberglass duct liner rated for velocities up to 5000 feet per minute. Maximum air friction correction factor shall be 1.1 at 2000 feet per minute velocity. Thermal conductance shall not exceed 0.25 BTU-inch/hour-square foot-degree Fahrenheit (F) at 75 degrees F mean temperature (1 inch thickness). Minimum noise reduction coefficient (NRC) shall be 0.70 when tested in a Type "A" mounting in accordance with ASTM C-423 (1 inch thickness). The airstream side and the edges shall be impregnated with an acrylic polymer, which will not support microbial growth when tested in accordance with ASTM G21 and G22. Duct liner shall be Manville Permacote Linacoustic with factory-applied edge coating. Field applied edge treatment shall be Manville Super Seal edge coating.

2.4 EXTERIOR DUCT INSULATION:

A. Exterior duct insulation shall be 2-inch thick, foil-scrim-kraft (FSK) faced, 0.6 pound minimum density fiberglass with a K factory not exceeding 0.30 BTU-inch/hour-square foot-degree F at 75 degrees F mean temperature. Exterior duct insulation shall be Manville R-Series Microlite.

2.5 FLEXIBLE DUCT:

A. Flexible duct shall be Class 1 Air Duct, insulated round with vapor barrier designed for low to medium operating pressures and constructed as follows:

1. Metalized jacket.
2. Air-tight inner core with high carbon steel wire helix encapsulated inside double-ply metalized/polyester core.
3. Fiberglass insulating blanket.
4. UL Listed and 181 approved, NEPA 90A and 90B,Tesred in accordance with ADC FD 72-R1.

B. Minimum ratings shall be as follows:

Maximum velocity:	4000 FPM
Service temperature:	250 degrees F (max)
Positive pressure:	6 in. wg. through 12" dia. 4 in. wg. over 12" dia.
Negative pressure:	¾ in. wg.
Vapor transmission:	0.04 perms
Thermal resistance:	R-6.0 for ducts located within the building's thermal envelope, R-8 for ducts located outside the building's thermal envelope.

C. Flexible duct shall be Hart & Cooley F294 Series or approved equal.

2.6 ADHESIVES, TAPES, AND CLOSURE SYSTEMS:

A. Adhesives, tapes, and closure systems shall be approved by the duct system manufacturer, SMACNA listed, and certified for use in a UL-181, Class 1 duct system. Tape all joints in sheet metal ductwork with fire resistant adhesive activated Hardcast tape system: DT tape and FTA-20 adhesive; use RTA-50 where exposed to the weather or approved equal. Joints in exposed round ductwork shall be substantially airtight using fittings as shown on the drawings. Use Hardcast Galva-Grip mastic between mating surfaces of joints. Wipe excess mastic from exposed surface of assembled joint. Allow 72 hours cure time before startup. Paint exposed duct with latex or other compatible finish.

2.7 FLEXIBLE FABRIC:

A. Flexible fabric used for connections to air handlers shall have an NFPA flame spread rating less than 25 and shall carry the label "incombustible". Flexible fabric shall be neoprene coated Ventglas (by Ventfabrics) or equal. Use #655 adhesive to seal longitudinal joints. For connections with electric resistance heaters, use high temperature, silicone coated Ventsil (or Thermafab by Duro Dyne). Use hardcast type/adhesive system to seal joints with ductwork.

2.8 BALANCING DAMPERS:

A. Butterfly balancing dampers shall be commercial grade with minimum 24 gauge sleeve and blade. Damper sleeve shall have rolled in stiffening beads at both ends. Regulator shall be locking, lever type. End bearings shall be sealed. Dampers shall be designed for flexible insulated duct.

2.9 DIFFUSERS AND GRILLES:

A. Diffusers and grilles shall be commercial grade, aluminum construction, surface mount with removable core. Diffusers shall be of one manufacturer, and shall have certified, published performance data. Finish shall be factory applied satin anodized unless noted otherwise. Models specified are by Hart & Cooley, ARE Series.

B. Return air grilles shall be aluminum construction with square core design, grid core ½ x ½ x ½ inch. Models specified are by Hart & Cooley RE5 Series.

2.10 FILTERS

A. Filters shall be the furnace manufacturer’s accessory, 1-inch thick washable media in an aluminum frame, and sized to fit in the accessory side return air filter rack. Provide one extra, spare filter so that a clean filter is always available for installation.

PART 3 EXECUTION

3.1 MANUFACTURER’S RECOMMENDATIONS: Where applicable, all materials, equipment, devices and appurtenances shall be installed in accordance with the recommendations of the manufacturer of the particular item. The Contractor shall have on hand all installation manuals, brochures, and procedures for the equipment and materials concerned. The Contractor shall be held responsible for all installations contrary to the manufacturer's recommendations. Any proposed deviation shall be first certified in writing by the particular manufacturer as being in accordance with their recommendations. If any item of equipment or material is found to be installed not in accordance with the manufacturer's recommendation, all necessary changes and revision to achieve such compliance shall be made by the Contractor at no additional cost to the Government.

3.02 MECHANICAL REQUIREMENTS:

A. The assembly and installation of all electrical components (including packagedfactory assemblies) furnished with or as a part of Mechanical, Division 15, is covered under that Division, and electrically shall meet the requirements of this Division and the applicable provisions of the National Electrical Code.

B. Complete mechanical and electrical systems are required. In general, Division 15 of the specifications includes heating, ventilating, and air conditioning equipment and controls.

C. Furnish and install disconnect switchs, starters fuse holders, similar devices and their enclosures, all line side conductors and raceways and line side terminations at the disconnect switches or similar devices. Including all line voltage control wiring that is part of mechanical equipment controls.

3.3 INTENT AND LAYOUT:

A. The Drawings and Specification indicate or show the intent of the work required. It is intended that the work shall be complete in all respects. Division 15 shall be responsible for complete and properly operating HVAC System.

B. The layout, which shall include all approved materials to be used on the job, shall be checked for interferences with work of other trades before installation. If discrepancies are found, report them immediately to the Contracting Officer for adjustment, or the Contractor will be held responsible for removal and correction of work done in error.

C. Should any other openings or space be found necessary under this Division they shall be arranged for with other workmen and Divisions, and in proper time to prevent unnecessary cutting.

3.4 GENERAL:

A. Permanently mount and completely install all equipment in strict compliance with the manufacturer's installation instructions, terms of listing, drawings, and specifications herein, including all codes and standards incorporated by reference. Where instructions differ, the most stringent and restrictive alternative shall apply, and the Contracting Officer shall be notified of the discrepancy before proceeding with the work. Install equipment so that all parts are easily accessible for inspection, operations, maintenance and repair; align, level, and adjust for satisfactory operation. Lubricate equipment properly before being put into service.

3.5 PIPING:

A. General: Layout concealed piping to run the shortest distance. Layout exposed piping to run parallel or perpendicular to framing members or building lines. Suspend overhead piping using commercially available hangers or fasten to the building structure with approved supports in compliance with "Guidelines For Seismic Restraint of Mechanical Systems & Plumbing Piping Systems" as published by SMACNA, and as shown on the drawings. Plumbers tape or other similar field fabricated supports are not acceptable. Use inserts in all pipe clamps to isolate nonferrous piping from ferrous supports. Conceal all piping where possible.

C. Gas Piping/Appliance Connections: Install gas supply piping and connections according to the appliance manufacturer's installation instructions, including shut-off valve, flexible connector, ground joint union, and dripleg. Flexible gas connectors shall not be run through appliance cabinets; use rigid piping from the appliance gas valve to the cabinet exterior, then install the flexible connector. In locations where the flexible connector is subject to damage, use rigid piping through the appliance cabinet, and install the flexible connector inside the cabinet.

D. Refrigeration piping: Size and install refrigerant piping according to the manufacturer's recommendations. Increase line sizes and add accessories as required for long line applications. Use rigid copper tubing, minimum type ACR, with long radius elbows; or approved soft ACR tubing. Run lines horizontally or slope continuously back to condensing units with no low spots. Use traps at the bottom of all suction line risers. Cap the ends of all lines when work is not in progress. Brazing material shall be high temperature (melting point above 800 degrees F) silver bearing material with low phosphorus content such as Stay-silv or Silfos. Use nitrogen sweep during all brazing to avoid oxidation. Remove any remaining flux or slag from lines after brazing. Support exterior lines with unistrut at 3- foot maximum intervals. Insulate suction lines with minimum ½-inch wall thickness closed cell foam insulation or equal. Insulate any sections of liquid line exposed to direct sunlight when the exposed length exceeds 6 feet. Use sheet metal sleeves between the insulation and pipe supports for all

insulated lines inside the building (insulation is continuous). Glue and/or tape the joints in the insulation according to the manufacturer's recommendations, and paint exterior insulation exposed to the sunlight.

E. Drain Lines: Cooling coil condensate drain lines shall be copper; furnace condensate drain lines shall be schedule 40 PVC. If common drain lines are used, use air gap style connections of individual drain lines to the common drain line. Common drain lines serving condensing appliances must be schedule 40 PVC. Route to indirect waste receptors. Drain lines shall not discharge under a building. Do not route any drain lines in front of appliance or coil access panels. Drain line connections to cooling coils shall be trapped with final connections made by flexible hose and clamps. Cooling coil drain lines routed through conditioned space or through spaces subject to damage from condensate shall be insulated to prevent condensation. Protect drain lines from freezing, including insulation where lines are exposed to freezing temperatures. Support PVC drain lines every 4 feet to prevent sagging.

3.6 PROTECTION:

A. All equipment, components and duct systems shall be covered, capped or otherwise protected from dirt, dust, and other contamination during the construction process. Before final acceptance, all equipment and duct systems will be inspected for cleanliness. The Contractor shall perform any work required to provide a clean system as required, and at no additional cost to the Government.

3.7 GAS FIRED HEATING APPLIANCES:

A. The location for the appliances is shown on the drawings; insure 30–inch minimum working clearance in front of all appliances. Install in accordance with the manufacturer's instructions and procedures to minimize any vibration transmitted during operation. Use vibration isolation mounting devices sized for the point loads. Install flexible duct connectors on all duct connections to appliances.

3.7 UNIT HEATERS:

A. Install unit heaters in strict compliance with the manufacturer's instructions. Maintain required clearances to combustibles; maintain at least 30 inches service clearance at the rear of the unit. Install double wall, type B gas vent through and above the roof. Minimum total vent height shall be 5 feet; minimum height above the roof shall be 2 feet. Install a minimum of 12 inches of straight vent pipe from the power venter before installing an elbow. Use a listed single to double wall connector at the junction of the vent connector to the vent pipe. Install a fusestat and fuse on the power connection. Measure the control circuit amperage draw and set the thermostat heat anticipator.

3.8 GAS VENTS

A. General: Submit the proposed location and vent termination for all gas vents for approval prior to installation. Support vent piping at all elbows and at 5-foot maximum centers using manufactured supports; plumber's tape and similar

materials are not acceptable. Provide lateral support required to resist wind and snow loads. Brace back vent terminations above the roof as required. On buildings with metal roofs, solder the roof jack flashing to the roofing material all around.

B. Category I Appliance Vents: Install gas vent systems according to the manufacturer's recommendations and terms of listing. Minimum vent height shall be 5 feet unless otherwise directed by the appliance manufacturer. Provide firestops at all ceiling and floor penetrations. Provide sheet metal insulation shields at penetrations of insulated building assemblies and above insulated ceilings.

C. Category IV Appliance Intake/Vents: Use termination kits supplied or specified by the manufacturer. Orient and group multiple inlets and outlets for proper separation with no cross flow to the inlets. If the expected snow depth exceeds the height of the intake openings on the roof termination kit, disassemble the kit as required and add piping to extend the termination above the snow line; brace back as required; verify with the Contracting Officer before installation. Vent piping routed through unheated spaces shall be insulated with minimum ½-inch Armaflex, or approved equal, pipe insulation as required by the manufacturer. Install in strict compliance with the manufacturer's recommendations, including adequate slope, support, and insulation.

3.10 CONDENSING UNITS:

A. Maintain clearances all around condensing units as shown on the drawings and in the manufacturer's requirements. If concrete pad dimensions are not shown on the drawings, pads shall be at least 3 inches larger than the condensing unit base dimensions. The top surface of the pad shall be at least 3 inches above the adjacent finished grade. Anchor condensing units to slabs.

B. Power and control wiring to condensing units shall be routed in separate conduits. Support conduit exposed above slabs at all corners and at 3-foot maximum intervals. Make final connections to condensing units with sealtight flex and 90 degree angle connectors at the unit.

C. Charge the systems according to the manufacturer's specifications, including any oil required for long line or receiver applications. Record the current date and the total system charge on the test report and on the equipment cabinet for each refrigerant system.

3.11 FLEXIBLE DUCT:

A. Flexible duct is allowed for all runs in the attic from the supply plenum and return air can to the differes and grilles. It shall be the minimum length necessary to provide direct connection to terminal devices with continuous sweeping turns and configurations. The minimum allowable radius of bend/diameter ratio shall be 1.5. Use sheet metal elbows with exterior duct insulation for sharper turns in tight locations. Support at all joints, connections, and at a maximum 4-foot spacing along suspended sections with a minimum 1-1/2 inch wide galvanized

steel strap, free from burrs, or by other approved methods.

B. Provide insulation for ductwork with a minimum R value of 6.0.

C. Connections to sheet metal boots, fittings, or individual lengths shall utilize one of the following closure systems. Field cut, in-line joints shall be avoided wherever possible; however, a 24 gauge galvanized sheet metal sleeve may be used with either system.

1. Roll beads on all sheet metal ends. Fasten the core behind the bead with approved banding; seal the core with listed hardcast tape system. Pull insulation and vapor barrier jacket over the connection, and seal with listed duct tape.

2. For connections without sheet metal beads, fasten the core with approved banding. Install at least two sheet metal screws, either directly through or downstream of the bands; ducts over 10-inch diameter require at least 3 screws, and ducts over 14-inch diameter require at least 4 screws. Seal the core and the screw heads with listed hardcast tape system. Pull insulation and vapor barrier jacket over the connection, and seal with listed duct tape.

3.12 DUCTWORK:

A. In addition to compliance with the codes and standards specified previously, the installation of all ductwork shall conform to applicable SMACNA Standards for the installation of sheet metal, fibrous glass, and flexible duct respectively. Unless specifically shown otherwise, all ductwork may be flexible duct; UL-181 Class 1 duct system.

B. Unless otherwise specified, all ductwork shall be supported in compliance with the duct manufacturer’s recommendations and SMACNA Low Pressure Duct Construction Standards; use Tables 4-1 & 4-2 for hanger sizing and spacing. Maintain SMACNA manuals on the job for reference by workmen and the Contracting Officer.

C. Install ducts in straight lines parallel or perpendicular to building lines unless shown otherwise. Support ducts according to the standards above to provide a rigid assembly. Make slip joints in the direction of flow.

D. Plenums to furnace and cooling coil shall be the full size of duct flanges or cabinet openings. Use sheet metal nosing on the leading edges of ductliner between the duct and the flange. Install sealing strips between the furnace cabinets and the return air plenum/ducts below. Seal all plenum to cabinet, and cabinet to cabinet connections with hardcast all around.

E. Connections to furnaces, fans, and vibrating equipment shall be made by a minimum 3-inch flexible fabric connector. Provide for up to 1 inch of motion in all axis.

F. Install branch duct balancing dampers at all wyes or plenum take-offs as required to reduce noise transmission to the space. Use concealed regulators where dampers are located above gypsum board ceilings and inaccessible from

above; brace damper and duct securely to prevent horizontal or vertical movement. Provide blocking or other support to secure concealed regulators flush with the finished ceiling surface.

G. All boots, boxes and cans shall be supported on a minimum of two sides (opposite sides) by blocking or other approved methods. Where grilles have mounting screws on all four sides, blocking shall be provided on all four sides. Rectangular cans/boxes with round side inlet collars are only allowed on return air or exhaust systems; all other diffuser and grille cans/boxes shall have radius elbows above. Where space limitations require square throat, radius heel elbows, install turning vanes; angle boots may be allowed in some locations with prior approval. Paint the inside of all unlined diffuser and grille cans flat black.

H. Prevent damage to ducts and keep sealed during construction. Remove all construction debris and repair or replace any damaged insulation and vapor barrier. The entire duct system shall be in a new, shop-built, clean condition at the time of final inspection and project acceptance.

3.13 DUCT INSULATION:

A. General: Unless specifically shown otherwise, all ductwork shall be insulated, including supply, return, outdoor air, and exhaust ductwork.

3.14 CONTROLS:

A. All control wiring shall be color-coded; number tape redundant colors used in any enclosure. Components mounted in normally accessible areas of the building shall be mounted in recessed metal boxes. Thermostats and related controls in areas accessible to persons with disabilities shall be mounted at 54-inch height. Seal all holes behind thermostats to prevent drafts from affecting the thermostats.

B. Controls shall be installed and tested according to the manufacturer's installation instructions and these specifications. Demonstrate operation of all user controls and complete automatic control system(s) to the Contracting Officer.

3.15 BALANCING AND ADJUSTMENT:

A. Adjust diffuser pattern deflectors and vanes for patterns and orientations shown on the drawings. Adjust balancing dampers and balance airflows to provide airflows as shown on thr drawings.

3.16 TESTING:

A .Provide operational testing in the presence of the Contracting Officer of all equipment installed under this section. Before requesting a final inspection, all balancing reports, testing reports, and operation and maintenance manuals must be submitted for approval; all operational demonstrations must be completed and all as-built wiring and control diagrams must be completed and posted as required.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Payment shall be included in the bid schedule under ‘60 x 40 Engine Bay and 20 x 30 Office Addition’. No separate measurement and payment shall be made.

END OF SECTION

SECTION 16010
ELECTRICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.1 DESCRIPTION: The work under this section includes all labor and material necessary for the installation of complete electrical system AS SHOWN ON THE DRAWINGS, and described in this section of the specifications. In general the work includes, but is not limited to the following:

A. Installation of a complete building wiring and lighting system.

B. Installation of telephone, data and radio outlets and conduit sleeves.

C. Installation of meter/main service panel and interior distribution panels.

D. Installation of underground electrical and telephone service laterals to serving utility pole.

1.2 CODES AND STANDARDS: Work performed under this section shall meet the requirements of the following:

A. National Electric Code, 2017 Edition.

B. Underwriters Laboratories (UL).

C. National Electrical Manufacturer's Association (NEMA).

1.3 LICENSED CONTRACTOR: All work performed under this Section shall be performed by a licensed electrical contractor. Prior to commencing work, the Contractor shall present a photostatic copy of his current license to the Contracting Officer.

PART 2 - PRODUCTS

2.1 MATERIALS: Electrical materials shall be new and have the approval of Underwriters Laboratories, or other nationally recognized and approved testing facility, whenever applicable standards have been established by the facility. Where two or more identical items, assemblies or pieces of equipment are required, they shall be by the same manufacturer.

2.2 STANDARD PRODUCTS: All materials to be furnished under this Division shall be the standard products of companies regularly engaged in the manufacture and production of such equipment equal to or superior to the material specified and shall be the manufacturer's latest design that complies with the Specification requirements.

2.3 APPROVAL AND SUBSTITUTION OF MATERIALS:

A. All materials required for this Division shall be specifically approved in accordance with General Conditions. Equipment and materials listed or designated herein or ON THE DRAWINGS show the intent of arrangement, quality, accuracy, range, and action required. Where manufacturers' names and models are shown, it is for purposes of showing intent only. Equipment and materials which are equal in all respects will be accepted when approved by the Contracting Officer.

B. If a substitute item is submitted and approved it shall be the responsibility of the Contractor to verify the substituted item is compatible with other Divisions and to provide all design modifications or other changes due to the substitutions.

2.4 SUBMITTALS: The Contractor shall submit to the Contracting Officer for approval five copies of submittals and/or shop drawings for all specified materials within thirty (30) days after the award of the contract. The Contractor shall furnish catalog data, descriptive literature, manufacturer's drawings, owner's manuals and operation manuals for all materials and equipment installed. Products not specifically identified by brand name in these Specifications require approval.

PART 3 - EXECUTION

3.1 MANUFACTURER'S RECOMMENDATIONS: Where applicable, all materials, equipment, devices and appurtenances shall be installed in accordance with the recommendations of the manufacturer of the particular item. The Contractor shall have on hand all installation manuals, brochures, and procedures for the equipment and materials concerned. The Contractor shall be held responsible for all installations contrary to the manufacturer's recommendations. Any proposed deviation shall be first certified in writing by the particular manufacturer as being in accordance with their recommendations. If any item of equipment or material is found to be installed not in accordance with the manufacturer's recommendation, all necessary changes and revision to achieve such compliance shall be made by the Contractor at no additional cost to the Government.

3.2 MECHANICAL REQUIREMENTS:

A. The assembly and installation of all electrical components (including packaged factory assemblies) furnished with or as a part of Mechanical, Division 15, is covered under that Division, and electrically shall meet the requirements of this Division and the applicable provisions of the National Electrical Code.

B. Complete mechanical and electrical systems are required. In general, Division 15 of the specifications includes heating, ventilating, and air conditioning equipment and controls.

C. Wiring diagrams shall be submitted for approval for each factory assembled or packaged system provided under this Division.

D. It shall be the responsibility of the Division 16 Contractor to coordinate his work with Division 15 work.

3.3 INTENT AND LAYOUT:

A. The Drawings and Specification indicate or show the intent of the work required. It is intended that the work shall be complete in all respects. Division 16 shall be responsible for complete and properly operating electrical, electrically operated, and electrically controlled equipment and systems, with the exception of Division 15 equipment and control systems.

B. The layout of lighting fixtures SHOWN ON THE DRAWINGS is generally diagrammatic unless specifically dimensioned. Surface mounted or recessed fixtures generally indicated in the center of the room or area, and not specifically dimensioned, shall be installed in the center of the room.

C. The layout of panels, receptacles, switches, and similar equipment, not specifically dimensioned, shall be installed with reference to adjacent architectural features, such as: an outlet is indicated adjacent to a window but not under the window, the outlet shall be installed adjacent to the window in the first available stud space; or a panel is indicated to be installed just past the door swing when open, then the panel shall be installed in the stud space past the door width, as indicated on the door schedule in the Architectural Drawings, from the hinged side of the door..

D. The layout, which shall include all approved materials to be used on the job, shall be checked for interferences with work of other trades before installation. If discrepancies are found, report them immediately to the Contracting Officer for adjustment, or the Contractor will be held responsible for removal and correction of work done in error.

E. All dimensions of doors, partitions, ceiling grids, etc., for the location of electrical work and equipment shall be taken from the Architectural Drawings.

F. The building design provides space in the construction of the building to install the electrical work. Keep all electrical work concealed within wall, ceiling or furring lines established on the Architectural Drawings unless work is shown exposed or surface mounted.

G. Should any other openings or space be found necessary under this Division they shall be arranged for with other workmen and Divisions, and in proper time to prevent unnecessary cutting. Do all cutting and excavation necessary in connection with the electrical work and make all repairs and back-filling in a manner satisfactory to the Contracting Officer.

3.4 COOPERATION WITH OTHERS: The Contractor shall check work under this Division for interference with work under other divisions and shall cooperate in making relocations so as to avoid all such interferences The Contractor shall organize his work schedule to coincide with the work schedule of other Divisions so that all work may proceed as expeditiously as possible.

3.5 UTILITY COMPANY REPRESENTATIVES: The Contractor shall coordinate all work involving utility company raceways and equipment with the utility company involved.

3.6 CLOSING OF UNINSPECTED WORK: The Contractor shall not allow or cause any of his work to be covered up or enclosed until notice has been given to the Contracting

Officer requesting an inspection, and the work has been inspected and approved by the Contracting Officer. Should any of the work be enclosed or covered up prior to inspection and/or testing, the contractor shall, at his expense, uncover the work. After the work has been tested, inspected and approved, the Contractor shall, at his expense, make all repairs necessary to restore all work disturbed by him to its original and proper condition.

3.7 PROTECTION OF WORK: Until final acceptance of the work, the Contractor shall protect all materials from damage, and shall provide adequate and proper storage facilities.

A. Storage: All panels, circuit breakers, light fixtures, lamps, switches, receptacles, boxes and similar equipment shall be stored inside in a covered and enclosed area, not subject to weather. Only conduit may be stored outside, but shall be kept covered at all times. If any of the items indicated above to be stored inside are found stored outside, the material in question may be rejected and upon rejection shall be removed from the job site at the end of the work day, and shall not be returned to the job.

B. Material or work in place: The Contractor shall protect all electrical equipment or material installed in place from damage, dirt or debris. Raceways shall be kept clean with ends sealed until terminated in boxes or panel enclosures. Below grade raceways shall be sealed as soon as the raceway is in place, and again after pull lines, ropes or conductors are installed. See Section 16050 for additional requirements. Panels shall have dead fronts installed after the installation of circuit breakers.

C. The Contractor shall replace all damaged or defective work, material and equipment before final acceptance.

3.7 DEMONSTRATION OF A COMPLETE ELECTRICAL SYSTEM: After all electrical systems are completed, the Contractor shall conduct an operational test for approval in the presence of the Contracting Officer to demonstrate that all equipment, fixtures and appurtenances are properly installed and operating.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Payment shall be included in the bid schedule under ‘Electrical Service’ and ‘Electrical Distribution’. No separate measurement and payment shall be made.

END OF SECTION

SECTION 16050
BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 DESCRIPTION: The work to be performed under this Section consists of furnishing and installing all materials, equipment, conductors, conduits, boxes, devices, etc. including all fittings and fasteners AS SHOWN ON THE DRAWINGS or specified in this Specification. The work shall include but not be limited to the following items:

A. Installation of conduit/raceway systems.

B. Installation of power cables and conductors.

C. Installation of building outlet, junction, device and pull boxes.

D. Installation of switches, receptacles, etc. complete with cover plates.

E. Installation of radio, telephone and data outlets, raceways and boxes.

F. Installation of electrical and telephone underground service laterals.

G. Installation of radio, telephone and data wiring.

H. Testing of equipment.

I. Provide system grounding to standards of NEC article 250.

PART 2 - PRODUCTS

2.1 CONDUIT: Conduit shall be one of the types listed below, AS SHOWN ON THE DRAWINGS or as specified herein.

A. Galvanized Rigid Metal Conduit (RMC)
B. Electrical Metallic Tubing (EMT)
C. Rigid Non-Metallic Conduit (PVC) Schedule 40 or 80
D. Liquidtight Flexible Conduit
E. Flexible Metal Conduit
F. Electrical Non-Metallic Tubing (ENT) meeting the requirements of NEMA TC-13.

2.02 CONDUIT FITTINGS:

A. Rigid Steel Conduit: All fittings, locknuts, bushings, condulets, and conduit bodies used with RMC shall be steel.

B. Electrical Metallic Tubing: Fittings used on building exterior conduits shall be raintight, compression type fittings. Fittings used on building interiors may be set-screw type. Fittings 1 1/4 inch and larger shall be insulated throat type or have

insulating bushings installed at all terminations.

C. Non-Metallic Rigid Conduit: Fittings shall be solvent weld type and of the same manufacturer as the conduit.

D. Liquidtight Flexible Conduit: Fittings shall be steel and shall be straight, 45 degree or 90 degree AS SHOWN ON THE DRAWINGS or as specified in these specifications.

E. Flexible Metal Conduit: Fittings shall be Thomas & Betts “Tite-Bite” type with mechanical screw connection for raceways 1 inch and larger. Set Screw cast zinc connectors will only be allowed on 1/2 inch and 3/4 inch raceways.

F. Electrical Non-Metallic Tubing: Fittings for use with ENT shall be manufactured for use with ENT and be of the same manufacturer as the conduit.

G. “MC” Metal Clad cable connectors shall be Thomas & Betts “Tite-Bite” set screw type.

2.3 ELBOWS/SWEEPS: Elbows or sweeps for use with conduit shall be as follows:

A. Rigid steel conduit and EMT may be field bent up to 1 inch trade size. For trade sizes 1 1/4 inch and larger, factory elbows or sweeps shall be used.

B. Rigid non-metallic conduit may be field bent using a "hot-box" where non-standard bends are required. Where standard elbows or sweeps are manufactured, then factory manufactured elbows and sweeps shall be used.

C. Sweeps and risers involving utility company service laterals shall be schedule 80 PVC and have a radius as required by the utility company. Where sweeps or risers are specified ON THE DRAWINGS as to a certain radius, that shall be verified with the utility company involved.

2.4 CONDUIT SUPPORTS:

A. Conduit clamps shall be 2 hole steel or as indicated below:

1. Exposed/Exterior work shall be two-hole steel.
2. Exposed/Interior work may be two-hole stamped.
3. Concealed in attics or crawl spaces may be two-hole stamped.
4. Concealed in walls may be one-hole stamped or nail straps.

Note: Nail straps will only be allowed concealed in walls, and will not be allowed in suspended ceiling, attic or for exposed work.

B. Conduit clamps shall be affixed with sheet metal screws or approved equal in exposed locations. Nails will only be allowed to affix clamps in concealed locations.

2.5 WIRE AND CABLE:

A. All conductors shall be copper. Aluminum conductors will not be allowed.

B. All conductors shall have insulation rated for 600 volts minimum and shall be type "THHN/THWN", unless otherwise called for on the drawings or required to meet other environmental conditions.

C. All conductors shall have markings indicating manufacturer, "UL" listing identification, insulation type, voltage rating and conductor size in accordance with National Electrical Code requirements.

D. The minimum conductor size for general power shall be No. 12 AWG.

E. Conductors No. 8 AWG smaller shall have continuous factory colored insulation for identification. Conductors No. 6 AWG and larger may be phase taped for identification.

F. The ampacities of conductors shall be based upon NEC Tables 310-16 and their corresponding Notes only. Other tables shall not apply.

G. Wiring concealed within the building may be Metal Clad type "MC" cable as allowed by Part 3 of this section of the specifications.

2.6 TELE/DATA OUTLETS:

A. Telephone and data outlets shall consist of a Caddy #MP1S mounting plate with blank cover plate, and a 3/4 inch schedule 40 PVC conduit sleeve from the top of the outlet mounting plate to a minimum of 6 inches above the insulation in the attic, or from the outlet location to an accessible attic location. Where flexible conduit is required to route through building structural members Electrical Nonmetallic Tubing (ENT) may be used if prior approval is obtained from the Contracting Officer.

2.7 TELE/DDATA WIRE AND CALBLE

A. All “computer receptacles” requested shall have no more than four computers on a single circuit.
B. Provide five, 20 amp 120 volt duplex receptacles at the office area and conference room area (10 minimum).
C. Provide five, orange dedicated receptacles for computer plug-in at the office area and conference room area (10 minimum).
D. Provide five, duplex CAT VI data outlet at the office area and conference room area (10 minimum).
E. Provide one, dedicated CAT VI outlet for a radio device at office area.
F. Provide one, dedicated CAT VI outlet on ceiling for future wifi equipment at the office area and conference room area (2 minimum).
G. Contractor shall terminate and test all equipment.

2.8 LUGS AND CONNECTORS:

A. Above grade conductors shall use ILSCO type "SPA" connectors for in-line splices, and type "PCT", "GTA" or "GTT" connectors for "parallel" or "tee" tap splices with type insulating covers. Above grade conductors No. 8 AWG and smaller may use 3M "Scotchlok" connectors (Yellow, Red, Gray, Blue).

B. Below grade conductors shall use ILSCO type "SPA" connectors or type “AS” in-line compression sleeves for in-line splices. In–line splices shall be insulated with ILSCO type "HST" heat shrink tubing or Scotch "8420" series cold shrink tubing. Below grade conductors No. 10 AWG and smaller may use "Scotch 3570 Sealing Packs" with Scotchlok "R/Y" connectors or may use Scotch "DBR-6" splice insulating tubes with Scotchlok "R" connectors.

C. Where type "MC" cable is used, set-screw type box fittings with factory insulating bushings shall be installed.

2.9 CONDUCTOR AND CIRCUIT IDENTIFICATION: Conductors shall be identified at all panels, disconnect switches, devices, fixtures, grade level pull boxes, etc. as indicated below:

A. Interior conductors and cables shall be identified with adhesive cloth markers. Markers shall be similar to Thomas & Betts type "WDR".

B. Conductors and cables in grade level pull boxes shall be identified with a tag that is moisture resistant. Tags shall indicate the load being served and panel and circuit number where the circuit originates. Tags shall be similar to Thomas & Betts type "WSLM", vinyl laminated "write on" labels, or approved equal.

C. Junction boxes shall have the panel and circuit number(s) of the conductors contained within the neatly printed on the blank box cover with permanent black marking pen.

D. At all switch, receptacle and similar device locations, the panel and circuit number(s) to which the device(s) are connected shall be neatly printed on the inside of the cover plate with a permanent black marking pen.

2.10 OUTLET AND JUNCTION BOXES:

A. Electrical boxes used with conduit shall be galvanized steel, four-inch square or octagonal by 2 1/8 inch deep, unless otherwise noted.

B. Electrical boxes used with type "MC" cable may be approved plastic, four- inch square by minimum of 2 1/8 inches deep.

C. Electrical boxes containing GFCI receptacles shall be a minimum of 2 1/8 inch deep.

D. Boxes installed outside shall be rated Nema 3R or equivalent. Outlet or device boxes shall be cast, moisture proof boxes 2 5/8 inches deep and UL listed for wet and damp locations, or AS CALLED FOR ON THE DRAWINGS. Boxes shall be manufactured by Pass and Seymour, Bell, Slater, or approved equal.

2.11 PLASTER RINGS: Plaster rings shall be suitable for the fixtures, switches, receptacles, boxes and wiring method.

Plaster rings shall be of sufficient depth so that the front of the ring shall not be recessed

more than 1/8 inch or extend 1/16 inch beyond the finished wall surface after installation. Verify thickness of all wall surfaces for proper plaster ring depth. It is recommended that plaster rings be provided 1/8 inch deeper than surface covering. (Example: Use 3/4 inch deep ring for 5/8 inch wall covering).

2.12 DEVICE COVERS:

A. Cover plates for devices shall be a smooth plastic, color Ivory.

B. Surface boxes shall have 1/2 inch raised steel industrial covers for devices and shall have blank covers for junction boxes.

C. Exterior device covers shall be rated Nema 3R with hinged cover and four screw mounting. Covers shall be similar to Leviton No. 6196-VFS for vertical cover and No. 6196-FS for horizontal cover.

2.13 BUSS FUSETRON BOX COVERS: Fusetron box covers where required shall have "Fusestat" inserts installed after proper fuse selection to prevent future over fusing. Covers shall be AS CALLED FOR ON THE DRAWINGS.

2.14 SWITCHES AND RECEPTACLES: Switches and receptacles shall be as follows unless otherwise CALLED FOR ON THE DRAWINGS or specified herein. Switches and receptacles shall be specification grade and shall be "back wired" and listed for use with standard conductors. Device colors shall be "Ivory" unless otherwise noted.

A. Switches:

SPST, 15 Amp., 125-277V. -	Leviton No. CSB1-15I
DPST, 15 Amp., 125-277V. -	Leviton No. CSB2-15I 3-
way, 15 Amp., 125-277V. -	Leviton No. CSB3-15I
4-way, 15 Amp., 125-277V. -	Leviton No. CSB4-15I

B. Power Receptacles:

Receptacle, Duplex, 15 Amp., 125V., NEMA 5-15R - Leviton No. BR15-I
Receptacle, Duplex, 20 Amp., 125V., NEMA 5-2OR - Leviton No. BR20-I
GFCI Receptcle, 15 Amp., 125V., NEMA 5-15R - Leviton No. 6898-I
Hubble HBL9367 Receptacle with non-metallic cover

PART 3 - EXECUTION

3.1 CONDUIT AND RACEWAYS:

A. All conduit containing conductors shall have bushings on both ends, or fittings having equivalent abrasion protection to protect the conductors. Conduits 1 1/4 inch and larger shall have insulating bushings provided.

B. Conduit shall be bent using the proper tools and shall show good workmanship with no kinks or flattening. Metal conduits 1 1/4 inch and larger shall have factory manufactured elbow installed.

Non-Metallic Rigid Conduit shall utilize factory manufactured elbows and sweeps.

Nonstandard field bends may be made utilizing a "Hot-Box" type of bender with prior approval from the Contracting Officer. If a "Hot-Box" bender is used, the raceway shall not show signs or flattening or kinking. If the raceway does show signs of flattening or kinking, that section of conduit shall be rejected and removed from the jobsite at the end of the work day.

C. Building conduits shall be installed so that the raceways are level, plumb, and at right angles or parallel to building lines, and with offsets as required.

D. Conduits shall be sized AS SHOWN ON THE DRAWINGS. The minimum size shall be 3/4 inch nominal. Conduits not specifically sized ON THE DRAWINGS shall be sized for a maximum conductor fill at 70 percent of NEC Annex C.

E. Storage/Cleaning: Conduit shall be kept clean and covered while stored or not in use. All conduits shall be clean prior to installation and prior to installation of conductors. Conduits requiring cleaning shall be thoroughly cleaned by swabbing prior to installation.

3.2 CONDUIT SUPPORTS: Conduits shall be supported and/or braced at intervals required by the NEC with clamps, straps or devices as specified in these Specifications.

3.3 CONDUIT SYSTEM:

A. Rigid Metal Conduit (RMC) may be used in all areas, but at minimum shall be used for the following:

1. All exposed exterior work up to 48 inches above final grade, and exposed interior work up to 24 inches above finish floor level.
2. All below grade site raceways where buried with a minimum cover of 18 inches or less, unless otherwise noted.
3. AS SHOWN ON THE DRAWINGS or as specified inthese specifications.

B. Electrical Metallic Tubing (EMT) may be used for the following:

1. Exposed work above 48 inches on building exteriors.
2. Raceways run in attics, crawl spaces, and concealed in walls.
3. AS SHOWN ON THE DRAWINGS or as specified inthese specifications.

C. Rigid Non-metallic Conduit (PVC) may be used for the following:

1. Underground site or building feeders.
2. Branch circuits run underslab. Where branch circuits are run under the slab the elbows and risers where concealed within walls may be PVC to above the bottom plate of the wall and may be run to receptacle boxes located at 24 inches above the floor level, but for other receptacles and switches concealed within walls the raceway shall adapt to another approved metal raceway within 6 inches of the bottom plate.
3. Telephone and Data cable raceways or wall outlet sleeves.

4. AS SHOWN ON THE DRAWINGS or as specified inthese specifications.

D. Rigid Non-metallic Conduit (PVC) shall be used for electrical and telephone service laterals, sweeps, elbows and risers from the building to the service pole. All sweeps, elbows and risers shall be Schedule 80 PVC. All utility service raceways shall be approved by the utility involved.

E. Flexible Metal Conduit:

1. Flexible Metal Conduit shall be used for the following:

   a. Final connections to interior motors.
   b. Final connections to Furnaces or unit heaters.
   c. Other interior equipment that vibrates or requiring movement for operation or servicing where final connections are exposed.
   d. Final connection to equipment shall be with 90 degree connectors.
   e. AS SHOWN ON THE DRAWINGS.

2. Flexible Metal Conduit may be used for the following:

   a. Branch circuit wiring concealed in walls, attic or crawl space.
   b. AS SHOWN ON THE DRAWINGS.

F. Liquidtight Flexible Conduit shall be used for the following:

1. Final connections to A/C condensing units.
2. Exterior final connections to motors, controls or equipment that vibrates or requires movement for operation or servicing. The length of conduit shall be adequate to reduce vibration or required servicing of equipment without disconnection of the equipment.
3. Final connection to equipment shall be with 90 degree connectors.
4. AS SHOWN ON THE DRAWINGS or specified in these Specifications.

G. Electrical Non-Metallic Tubing may be used for Tele/Data cables where flexibility is required to route through building structural members and when approved. Where used for tele/data cables the color of the conduit shall be "Yellow".

ENT installed through bored wood studs, plates, joists or similar, shall have nail plates installed where the distance from the edge of the stud to the inside edge of the bored hole is less that 2 1/2 inches. ENT installed through metal studs, plates or similar shall have grommets installed at stud penetrations.

ENT shall NOT be use through fire rated walls.

H. Exposed conduits shall be so arranged that conduits do not unnecessarily cross other conduits but run parallel to each other in horizontal or vertical rows. Conduits in exposed areas shall conform to building structural and architectural lines.

I. Conduits shall be jointed by approved couplings with ends butted. Raceways shall be securely fastened to the cabinets, pull boxes, terminals, etc., with two locknuts or approved fittings, and the ends shall be equipped with insulating bushings, grounding type bushings or shall have approved terminal fittings. Raceways shall be cut square and shall have ends carefully reamed.

J. Each length of conduit subjected to rough usage and damaged while on the job before installation shall be removed from the premises upon notice.

3.4 CONDUCTORS AND CABLES – GENERAL WIRING:

A. Type “MC” Metal Clad Cable may be run in the attic or concealed within walls of the building. Where run in the attic, the cable shall be run along the face of joists, rafters or truss members. If run on joist, rafter or truss member edges or across these members the cables shall be located within 2 feet of the eave side of exterior walls or shall be run on running boards. Cables run on or across the bottom edge of rafters or truss top chords that are a minimum of 6'- 6" above the top edge of ceiling joists or truss bottom chords shall not require running boards.

Type “MC” cable will not be allowed where serving outlets, switches, light fixtures, or similar items on walls or ceilings within the Engine Bay area. Approved conduit types meeting the requirements of these Specifications shall be used to serve outlets, switches, light fixtures, or similar items on walls or ceilings within the Engine Bay area.

B. Conductors shall not be double lugged. A properly sized terminal fitting will be provided for every conductor.

C. Skinning or cutting of conductor strands to allow a conductor to fit into a termination device (hair-cutting or ringing) will not be accepted.

D. Where the insulation on a conductor is damaged during installation, the conductor so damaged shall be removed and a new conductor installed. Covering nicks and cuts in the insulation with tape will not be accepted.

E. Color Coding: All conductors shall be phase/voltage identified at all terminations, junction boxes, pull boxes, or wherever the conductors are accessible. Conductor identification shall be by use of factory colored conductor insulation. Conductors No. 6 AWG and larger may be identified by use of phase tape. The following colors shall be utilized for conductor identification:

"A" phase	Black
"B" phase	Red
Neutral	White
Equip. Ground	Green

F. An equipment grounding conductor shall be installed in all raceways and shall be furnished in all cables. Where an isolated grounding conductor is required, both an equipment ground and an isolated ground shall be installed in the raceway. The equipment ground shall be attached to the box and the isolated ground shall be

attached to the device. The isolated grounding conductor shall be easily distinguished from the equipment grounding conductor by another shade of green or shall be striped for identification.

G. Conductors shall be looped in all pull, junction, device or splice boxes, both above grade and grade level boxes.

H. Conductor Installation: Every precaution shall be taken to avoid damage to the insulation or damage to the electrical or mechanical properties of the conductors when installing the conductors in raceways. Care shall be taken to avoid dragging the conductors on the ground during the installation. All raceways shall be clean prior to installing conductors. Approved grips (pulling socks) shall be used in pulling conductors # 4 AWG or larger.

I. Where type "MC" cable is used and penetrates studs, joists or similar building structural members, and the edge of the bored hole for the cable is within 1 1/2 inches of the edge of the board member, a 1/16 inch thick steel nail plate shall be installed to protect the cable. If run through holes in metal studs the holes shall have grommets provided.

3.5 OUTLET AND JUNCTION BOXES:

A. All boxes shall be suitable for the fixtures, switches, receptacles, and wiring method.

B. All metal boxes shall be grounded. Boxes shall be grounded by pigtailing from the equipment grounding conductors in the box to a 10/32 ground screw, ground clip or similar approved device attached to the box.

C. All boxes shall be sized for the conductor fill.

D. Equipment grounding conductor splices at boxes shall be made using wire nut connectors. Twisting of wires as the means of connecting them will not be accepted. A pigtail from this connection shall be connected to the box and to any device within the box.

E. All boxes shall be affixed to a building or site structural member for support. Boxes shall not be supported by a raceway unless approved by the Contracting Officer. Boxes shall be affixed to wood surfaces using No. 10 x 3/4 inch sheet metal screw unless otherwise noted. Where boxes are affixed to surfaces of gypsum board over wood studs or plywood the boxes shall be affixed using No. 10 x 1 1/4 inch sheet metal screws or screws of a required length so that a minimum of 5/8 inch will penetrate the stud or plywood, unless otherwise noted.

F. Junction boxes located in attic areas shall have the panel and circuit numbers written on the blank covers of the wiring contained within the box with a permanent black marker pen.

3.6 SWITCHES AND RECEPTACLES:

A. Only one wire will be allowed under a screw terminal.

B. Devices with a grounding screw shall be grounded to the box or equipment grounding conductor with a bare or insulated green bonding jumper. Devices with automatic grounding devices are not exempt from this requirement.

C. All conductors in device boxes shall be pigtailed so that removal of the device shall not interrupt phase, neutral and/or grounding circuit conductors continuing on. Pigtails to devices shall be a minimum of six inches in length. Where the device is located on the end of a circuit run pigtailing will not be required.

D. Location of outlets SHOWN ON THE DRAWINGS is approximate, unless dimensioned. The Contractor shall locate outlets to best serve the intended area and to avoid mechanical and structural interferences. Location of outlets will be approved by the Contracting Officer prior to rough-in wiring.

E. Conductors connecting to switches, receptacles, and other devices shall be connected to the back wired screw terminals. Terminating conductors in the spring-loaded stab-back holes on the rear of the device or wrapping around the binding screw terminals of non-back wired devices will not be accepted.

F. All wiring shall be inspected after the rough-in wiring is complete and wiring within boxes have been made-up, but prior to the installation of receptacles, switches, fixtures, covers, and insulation or wall coverings. Any installations not meeting the requirements of these specifications or AS INDICATED ON THE DRAWINGS shall be corrected and inspected prior to covering the work.

G. Conductors terminating at switches, receptacles, or other devices shall be identified with adhesive markers to indicate panel and circuit number. The panel and circuit number the device to which the device is connected shall be written on the inside of the cover plate with a black marking pen.

3.7 PROTECTION OF WORK DURING PLASTERING/TEXTURING/PAINTING: Boxes and conductors shall be protected during plastering, texturing and painting. Boxes shall be covered or stuffed with paper or similar so that plaster, texture or paint does not enter the box and does not cover the conductors. Box interiors and conductors shall be thoroughly cleaned of all plaster, texture and/or paint prior to rough-in inspection.

3.8 INTENT AND LAYOUT: The DRAWINGS and Specifications indicate or show the intent of the work required. It is intended that the work be complete in all respects. The Contractor shall be responsible for complete, properly operating electrical, electrically operated, and electrically controlled equipment and systems.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Payment shall be included in the bid schedule under ‘Electrical Service’ and ‘Electrical Distribution’. No separate measurement and payment shall be made.

END OF SECTION

SECTION 16400
SERVICE AND DISTRIBUTION

PART 1 - GENERAL

1.1 DESCRIPTION: The work to be performed under this Section consists of furnishing and installing a complete electrical distribution system AS SHOWN ON THE DRAWINGS, and described in this section of the specifications. In general, the work shall include, but is not limited to the following:

A. Connection to meter/main service panel with test by-pass.

B. Installation of Electrical and Telephone service conduits

C. Installation of building interior distribution panels complete with branch circuit breakers.

D. Installation of air conditioning, air compressor or other equipment disconnect switches.

E. Installation of Grounding Electrode and system Bonding.

F. Engraved nameplates.

PART 2 - PRODUCTS

2.1 BUILDING METER/MAIN SERVICE PANEL: The building meter/main service panel shall be a commercial panel with test by-pass facilities to PG&E requirements. The panel shall be underground feed and shall contain a main disconnect circuit breaker in a Nema 3R enclosure. The panel shall be rated 200 amperes at 120/240 volts, single phase, three wire and the main breaker shall be rated for 42,000 AIC. The panel shall be equal to a Circle AW #U224MTBH.

2.2 BUILDING INTERIOR DISTRIBUTION PANELS: The building interior distribution panels shall be branch circuit load centers and shall be rated at 120/240 volts, single phase, three wire. Panel amperage rating and type of mounting shall be as called for on the panel schedule. The load centers shall be supplied with an equipment ground bar kits.

2.3 LOAD CENTER CIRCUIT BREAKERS: Circuit breakers shall be of the type, size, voltage and trip rating indicated on the panel schedule.

A. Two and three pole circuit breakers shall have internal common trip, trip handle ties will not be allowed.

B. Circuit breakers shall be of the same manufacturer as the load center or of a manufacturer UL listed and approved for use in that load center. Circuit breakers installed as "back feed mains" shall be affixed to panel bussing by a listed factory provided clip or other approved attachment.

C. Circuit breakers serving air conditioning equipment shall be "HACR" rated.

D. Circuit breakers shall be full size, "Tandem" or "Piggy-back" style circuit breakers will not be allowed.

E. Circuit breakers shall have visual trip indication other than handle position.

2.4 DISCONNECT SWITCHES: Disconnect switches serving the air conditioning condensing unit, air compressor or other equipment shall be of a size and rating AS CALLED FOR ON THE DRAWINGS. Where no size is specified, or the size and rating of the disconnect is not adequate for the equipment served, the disconnect shall be sized and rated in accordance with the nameplate rating on the equipment. Verify actual equipment loads with other Divisions where substitute materials have been approved. Disconnect switches for air compressor and air conditioning condensing unit shall have an operable exterior handle.

2.5 NEUTRAL AND EQUIPMENT GROUND BUSSES:

A. Where neutral conductors or equipment grounding conductors are too large to be connected to a panel or disconnect switch neutral or equipment ground buss, factory oversize buss lugs shall be provided. Splitting conductor strands between adjacent buss terminations will not be allowed.

B. Conductors terminated on neutral or equipment ground busses shall not be double lugged, only one conductor shall be terminated in a buss lug.

C. An equipment ground buss shall be provided in all panels, switches and load centers and shall be bonded to the panel frame.

D. In disconnect switches where no neutral is required the neutral buss may be used for the ground buss if bonded to the panel frame using a bonding jumper or neutral bonding screw.

2.6 FUSES: Fuses serving motor loads or air conditioning equipment shall be type “FRN” “Dual Element – Time Delay”, or approved equal and sized at 115% of nameplate “Full Load Amperes”, unless otherwise indicated. Fuses shall be installed within the disconnect such that all labeling is facing forward and not installed upside down. Fuses serving HVAC equipment shall be furnished and installed by Division 15.

2.7 GROUNDING ELECTRODE AND SYSTEM BONDING:

A. The building grounding electrode shall be a “Concrete Encased Electrode” (‘UFER” ground) that consists of a minimum of 20 feet of #2 AWG bare copper conductor, embedded in the bottom of the building concrete footing or slab footing. The conductor shall extend unspliced from the footing to the panel and terminated on the panel neutral buss. The grounding electrode conductor shall be sleeved with Sch 80 PVC if exposed or Sch 40 PVC if concealed from the concrete to the panel.

B. The building system bonding shall consist of #4 AWG copper to bond the building cold water piping system and #8 AWG copper to bond the building gas piping system. The bonding conductors shall be terminated at the meter/main service.

2.8 ENGRAVED NAMEPLATES: Engraved nameplates shall be lamicoid plates, black face with white core producing white lettering. Lettering shall be 1/4" in height. Nameplates shall be affixed to distribution panel deadfront covers with machine screws or rivets. Nameplates are required on interior distribution panels and shall identify the panel as follows:

PANEL “E-1”
120/240 VOLTS

PART 3 - EXECUTION

3.1 BUILDING METER/MAIN SERVICE PANEL: The building service panel shall be installed so the centerline of the meter socket is located at 6'-0" above grade and shall meet all utility company requirements. The service lateral riser shall be Sch 80 PVC where exposed.

3.2 BUILDING DISTRIBUTION PANELS: The interior distribution panels shall be installed AS SHOWN ON THE DRAWINGS. The panels shall be installed so that the top of the panel is at 6'-0" above finish floor.

3.3 CIRCUIT BREAKERS: Circuit breakers shall be identified in all panels by circuit number and panel legends shall be neatly typed or printed to indicate loads served by the individual breakers.

3.4 DISCONNECT SWITCHES: Disconnect switches shall be mounted adjacent to the equipment served. Mounting height shall be as required by the equipment conditions but in no case shall be top of the switch be above 6'-0" above the working surface. At the air conditioning condensing unit the disconnect shall be mounted at a height of 42 inches above grade. The circuit from the disconnect switch to the a/c unit shall be in surface run rigid steel conduit with the final 12 inches to 18 inches in liquidtight flexible conduit. The connector at the unit shall be a 90 degree connector.

3.5 GROUNDING AND BONDING:

A. The neutral buss shall be bonded to the panel frame and equipment grounding buss in the meter/main service panel.

B. If the building main disconnect is served by a site feeder with an equipment grounding conductor the neutral buss shall not be bonded at the building main and the equipment grounding conductor shall terminate on the equipment ground buss.

If the building main disconnect is served by a site feeder with no equipment grounding conductor the neutral buss shall be bonded at the building disconnect.

C. The building interior distribution panels shall not have their neutral buss bonded to the panel frame or equipment ground buss. The equipment grounding conductors shall terminate on the equipment ground buss.

PART 4 - MEASUREMENT AND PAYMENT

4.1 PAYMENT:

A. Payment will be included in the Bid Schedule under ‘Electrical Service’ and ‘Electrical Distribution’ and shall include furnishing and installing a complete electrical system as shown on the drawings and described in the specifications.

END OF SECTION

SECTION 16510
LIGHTING FIXTURES

PART 1 GENERAL

1.1 DESCRIPTION: The work to be performed under this Section consists of furnishing and installing all lighting fixtures and their appurtances necessary for a complete and operational lighting system AS SHOWN ON THE DRAWINGS or as specified in this Section. The work shall include but not be limited to the following:

A. Installation of Lighting Fixtures.

B. Installation of Lamps.

C. Installation of Lighting Fixture Supports.

D. Installation of Lighting Control Panel and Photocell.

1.2 SUBMITTALS: Submittals for lighting fixtures, other than those specified in the Fixture Schedule, shall be manufacturer's catalog brochures, color if available. Sufficient information shall be provided, including photometric information, to evaluate the submitted fixture. Some lamps are included with a specified fixture. If a substitute fixture is submitted, the appropriate lamp information shall be submitted along with the fixture submittal.

PART 2 PRODUCTS

2.1 LIGHTING FIXTURES: Lighting fixtures shall be as indicated on the LIGHT FIXTURE SCHEDULE and shall be complete with lamps. Fixtures specified designate types that are suitable. Fixtures furnished shall be equal to those specified in efficiency, heat dissipation, brightness control, appearance, structural strength, finish, color, corrosion resistance, dimensional stability of plastics used, and ease of lamp replacement and maintenance. Each lighting fixture shall be furnished with a factory installed ground lug.

2.2 LAMPS: Lamps shall be as indicated on the LIGHT FIXTURE SCHEDULE. Where a type of lamp is not indicated on the drawings or in these specifications, the lamp shall be as recommended by the fixture manufacturer. Some lamps are included with a specified fixture. If a substitute fixture is submitted, the appropriate lamp information shall be submitted along with the fixture submittal.

2.3 FIXTURE SUPPORT:

A. Surface mounted fixtures shall be supported to the building structural members or to backing blocks with #10 sheet metal screws or approved equal. The screws shall be of adequate length for the screw to penetrate the wood structure or backing block a minimum of one inch.

B. Pendant mounted fixtures shall have the pendant directly attached to the fixture outlet box. Pendant fixture outlet boxes shall be attached to building structural

members or to backing blocks with #10 sheet metal screws or approved equal. The screws shall be of adequate length for the screw to penetrate the wood structure or backing block a minimum of one inch.

C. Chain supported fixtures shall be electrically connected with flexible metal conduit. Chain supports shall be attached to the ceiling with “eye” bolts or similar of adequate length for the screw to penetrate the wood structure or backing block a minimum of one inch. The flexible metal conduit shall be attached to the chain support with “ty-raps” or similar when lengths exceed 24 inches.

D. All new fixtures shall require backing at support locations within the ceiling or wall. Backing for surface-mounted, recessed, or suspended light fixtures shall be the responsibility of the Electrical Contractor. Backing blocks where required shall be 2" x 6" blocks mounted between studs, joists or bottom chords of truss members. Backing blocks shall be end-nailed through the structural members with three #8d nails at each end.

A. Where multiple fixtures are pendant mounted in a row, only the power drop will be required to have a stem pendant. Other support locations may be with a pendant or 1/16 inch stainless steel aircraft cable. Fixture row supports shall be required at each end of the row and at each junction of two 4-foot fixtures. Aircraft cable attachments to ceiling or box and at the fixture shall be per manufacturer’s recommendations or as approved by the Contracting Officer. Where attached to ceilings the cable studs shall be attached to building structural members or backing blocks and shall penetrate the wood members a minimum of one inch.

2.4 PHOTOCELL: The photoelectric cell shall be as supplied by the lighting fixture manufacture and installed in the individual fixture.

PART 3 EXECUTION

3.1 GENERAL: Fixtures shall be installed in accordance with manufacturer’s recommendations and installation instructions. A copy of the installation instructions shall be provided to the Contracting Officer for each fixture type.

3.2 FIXTURE GROUNDING: All lighting fixtures shall be grounded. Circuit equipment grounding conductors shall be attached to the factory provided ground lug or screw.

PART 4 MEASUREMENT AND PAYMENT

4.1 Payment shall be included in the Bid Schedule under Electrical Distribution. No separate measurement and payment shall be made.

END OF SECTION