Barrett Station Truck Wash
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01019

CONTRACT REQUIREMENTS

PART 1 GENERAL

1.1 SCHEDULE OF VALUES

A. Submit a printed schedule on Contractor's standard form. Electronic media printout will be considered.

B. Submit Schedule of Values in duplicate within 20 days after date of Owner-Contractor Agreement.

C. Revise schedule to list approved Change Orders, with each Application For Payment.

1.2 APPLICATIONS FOR PAYMENT

A. Submit four copies of each application on Contractor's electronic media driven form.
B. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.
C. Payment Period: 30 days.
D. Include an updated construction progress schedule.
E. Certified payroll records.

1.3 CHANGE PROCEDURES

A. The Architect/Engineer/Designer may issue a Notice of Change that includes a detailed description of a proposed change with supplementary or revised Drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required.

B. The Contractor may propose changes by submitting a request for change to the Architect/Engineer/Designer describing the proposed change and its full effect on the Work. Include a statement describing the reason for the change, the effect on the Contract Sum/Price and Contract Time, and a statement describing the effect on Work by the MoDOT District or other Contractors.

C. Stipulated Sum/Price Change Order: Based on Notice of Change and Contractor's fixed price quotation or Contractor's request for a Change Order as approved by Architect/Engineer/Designer.

D. Construction Change Directive: Architect/Engineer/Designer may issue a directive instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work, and designate method of determining any change in Contract Sum/Price or Contract Time. Promptly execute the change.

E. Time and Material Change Order: Submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract. Architect/Engineer/Designer will determine the change allowable in Contract Sum/Price and Contract Time as provided in the Contract Documents.

F. Maintain detailed records of work done on Time and Material basis. Provide full information required for evaluation of proposed changes, and to substantiate costs for changes in the Work.

G. Execution of Change Orders: Architect/Engineer/Designer will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

1.4 DEFECT ASSESSMENT

A. Replace the Work, or portions of the Work, not conforming to specify requirements.

B. If, in the opinion of the Architect/Engineer/Designer, it is not practical to remove and replace the Work, the Architect/Engineer/Designer will direct an appropriate remedy or adjust payment.

1.5 ALTERNATIVES

A. Accepted Alternatives will be identified in Owner-Contractor Agreement.

END OF SECTION

01039

COORDINATION AND MEETING REQUIREMENT

PART 1 GENERAL

1.1 COORDINATION AND PROJECT CONDITIONS

A. Coordinate scheduling, submittals, and Work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements.

B. Verify utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to and placing in service, such equipment.

C. Coordinate space requirements, supports, and installation of mechanical and electrical Work, which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

D. In finished areas, except as otherwise indicated, conceal pipes, ducts and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

E. Coordinate completion and clean up of Work of separate sections in preparation for Completion.

F. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

1.2 FIELD ENGINEERING

A. Employ a Land Surveyor registered in the State of Missouri and acceptable to Architect/Engineer/Designer.
B. Owner will locate and protect survey control and reference points.
C. Control datum for survey is that established by Owner provided survey.
D. Verify setbacks and easements; confirm drawing dimensions and elevations.
E. Provide field engineering services. Establish elevations, lines and levels, utilizing recognized engineering survey practices.

1.3 PRECONSTRUCTION MEETING

A. Architect/Engineer/Designer will schedule a meeting after Notice of Award.
B. Attendance Required: District engineer or representative, Architect/Engineer/Designer and Contractor.
C. Record minutes and distribute copies within 5 days after meeting to participants, with two copies to District Engineer, Architect/Engineer/Designer, participants and those affected by decisions made.

1.4 SITE MOBILIZATION MEETING

A. Architect/Engineer/Designer will schedule a meeting at the Project site prior to Contractor occupancy.

B. Architect/Engineer/Designer will record minutes and distributes copies within 5 days after meeting to participants, with two copies to Architect/Engineer/Designer, participants and those affected by decisions made.

1.5 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the Work at when arranged by Architect/Engineer/Designer.

B. Architect/Engineer/Designer will make arrangements for meetings, prepare agenda with copies for participants, and preside at meetings.

C. Attendance Required: Job superintendent, major Subcontractors and suppliers, District engineer representative, Architect/Engineer/Designer, as appropriate to agenda topics for each meeting.

D. Agenda:
1. Review of Work progress.
2. Field observations, problems, and decisions.
3. Identification of problems, which impede planned progress.
4. Maintenance of progress schedule.
5. Corrective measures to regain projected schedules.
6. Coordination of projected progress.
7. Effect of proposed changes on progress schedule and coordination.

E. Record minutes and distributes copies within 5 days after meeting to participants and those affected by decisions made.

1.6 PREINSTALLATION MEETING

A. When required in individual specification sections, convene a pre-installation meeting at the site prior to commencing work of the section.
B. Notify Architect/Engineer/Designer seven days in advance of meeting date.
C. Prepare agenda and preside at meeting:
1. Review conditions of installation, preparation and installation procedures.
2. Review coordination with related work.
D. Record minutes and distributes copies within 5 days after meeting to participants and those affected by decisions made.

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

3.1 CUTTING AND PATCHING

A. Employ skilled and experienced installer to perform cutting and patching.

B. Submit written request in advance of cutting or altering elements, which affect:
1. Structural integrity of element.
2. Integrity of weather-exposed or moisture-resistant elements.
3. Work of Owner or separate contractor.

C. Execute cutting, fitting, and patching to complete Work, and to:
1. Uncover Work to install or correct ill-timed Work.
2. Remove and replace defective and non-conforming Work.
3. Provide openings in elements of Work for penetrations of mechanical and electrical Work.

D. Cut masonry and concrete materials using masonry saw or core drill.

E. Fit Work tight to pipes, sleeves, ducts, conduit and other penetrations through surfaces.

F. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.

G. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for an assembly, refinish entire unit.

H. Identify hazardous substances or conditions exposed during the Work to the Architect/Engineer/Designer for decision or remedy.

3.2 ALTERATION PROJECT PROCEDURES

A. Materials: As specified in Product sections; match existing Products and work for patching and extending work.

B. Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity.

C. When finished surfaces are cut so that a smooth transition with new Work is not possible, terminate existing surface along a straight line at a natural line of division and submit recommendation to Architect/Engineer/Designer for review.

D. Patch or replace portions of existing surfaces that are damaged, lifted, discolored or showing other imperfections.

E. Finish surfaces as specified in individual Product sections.

END OF SECTION

01300

SUBMITTAL REQUIREMENTS

PART 1 GENERAL

1.1 REFERENCES

A. AGC Associated General Contractors of America publication "The Use of CPM in Construction - A Manual for General Contractors and the Construction Industry".

1.2 SUBMITTAL PROCEDURES

A. Submit five (5) hard copies of each submittal with Architect/Engineer/Designer accepted form.
B. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number and specification section number, as appropriate.
C. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work and coordination of information is in accordance with the requirements of the Work and Contract Documents.
D. Schedule submittals to expedite the Project, and deliver to Architect/Engineer/Designer at business address. Coordinate submission of related items.
E. For each submittal for review, allow 15 days excluding delivery time to and from the contractor.
F. Identify variations from Contract Documents and Product or system limitations, which may be detrimental to successful performance of the completed Work.
G. Submittals not requested will not be recognized or processed.

1.3 CONSTRUCTION PROGRESS SCHEDULES

A. Submit initial schedule in duplicate within 15 days after date established in Notice to Proceed.
B. Revise and resubmit as required.
C. Submit revised schedules with each Application for Payment, identifying changes since previous version.
D. Submit a horizontal bar chart with separate line for each major portion of Work or operation, identifying first workday of each week.

1.4 PROPOSED PRODUCTS LIST

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

1.5 PRODUCT DATA

A. Product Data for Review:
   1. Submitted to Architect/Engineer/Designer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
   2. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01700 - CONTRACT CLOSEOUT.

B. Product Data for Information:
   1. Submitted for the Architect/Engineer/Designer’s knowledge as contract administrator or for the Owner.

C. Product Data for Project Closeout:
1. Submitted for the Owner's benefit during and after project completion.

D. Submit the number of copies, which the Contractor requires, plus two copies that will be retained by the Architect/Engineer/Designer.

E. Mark each copy to identify applicable products, models, options and other data. Supplement manufacturers' standard data to provide information specific to this Project.

F. After review distribute in accordance with the Submittal Procedures article above and provide copies for record documents described in Section 01700 - CONTRACT CLOSEOUT.

1.6 SHOP DRAWINGS

A. Shop Drawings for Review:
1. Submit five (5) hard copies to Architect/Engineer/Designer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
2. After review, produce copies and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01700 - CONTRACT CLOSEOUT.

B. Shop Drawings for Information:
1. Submitted for the Architect/Engineer/Designer’s knowledge as contract administrator or for the Owner.

C. Shop Drawings For Project Closeout:
1. Submitted for the Owner's benefit during and after project completion.

D. Indicate special utility and electrical characteristics, utility connection requirements and location of utility outlets for service for functional equipment and appliances.

E. Submit in the form of one reproducible transparency and one opaque reproduction.

1.7 SAMPLES

A. Samples for Review:
1. Submitted to Architect/Engineer/Designer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
2. After review, produce duplicates and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01700 - CONTRACT CLOSEOUT.

B. Samples for Information:
1. Submitted for the Architect/Engineer/Designer’s knowledge as contract administrator or for the Owner.

C. Samples for Selection:
1. Submitted to Architect/Engineer/Designer for aesthetic, color, or finish selection.
2. Submit samples of finishes for Architect/Engineer/Designer selection.
3. After review, produce duplicates and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01700 - CONTRACT CLOSEOUT.

1.8 DESIGN DATA

A. Submit for the Architect/Engineer/Designer’s knowledge as contract administrator or for the Owner.
B. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.9 TEST REPORTS

A. Submit for the Architect/Engineer/Designer’s knowledge as contract administrator or for the Owner.
B. Submit test reports for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.10 CERTIFICATES

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

1.11 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, and start-up, adjusting and finishing, to Architect/Engineer/Designer for delivery to owner in quantities specified for Product Data.
B. Indicate special procedures, perimeter conditions requiring special attention and special environmental criteria required for application or installation.
C. Refer to Section 01400 - Quality Control, Manufacturers' Field Services article.

1.12 MANUFACTURER'S FIELD REPORTS

A. Submit reports for the Architect/Engineer/Designer's benefit as contract administrator or for the Owner.
B. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.13 ERECTION DRAWINGS

A. Submit drawings for the Architect/Engineer/Designer’s benefit as contract administrator or for the Owner.
B. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
C. Data indicating inappropriate or unacceptable Work may be subject to action by the Architect/Engineer/Designer or Owner.

END OF SECTION

01400

QUALITY CONTROL REQUIREMENTS

PART 1 GENERAL

1.1 QUALITY ASSURANCE - CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions and workmanship, to produce Work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect/Engineer/Designer before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes or specified requirements indicate higher standards or more precise workmanship.

E. Perform Work by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.2 TOLERANCES

A. Monitor fabrication and installation tolerance control of Products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect/Engineer/Designer before proceeding.

C. Adjust Products to appropriate dimensions; position before securing Products in place.

1.3 REFERENCES AND STANDARDS

A. For Products or workmanship specified by association, trade or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard by date of issue current on date for receiving bids or date specified in the individual specification sections, except where a specific date is established by code.

C. Neither the contractual relationships, duties or responsibilities of the parties in Contract nor those of the Architect/Engineer/Designer shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.4 TESTING SERVICES

A. Contractor to provide all testing services as called out in these specifications.

B. Testing and source quality control may occur on or off the project site. Perform off-site testing as required by the Architect/Engineer/Designer or the Owner.

C. Testing does not relieve Contractor to perform Work to contract requirements.

D. Re-testing required because of non-conformance to specified requirements shall be performed by the same MoDOT personnel on instructions by the Architect/Engineer/Designer.

1.5 INSPECTION SERVICES

A. Owner will employ MoDOT Personnel to perform inspection.
B. Inspecting may occur on or off the project site. Perform off-site inspecting as required by the Architect/Engineer/Designer or the Owner.
C. Inspecting does not relieve Contractor to perform Work to contract requirements.

1.6 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and the balancing of equipment as applicable and to initiate instructions when necessary.
B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
C. Refer to Section 01300 - SUBMITTALS, MANUFACTURERS' FIELD REPORTS article.

PART 2 EXECUTION

2.7 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.

2.8 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.
B. Seal cracks or openings of substrate prior to applying next material or substance.
C. Apply manufacturer required or recommended substrate primer, sealer or conditioner prior to applying any new material or substance in contact or bond.

END OF SECTION

01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROL REQUIREMENTS

PART 1 GENERAL

1.1 TEMPORARY ELECTRICITY

A. Cost: By Contractor; pay for temporary power service furnished by MoDOT.

1.2 TELEPHONE SERVICE

A. Provide, maintain, and pay for telephone service to field office and Architect/Engineer/Designer's field office at time of project mobilization.

1.3 FACSIMILE SERVICE

A. Provide, maintain and pay for facsimile service and a dedicated telephone line to field office and Architect/Engineer/Designer's field office at time of project mobilization.

1.4 TEMPORARY WATER SERVICE

A. Connect to existing water source as directed for construction operations at time of project mobilization.
B. Contractor will reimburse Owner for water used in construction as agreed upon at time of project mobilization.

1.5 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

1.6 FENCING

A. Construction: Use plastic mesh safety fencing or better.
B. Provide 48" high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.7 WATER CONTROL

A. Grade site to drain. Maintain excavations free of water. Provide, operate and maintain pumping equipment.
B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

1.8 EXTERIOR ENCLOSURES

A. Provide temporary weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.9 PROTECTION OF INSTALLED WORK

A. Protect installed Work and provide special protection where specified in individual specification sections.
B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to prevent damage.

C. Provide protective coverings at walls, projections, jambs, sills and soffits of openings.
D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage or movement of heavy objects, by protecting with durable sheet materials.
E. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
F. Prohibit traffic from landscaped areas.

1.10 SECURITY

A. Provide security and facilities to protect Work and existing facilities and Owner's operations from unauthorized entry, vandalism or theft.
B. Coordinate with Owner's security program.

1.11 ACCESS ROADS

A. Provide and maintain access to fire hydrants, free of obstructions.
B. Provide means of removing mud from vehicle wheels before entering streets.
C. Designated existing on-site roads may be used for construction traffic.

1.12 PROGRESS CLEANING AND WASTE REMOVAL

A. Maintain areas free of waste materials, debris and rubbish. Maintain site in a clean and orderly condition.
B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces and other closed or remote spaces, prior to enclosing the space.
C. Broom and vacuum clean interior areas prior to start of surface finishing and continue cleaning to eliminate dust.
D. Collect and remove waste materials, debris and rubbish from site periodically and dispose off-site.
E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.13 FIELD OFFICES AND SHEDS

A. Office: Weather tight, with lighting, electrical outlets, heating and ventilating equipment and equipped with drawing rack and drawing display table.
B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.

1.14 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities and materials prior to Final Application for Payment inspection.
B. Clean and repair damage caused by installation or use of temporary work.
C. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 2 PRODUCTS Not Used.

PART 3 EXECUTION Not Used.

END OF SECTION

01600

MATERIAL AND EQUIPMENT REQUIREMENT

PART 1 GENERAL

1.1 PRODUCTS

A. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.
B. Provide interchangeable components of the same manufacture for components being replaced.

1.2 TRANSPORTATION AND HANDLING

A. Transport and handle Products in accordance with manufacturer's instructions.
B. Promptly inspect shipments to ensure that Products comply with requirements, quantities are correct and products are undamaged.
C. Provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement or damage.

1.3 STORAGE AND PROTECTION

A. Store and protect Products in accordance with manufacturers' instructions.

B. Store with seals and labels intact and legible.

C. Store sensitive Products in weather tight, climate controlled, enclosures in an environment favorable to Product.

D. For exterior storage of fabricated Products, place on sloped supports above ground.

E. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.

F. Cover Products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of Products.

G. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

H. Provide equipment and personnel to store Products by methods to prevent soiling, disfigurement or damage.

I. Arrange storage of Products to permit access for inspection. Periodically inspect to verify Products are undamaged and are maintained in acceptable condition.

1.4 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any Product meeting those standards or description is acceptable.
B. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.
C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named in accordance with the following article.

1.5 SUBSTITUTIONS

A. Architect/Engineer/Designer will consider requests for Substitutions only within 15 days after date established in Notice to Proceed.

B. Substitutions may be considered when a Product becomes unavailable through no fault of the Contractor.

C. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

D. A request constitutes a representation that the Contractor:
   1. Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.
   2. Will provide the same warranty for the Substitution as for the specified Product.
   3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
   4. Waives claims for additional costs or time extension that may subsequently become apparent.
   5. Will reimburse Owner for review or redesign services associated with re-approval by authorities.

E. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request or when acceptance will require revision to the Contract Documents.

F. Substitution Submittal Procedure:
   1. Submit three copies of request for Substitution for consideration. Limit each request to one proposed Substitution.
   2. Submit shop drawings, product data and certified test results attesting to the proposed Product equivalence. Burden of proof is on proposer.
   3. The Architect/Engineer/Designer will notify Contractor in writing of decision to accept or reject request.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

01650

STARTING OF SYSTEMS REQUIREMENT

PART 1 GENERAL

1.1 STARTING SYSTEMS

A. Coordinate schedule for start-up of various equipment and systems.
B. Notify Architect/Engineer/Designer seven days prior to start-up of each item.
C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, and control sequence and for conditions that may cause damage.
D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
E. Verify that wiring and support components for equipment are complete and tested.
F. Execute start-up under supervision of applicable manufacturer's representative or Contractors' personnel in accordance with manufacturers' instructions.
G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check and approve equipment or system installation prior to start-up and to supervise placing equipment or system in operation.
H. Submit a written report in accordance with Section 01300 that equipment or system has been properly installed and is functioning correctly.

1.2 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of Products to Owner's personnel two weeks prior to date of Final Completion.

B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

C. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owners' personnel in detail to explain all aspects of operation and maintenance.

D. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance and shutdown of each item of equipment at agreed time, at equipment location.

E. Prepare and insert additional data in operations and maintenance manuals when the need for additional data becomes apparent during instruction.

F. The amount of time required for instruction on each item of equipment and system that’s specified in individual sections.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

01700

CONTRACT CLOSEOUT REQUIREMENT

PART 1 GENERAL

1.1 CLOSEOUT PROCEDURES

A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Architect/Engineer/Designer's review.
B. Provide submittals to Owner that is required by governing or other authorities.
C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments and sum remaining due.
D. Owner will occupy portions of the building as specified in Section 01010.
E. Projects shall not be accepted by MoDOT until the vendor has completed all punch list items. The vendor will then have 30 days to submit all required paperwork necessary to close the project. Failure to submit the required paperwork within 30 days could result in the debarment or suspension of the contractor from future projects.

1.2 FINAL CLEANING

A. Execute final cleaning prior to final project assessment. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

B. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

C. Clean or replace filters of operating equipment used during construction and/or adjustment.

D. Clean debris from roofs, gutters, downspouts and drainage systems.

E. Clean site; sweep paved areas, rake clean landscaped surfaces.

F. Remove waste and surplus materials, rubbish and construction facilities from the site.

1.3 ADJUSTING

A. Adjust operating Products and equipment to ensure smooth and unhindered operation.

1.4 PROJECT RECORD DOCUMENTS

A. Store record documents separate from documents used for construction.

B. Record information concurrent with construction progress.

C. Specifications: Legibly mark and record at each Product section description of actual Products installed, including the following:
1. Manufacturer's name and product model and number.
2. Product substitutions or alternates utilized.
3. Changes made by Addenda and modifications.

D. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
1. Measured depths of foundations in relation to finish main floor datum.

2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
4. Field changes of dimension and detail.
5. Details not on original Contract drawings.

E. Submit documents to Architect/Engineer/Designer'swith claim for final Application for Payment.

1.5 OPERATION AND MAINTENANCE DATA

A. Submit data bound in 8-1/2 x 11 inch (A4) text pages, three D side ring binders with durable plastic covers.
B. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project and subject matter of binder when multiple binders are required.
C. Internally subdivide the binder contents with permanent page dividers, logically organized; with tab titling clearly printed under reinforced laminated plastic tabs.
D. Submit 1 draft copy of completed volumes 15 days prior to final inspection. This copy will be reviewed and returned with Architect/Engineer/Designer comments. Revise content of all document sets as required prior to final submission.
E. Submit two sets of revised final volumes, within 10 days after final inspection.

1.6 SPARE PARTS AND MAINTENANCE PRODUCTS

A. Provide spare parts, maintenance, and extra Products in quantities specified individual specification sections.
B. Deliver to Project site; obtain receipt prior to final payment.
C. Examine system components at a frequency consistent with reliable operation. Clean, adjust and lubricate as required.
D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
E. Maintenance service shall not be assigned or transferred to any agent or Subcontractor without prior written consent of the Owner.

1.7 WARRANTIES

A. Execute and assemble transferable warranty documents from Subcontractors, suppliers and manufacturers.
B. Submit prior to final Application for Payment.
C. For items of Work delayed beyond date of Final Completion, provide updated submittal within 10 days after acceptance, listing date of acceptance as start of the warranty period.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

02100

SITE PREPARATION

PART 1 SCOPE

A. The contractor shall visit the site and carefully examine the conditions of the premises to determine the amount of work and materials required for the work necessary to prepare the site in every respect for the construction of the parking lot, driveways, final grading, as shown on the plans.

B. The contractor shall be responsible for determining the quantities of materials to be excavated and handled and for the amount of backfilling, filling and grading to be done in order to perform all work required on the plans.

C. Included in the site grading is final seeding and mulching.

PART 2 SEEDING AND MULCHING

A. An area 50' wide surrounding the new building and parking lot shall be seeded and mulched.

B. Fertilizing:

1. Soil Neutralization: Shall be at the rate of 1000 pounds of effective neutralization per acre as per Specification Section 801.2.2 of the Missouri Standard Specifications for Highway Construction.
2. Commercial Fertilizer: In accordance with Specification Section 801.2.3 of the Missouri Standard Specifications for Highway Construction, fertilizers shall be applied at the following rates:

(a)	Nitrogen	80 lb. per acre
(b)	Phosphoric Acid	240 lb. per acre
(c)	Potash	80 lb. per acre

C. Seeding: Seed shall be Champion 3 + 3 Fescue Blend as sold by Mangelsdorf Seed Company, or equivalent as approved by the owner. The seed shall be applied at a rate of 400 lb. per acre.

D. Mulching: The mulch shall be Type 1 mulch as per Specification Section 802 of the Missouri Standard Specifications for Highway Construction.

END OF SECTION

02220

EXCAVATING, BACKFILLING AND COMPACTING

PART 1 GENERAL

1.1 SUMMARY

A Excavate, backfill, compact, and grade the site to the elevations shown on the Drawings, as specified herein, and as needed to meet the requirements of the construction shown in the Contract Documents.

B. Related work:

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

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Use equipment adequate in size, capacity and numbers to accomplish the work of this Section in a timely manner.

C. In addition to complying with requirements of governmental agencies having jurisdiction, comply with the directions of the MoDOT Inspector.

1.3 DELIVERY, STORAGE AND HANDLING

A. Comply with pertinent provisions of Section 01600.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

A. Fill and backfill materials:

1. Provide soil materials free from organic matter and deleterious substances, containing no rocks or lumps over 6" in greatest dimension, and with not more than 15% of the rocks or lumps larger than 2-3/8" in their greatest dimension.
2. Fill material is subject to the approval of the MoDOT Inspector, and are those materials removed from excavations or imported from off-site borrow areas; predominantly granular, non-expansive soils free from roots and other deleterious matter.
3. Do not permit rocks having a dimension greater than 1" in the upper 12" of fill or embankment.
4. Cohesionless material used for structural backfill. Provide sand free from organic material and other foreign matter, and as approved by the MoDOT Inspector.
5. Where granular base is called for under building slabs, provide aggregate complying with requirements of Section 03300 of these Specifications.

2.2 WEED KILLER

A. Provide a dry, free-flowing, dust-free chemical compound, soluble in water, capable of inhibiting growth of vegetation, and approved for use on this Work by governmental agencies having jurisdiction.

2.3 TOPSOIL

A. Where and if shown on the Drawings or otherwise required, provide topsoil consisting of friable, fertile soil of loamy character, containing an amount of organic matter normal to the region, capable of sustaining healthy plant life, and reasonably free from subsoil, roots, heavy or stiff clay, stones larger than 2" in greatest dimension, noxious weeds, sticks, brush, litter and other deleterious matter.

B. Obtain topsoil/backfill from sources within the project limits as approved by Owner, or provide imported topsoil obtained from sources outside the project limits or from both sources.

2.4 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 PROCEDURES

A. Utilities:
1. Unless shown to be removed, protect active utility lines shown on the Drawings or otherwise made known to the Contractor prior to excavating. If damaged, repair or replace at no additional cost to the Owner.
2. If active utility lines are encountered and are not shown on the Drawings or otherwise made known to the Contractor, promptly take necessary steps to assure that service is not interrupted.
3. If service is interrupted as a result of work under this Section, immediately restore service by repairing the damaged utility at no additional cost to the Owner.
4. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the Architect and secure his instructions.
5. Do not proceed with permanent relocation of utilities until written instructions are received from the Architect.

B. Protection of persons and property:
1. Barricade open holes and depressions occurring as part of the Work, and post warning lights on property adjacent to or with public access.
2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
3. Protect structures, utilities, sidewalks, pavements and other facilities from damage caused by settlement, lateral movement, washout and other hazards created by operations under this Section.

C. Dewatering:
1. Remove all water, including rainwater encountered during trench and sub-structure work to an approved location by pumps, drains and other approved methods.
2. Keep excavations and site construction area free from water.

D. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors and to other work being performed on or near the site.

E. Maintain access to adjacent areas at all times.

3.3 EXCAVATING

A. Perform excavating of every type of material encountered within the limits of the Work to the lines, grades and elevations indicated and specified herein.

B. Satisfactory excavated materials:
1. Transport to and place in, fill or embankment areas within the limits of the Work.

C. Unsatisfactory excavated materials:
1. Excavate to a distance below grade as directed by the MoDOT Inspector and replace with satisfactory materials.
2. Include excavation of unsatisfactory materials and replacement by satisfactory materials, as parts of the work of this Section.

D. Surplus materials:
1. Dispose of unsatisfactory excavated material, and surplus satisfactory excavated material, away from the site at disposal areas arranged and paid for by the Contractor.

E. Excavation of rock:
1. Where rocks, boulders, granite, or similar material is encountered, and where such material cannot be removed or excavated by conventional earth moving or ripping equipment, take required steps to proceed with the general grading operations of the Work, and remove or excavate such material by means which will neither cause additional cost to the Owner nor endanger buildings or structures whether on or off the site.
2. Do not use explosives without written permission from the Architect.

F. Excavate and backfill in a manner and sequence that will provide proper drainage at all times.

G. Borrow:
1. Obtain material required for fill or embankment in excess of that produced within the grading limits of the Work from borrow areas selected and paid for by the Contractor and approved by the MoDOT Inspector.

H. Ditches and gutters:
1. Cut accurately to the cross sections, grades and elevations shown.
2. Maintain excavations free from detrimental quantities of leaves, sticks, trash, and other debris until completion of the Work.
3. Dispose of excavated materials as shown on the Drawings or directed by the MoDOT Inspector; except do not, in any case, deposit materials less than 3'-0" from the edge of a ditch.

I. Unauthorized excavation:
1. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific instruction from the Architect or the MoDOT Inspector.
2. Under footings, foundations, or retaining walls:
   a. Fill unauthorized excavations by extending the indicated bottom elevation of the footing or base to the excavation bottom, without altering the required top elevation.

   b. When acceptable to the soil engineer, lean concrete fill may be used to bring the bottom elevation to proper position.
3. Elsewhere backfill and compact unauthorized excavations as specified for authorized

excavations, unless otherwise directed by the soil engineer.

J. Stability of excavations:
1. Slope sides of excavations to 1:1 or flatter, unless otherwise directed by the MoDOT Inspector.
2. Shore and brace where sloping is not possible because of space restrictions or stability of the materials being excavated.
3. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.

K. Excavating for structures:
1. Conform to elevations and dimensions shown within a tolerance of 0.10 ft, and extending a sufficient distance from footings and foundations to permit placing and removing concrete formwork, installation of services, other construction required and for inspection.
2. In excavating for footings and foundations, take care not to disturb bottom of excavation:
   a. Excavate by hand tools to final grade just before concrete is placed.
   b. Trim bottoms to required lines and grades to leave solid base to receive concrete.
3. Excavate for footings and foundations only after general site excavating, filling and grading are complete.

L. Excavating for pavements:
1. Cut surface under pavements to comply with cross sections, elevations and grades.

M. Cold weather protection:
1. Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.

3.4 FILLING AND BACKFILLING

A. General:
1. For each classification listed below, place acceptable soil material in layers to required subgrade elevations.
2. In excavations:
   a. Use satisfactory excavated or borrowed materials.
3. Under building slabs:
   a. Use subbase materials.
4. Under building slabs:
   a. Use granular fill, if so called for on the Drawings, complying with aggregate acceptable under Section 03300 of these Specifications.

B. Backfill excavations as promptly as progress of the Work permits, but not until completion of the following.
1. Acceptance of construction below finish grade including, where applicable, dampproofing and waterproofing.
2. Inspecting, testing, approving and recording locations of underground utilities.
3. Removing concrete formwork.
4. Removing shoring and bracing and backfilling of voids with satisfactory materials.
5. Removing trash and debris.
6. Placement of horizontal bracing on horizontally supported walls.

C. Ground surface preparation:
1. Remove vegetation, debris, unsatisfactory soil materials, obstructions and deleterious matter from ground surface prior to placement of fills.
2. Plow, strip, or break up sloped surfaces steeper than one vertical to four horizontal so that fill material will bond with existing surface.
3. When existing ground surface has a density less than that specified under "compacting" for the particular area, break up the ground surface, pulverize, moisture-condition to the

optimum moisture content and compact to required depth and percentage of maximum density.

D. Placing and compacting:
1. Place backfill and fill materials in layers not more than 8" in loose depth.
2. Before compacting, moisten or aerate each layer as necessary to provide the optimum moisture content.
3. Compact each layer to required percentage of maximum density for area.
4. Do not place backfill or fill material on surfaces that are muddy, frozen or containing frost or ice.
5. Place backfill and fill materials evenly adjacent to structures, to required elevations.
6. Take care to prevent wedging action of backfill against structures by carrying the material uniformly around the structure to approximately the same elevation in each lift.
7. Where the construction includes basement or other underground walls having structural floors over them, do not backfill such walls until the structural floors are in place and have attained sufficient strength to support the walls.

3.5 GRADING

A. General:
1. Uniformly grade the areas within limits of grading under this Section, including adjacent transition areas.
2. Smooth the finished surfaces within specified tolerance.
3. Compact with uniform levels or slopes between points where elevations are shown on the Drawings, or between such points and existing grades.
3. Where a change of slope is indicated on the Drawings, construct a rolled transition section having a minimum radius of approximately 8'0", unless adjacent construction will not permit such a transition or if such a transition defeats positive control of drainage.

B. Grading outside building lines:
1. Grade areas adjacent to buildings to achieve drainage away from the structures and to prevent ponding.

2. Finish the surfaces to be free from irregular surface changes, and:
a. Shape the surface of areas scheduled to be under walks to line, grade and cross-section, with finished surface not more than 0.10 ft above or below the required subgrade elevation.
b. Shape the surface of areas scheduled to be under pavement to line, grade and cross-section, with finished surface not more than 0.05 ft above or below the required subgrade elevation.

3.6 COMPACTING

A. Control soil compaction during construction to provide the minimum percentage of density specified for each area as determined according to ASTM D1557.

B. Provide not less than the following maximum density of soil material compacted at optimum moisture content for the actual density of each layer of soil material in place and as approved by the MoDOT Inspector.
1. Structures:
a. Compact the top 8" of subgrade and each layer of fill material or backfill material at 90% of maximum density.

2. Lawn and unpaved areas:
a. Compact the top 8" of subgrade and each layer of fill material or backfill material

at 90% of maximum density.

b. Compact the upper 12" of filled areas, or natural soils exposed by excavating, at 85% of maximum density.

3. Walks:

a. Compact the top 8" of subgrade and each layer of fill material or backfill material at 90% of maximum density.

4. Pavements:

a. Compact the top 8" of subgrade and each layer of fill material or backfill material at 90% of maximum density.

C. Moisture control:

1. Where subgrade or layer of soil material must be moisture-conditioned before compacting, uniformly apply water to surface of subgrade or layer of soil material to prevent free water appearing on surface during or subsequent to compacting operations.
2. Remove and replace or scarify and air dry, soil material that is too wet to permit compacting to the specified density.
3. Soil material that has been removed because it is too wet to permit compacting may be stockpiled or spread and allowed to dry. Assist drying by disking, harrowing, or pulverizing until moisture content is reduced to a satisfactory value as determined by moisture-density relation tests approved by the MoDOT Inspector.

3.7 MAINTENANCE

A. Protection of newly graded areas:

1. Protect newly graded areas from traffic and erosion, and keep free from trash and weeds;
2. Repair and establish grades in settled, eroded and rutted areas to the specified tolerances.

B. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, reshape and compact to the required density prior to further construction.

END OF SECTION

02221

TRENCHING, BACKFILLING AND COMPACTING

PART 1 GENERAL

1.1 SUMMARY

A. Trench, backfill, and compact as specified herein and as needed for installation of underground utilities associated with the Work.

B. Related work:

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

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirement and the methods needed for proper performance of the work of this Section.

B. Use equipment adequate in size, capacity and numbers to accomplish the work in a timely manner.

C. In addition to complying with requirements of governmental agencies having jurisdiction, comply with the directions of the construction soil engineer.

1.3 DELIVERY, STORAGE AND HANDLING

A. Comply with pertinent provisions of Section 01600.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

A. Fill and backfill materials:

1. Provide soil materials free from organic matter and deleterious substances, containing no rocks or lumps over 6" in greatest dimension, and with not more than 15% of the rocks or lumps larger than 2-3/8" in their greatest dimension.
2. Fill material is subject to the approval of the owner/architect and is that material removed from excavations or imported from off-site borrow areas, predominantly granular, non-expansive soil free from roots and other deleterious matter.
3. Do not permit rocks having a dimension greater than 1" in the upper 12" of fill.
4. Cohesionless material used for backfill: Provide sand free from organic material and other foreign matter and as approved by the Owner/Architect.

2.2 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 PROCEDURES

A. Utilities:
1. Unless shown to be removed, protect active utility lines shown on the drawings or otherwise made known to the Contractor prior to trenching. If damaged, repair or replace at no additional cost to the Owner.
2. If active utility lines are encountered, and are not shown on the Drawings or otherwise made known to the Contractor, promptly take necessary steps to assure that service is not interrupted.
3. If service is interrupted as a result of work under this Section, immediately restore service by repairing the damaged utility at no additional cost to the Owner.
4. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the Architect and secure his instructions.
5. Do not proceed with permanent relocation of utilities until written instructions are received form the Architect.

B. Protection of persons and property:
1. Barricade open holes and depressions occurring as part of the Work, and post warning lights on property adjacent to or with public access.
2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
3. Protect structures, utilities, sidewalks, pavements and other facilities from damage caused by settlement, lateral movement, washout and other hazards created by operations under this Section.

C. Dewatering:
1. Remove all water, including rainwater, encountered during trench and sub-structure work to an approved location by pumps, drains and other approved methods.
2. Keep trenches and site construction area free from water.

D. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors and to other work being performed on or near the site.

E. Maintain access to adjacent areas at all times.

3.3 TRENCHING

A. Comply with pertinent provisions of Section 02220 and the provisions of this Section.

B. Provide sheeting and shoring necessary for protection of the Work and for the safety of personnel.
1. Prior to backfilling, remove all sheeting.
2. Do not permit sheeting to remain in the trenches except when, in the opinion of the Architect, field conditions or the type of sheeting or methods of construction such as use of concrete bedding are such as to make removal of sheeting impracticable. In such cases, the Architect may permit portions of sheeting to be cut off and remain in the trench.

C. Open cut:
1. Excavate for utilities by open cut.
2. If conditions at the site prevent such open cut and if approved by the Architect, trenching may be used.
3. Short sections of a trench may be tunneled if, in the opinion of the Architect, the conductor can be installed safely and backfill can be compacted properly into such tunnel.
4. Where it becomes necessary to excavate beyond the limits of normal excavations lines in order to remove boulders or other interfering objects, backfill the voids remaining after removal of the objects as directed by the construction soil engineer.
5. When the void is below the subgrade for the utility bedding, use suitable earth materials

and compact to the relative density directed by the construction soil engineer, but in no case to a relative density less than 90%%.

6. When the void is in the side of the utility trench or open cut, use suitable earth or sand compacted or consolidated as approved by the construction soil engineer but in no case to a relative density less than 80%.
7. Remove boulders and other interfering objects and backfill voids left by such removals, at no additional cost to the Owner.
8. Excavating for appurtenances:
   a. Excavate for manholes and similar structures to a distance sufficient to leave at least 12" clear between outer surfaces and the embankment or shoring that may be used to hold and protect the banks.
   b. Overdepth excavation beyond such appurtenances that has not been directed will be considered unauthorized. Fill with sand, gravel or lean concrete as directed by the construction soil engineer and at no additional cost to the Owner.

D. Trench to the minimum width necessary for proper installation of the utility, with sides as nearly vertical as possible. Accurately grade the bottom to provide uniform bearing for the utility.

E. Depressions:
1. Dig bell holes and depressions for joints after the trench has been graded. Provide uniform bearing for the pipe on prepared bottom of the trench.
2. Except where rock is encountered, do not excavate below the depth indicated or specified.
3. Where rock is encountered, excavate rock to a minimum overdepth of 4" below the trench depth indicated or specified.

F. Where utility runs traverse public property or are subject to governmental or utility company jurisdiction, provide depth, bedding, cover and other requirements as set forth by legally constituted authority having jurisdiction but in no case less than the depth shown in the Contract Documents.

G. Where trenching occurs in existing lawns, remove turf in sections and keep damp. Replace turf upon completion of the backfilling.

H. Cover:
1. Provide minimum trench depth indicated below to maintain a minimum cover over the top of the installed item below the finish grade or subgrade.
   a. Areas subject to vehicular traffic:
      (1) Sanitary sewers:
      (2) Storm drains:
   b. Areas not subject to vehicular traffic:
      (1) Sanitary sewers: 30";
      (2) Storm drains: 18".
   c. All areas:
      (1) Water lines: 30";
      (2) Natural gas lines: 24";
      (3) Electrical cables: 42";
      (4) Electrical ducts: 36".
   d. Concrete encased:
      (1) Pipe sleeves for water and gas lines: 24";
      (2) Sanitary sewers and storm drains: 12";
      (3) Electrical ducts: 24".

2. Where utilities are under a concrete structure slab or pavement, the minimum depth need only be sufficient to completely encase the conduit or pipe sleeve and electrical long-radius rigid metal conduit rise, provided it will not interfere with the structural integrity of the slab or pavement.

3. Where the minimum cover is not provided encase the pipes in concrete as indicated. Provide concrete with a minimum 28th day compressive strength of 2,500 psi.

3.4 BEDDING

A. Provide bedding as indicated on the Drawings.

3.5 BACKFILLING

A. General:
1. Do not completely backfill trenches until required pressure and leakage tests have been performed, and until the utilities systems as installed conform to the requirements specified in the pertinent Sections of these Specifications.
2. Except as otherwise specified or directed for special conditions, backfill trenches to the ground surface with selected material approved by the construction soil engineer.
3. Reopen trenches that have been improperly backfilled, to a depth as required for proper compaction. Refill and compact as specified or otherwise correct to the approval of the construction soil engineer.
4. Do not allow or cause any of the Work performed or installed to be covered up or enclosed by work of this Section prior to required inspections, tests and approvals.
5. Should any of the Work be so enclosed or covered up before it has been approved, uncover all such Work and, after approvals have been made, refill and compact as specified, all at no additional cost to the Owner.

B. Lower portion of trench:
1. Deposit approved backfill and bedding material in layers of 6" maximum thickness, and compact with suitable tampers to the density of the adjacent soil, or grade as specified herein, until there is a cover of not less than 24" over sewers and 12" over other utility lines.
2. Take special care in backfilling and bedding operations to not damage pipe and pipe coatings.

C. Remainder of trench:
1. Except for special materials for pavements, backfill the remainder of the trench with material free from stones larger than 6" or 1/2 the layered thickness, whichever is smaller, in any dimension.
2. Deposit backfill material in layers not exceeding the thickness specified and compact each layer to the minimum density directed by the construction soil engineer.

D. Adjacent to buildings: Mechanically compact backfill within ten feet of buildings.

E. Consolidation of backfill by jetting with water may be permitted, when specifically approved by the construction soil engineer, in areas other than building and pavement areas.

3.6 TEST FOR DISPLACEMENT OF SEWERS AND STORMDRAINS

A. Check sewers and storm drains to determine whether displacement has occurred after the trench has been backfilled to above the pipe and has been compacted as specified.
B. Flash a light between manholes or, if the manholes have not yet been constructed, between the locations of the manholes, by means of a flashlight or by reflecting sunlight with a mirror.
C. If the illuminated interior of the pipeline shows poor alignment, displaced pipes, or any other defects, correct the defects to specified conditions and at no additional cost to the Owner.

3.7 PIPE JACKING

A. The Contractor may, at his option, install steel pipe casings, tongue-and-groove reinforced concrete pipes, and steel pipes under existing roads or pavements by jacking into place using procedures

approved by the governmental agencies having jurisdictional approved by the construction soil engineer.

3.8 TUNNELING OPERATIONS

A. The Contractor may, at his option, tunnel pipes into position using procedures approved by the construction soil engineer and the governmental agencies having jurisdiction.

3.9 FIELD QUALITY CONTROL

A. The construction soil engineer will inspect open cuts and trenches before installation of utilities, and will make the following tests:
   1. Assure that trenches are not backfilled until all tests have been completed.
   2. Check backfilling for proper layer thickness and compaction.
   3. Verify that test results conform to the specified requirements, and that sufficient tests are performed.
   4. Assure that defective work is removed and properly replaced.

END OF SECTION

02660

WATER DISTRIBUTION SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. Provide water distribution system as shown on the Drawings, specified herein and needed for a complete and proper installation.

B. Related work:

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

1.2 SUBMITTALS

A. Product data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Materials list of items proposed to be provided under this Section;
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
3. Names and addresses of the nearest service and maintenance organization that readily stocks repair parts.
4. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.4 DELIVERY, STORAGE AND HANDLING

A. Comply with pertinent provisions of Section 01600.

PART 2 PRODUCTS

2.1 PIPE AND FITTINGS

A. General:

1. Assume connection point to building service lines as being approximately five feet outside buildings and structures to which service is required.
2. Pipe materials 3" size and larger: Use cast iron, ductile iron, plastic or asbestos cement pipes unless otherwise indicated or approved in advance by the Architect.
3. Pipe materials less than 3" size: Use PVC or galvanized steel.

B. Pipe:

1. Cast iron pipe:
   a. Comply with ANSI A-21.6 or ANSI A-21.8, with working pressure of not less than 150 psi unless otherwise shown or specified.
   b. Use cement mortar lining complying with ANSI A-21.4 or AWWA C205, standard thickness.
2. Ductile iron pipe:

a. Comply with ANSI A-21.51, with working pressure of not less than 150 psi unless otherwise shown or specified.
b. Use cement mortar lining complying with ANSI A-21.4 or AWWA C205, standard thickness.

3. Plastic pipe:
a. Use acrylonitrile-butadine-styrene (ABS) complying with ASTM D15527; or
b. Use polyvinyl-chloride (PVC) complying with ASTM D1785, schedule 40.

4. Galvanized steel:
a. Use steel pipe risers and fittings, with PVC or ABS couplings below grade to steel risers for hose bibbs, and complying with ASTM A120.

C. Joints:

1. Cast iron or ductile iron pipe:
a. Use mechanical joints of the stuffing-box type complying with ANSI A-21.11 as modified by ANSI A-21.51 for ductile iron pipe, with push-on joints complying with ANSI A-21.11 for cast iron, and ANSI A-21.51 for ductile iron; or
b. Use rubber gaskets and lubricant complying with applicable requirements of ANSI A-21.11.

2. Plastic pipe:
a. Use solvent cement for PVC joints complying with ASTM D2564.
b. Use solvent cement for ABS joints complying with ASTM D2235.

3. Steel pipe fittings 2-1/2" or less in diameter:
a. Use malleable iron bonded screw fittings, manufactured to standards of ANSI B-16.3.
b. Use unions that are screwed, malleable iron, ground joint, 300 lb AAR, with bronze-to-iron seat.

4. Insulating joints:
a. Provide between non-threaded ferrous and non-ferrous metallic pipe, fittings, and values.
b. Use sandwich type flange insulating gasket of the dielectric type, insulating washers and insulating sleeves for flange bolts.
c. Use full faced insulating gaskets with outside diameter equal to the flange outside diameter.
d. Use full-length bolt insulating sleeves.
e. Install in a manner to prevent metal-to-metal contact of dissimilar metallic piping elements.

D. Fittings and specials:

1. Cast iron pipe and ductile iron pipe:
a. Use fittings and specials suitable for 150-psi pressure rating unless otherwise specified.
b. For use with mechanical joint pipe, comply with ANSI A-21.10.
c. For use with push-on joint pipe, comply with ANSI A21.10 and ANSI A-21.11.
d. Use cement mortar lining complying with ANSI A-21.4, standard thickness.

2. Plastic pipe:
a. Use fittings and specials suitable for schedule 40 rating, unless otherwise specified or directed.
b. Use fittings and specials for PVC pipe complying with ASTM D2468.
c. Use schedule 80 under paved areas with heavy truck traffic.

3. Steel pipe: Comply with ANSI B-16.3, using fittings and specials made for steel pipe.

E. Valves

1. Gate valves:
a. Use gate valves designed for a working pressure of not less than 150 p.s.i.
b. Provide connections as required for the piping in which they are installed.

c. Provide a clear waterway equal to the full nominal diameter of the valve, opens by turning counter clockwise.
d. Provide an arrow on the operating nut or wheel, cast in metal, indicating direction of opening.
e. Valves smaller than 3":
(1) Provide all bronze, screwed, single wedge disc, screw-in bonnet, packing gland and nut with non-rising stem.
(2) Buried valves: Install in suitable precast concrete hand hole with cover marked "WATER".
f. Valves 3" and larger:
(1) Design in accordance with AWWA C500, standard, bronze trimmed, non-rising stem and solid wedge disc valves.
(2) Buried valves: Provide 2" operating nuts and in a suitable valve box with extension and marked cover.
(3) Provide tee handle socket operating wrenches of suitable size.

2. Check valves:
a. Use check valves designed for a working pressure of not less than 150 p.s.i or as indicated or directed, with a clear waterway equal to the full nominal diameter of the valve.
b. Use valves designed to permit flow in one direction, when the inlet pressure is greater than the discharge pressure and to close tightly to prevent return flow when discharge pressure exceeds inlet pressure.
c. Distinctly cast on the body of each valve:
(1) Manufacturer's name, initials or trademark by which he can be identified readily;
(2) Valve size;
(3) Working pressure;
(4) Direction of flow.
d. Valves 2" and smaller: Provide all bronze, designed for screwed fittings.
e. Valves larger than 2":
(1) Provide iron body, bronze mounted, with flanged ends, of the non-slam type;
(2) Provide class 125 flanges complying with ANSI B-16.1.

F. Service fittings:
1. Asbestos cement main, 6" or less in diameter:
a. For 3/4" service diameter, use 3/4" corporation stop.
b. For service 1" in diameter to 2-1/2" in diameter, use double strap service clamp with corporation stop.
2. Asbestos cement main, 8" and larger in diameter:
a. For service 3/4" in diameter to 1" in diameter, use 1" corporation stop.
b. For service 1-1/2" in diameter to 2-1/2" in diameter; use double strap service clamp with corporation stop.
3. PVC mains smaller than 2" in diameter:
a. Make 3/4" maximum service with tees or plastic valve tees.
b. Acceptable products:
(1) As manufactured by Mueller Company, Decatur, Illinois.
4. PVC mains 2" to 3-1/2" in diameter: For 3/4" service to 1" service, use bronze service clamp and bronze corporation stop designed for PVC pipe.
5. Service clamps and corporation stops:
a. Use bronze.
b. Provide service clamp with flattened straps and molded neoprene gaskets.
6. Services larger than those stated above: Make with standard tees on new lines and tapping tees on existing lines.

2.2 TAPPING SLEEVES

A. Provide sleeve type coupling for existing water mains, furnished with outlet flanged to American 125 standard (ASA series 15):
   1. Acceptable products:
      a. Clow Corporation, Corona, California; boltless type:
         (1) Model C1 series for existing cast iron mains, complying with AWWA class A;
         (2) Model CA for class 150 and class 200 existing asbestos cement mains.
   2. Coordinate requirements of tapping sleeves with gate valves and other fittings as required.

2.3 VALVE BOXES

A. Valves 3" and larger:
   1. Use service box of cast iron, extension type of the required length, with screw adjustment.
   2. Provide the word "WATER" cast into the cover.
   3. Acceptable products:
      a. Alhambra Foundry Company, Alhambra, California:
         (1) For valves 6" and smaller: Model A-3004;
         (2) For valves 8" and larger: Model 3005.

B. Valves 2-1/2" and smaller:
   1. Use precast concrete box with the word "WATER" cast into the cover.
   2. Provide risers on pipeline to place valve within box depth.
   3. Acceptable products:
      a. Manufactured by Brooks Products, Inc., El Monte, California.

2.4 DOMESTIC WATER PIPE INSULATION

A. Provide and install 1/2" thick foam insulation (beyond pipe diameter) on all cold water lines.
B. Provide R-2 minimum foam insulation on all hot water lines.
C. Accessories: Use insulated foam tape at all insulation joints, elbows etc. so no water line is exposed.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 FIELD MEASUREMENT

A. Make necessary measurements in the field to assure precise fit of items in accordance with the approved design.

3.3 HANDLING

A. Handle pipe accessories so as to ensure delivery to the trench in sound, undamaged condition:
   1. Carry pipe into position; do not drag.
   2. Use pinch bars or tongs for aligning or turning the pipe only on the bare end of the pipe.
B. Thoroughly clean interior of pipe and accessories before lowering pipe into trench. Keep clean during laying operations by plugging or other method approved by the Architect.

C. Before installation, inspect each piece of pipe and each fitting for defects:

1. Material found to be defective before or after laying: Replace with sound material meeting the specified requirements and without additional cost to the Owner.

D. Rubber gaskets: Store in a cool dark place until just prior to time of installation.

3.4 PIPE CUTTING

A. Cut pipe neatly and without damage to the pipe.

B. Unless otherwise recommended by the pipe manufacturer, and authorized by the Architect, cut pipe with mechanical cutter only.
   1. Use wheel cutters when practicable.
   2. Cut plastic pipe square, and remove all burrs.

3.5 LOCATING

A. Locate water pipe at least ten feet away, horizontally, from sewer pipes.
   1. Where bottom of the water pipe will be at least 12" above top of the sewer pipe, locate water pipe at least six feet away, horizontally, from the sewer pipe.

B. Where water lines cross under gravity-flow sewer lines, fully encase the sewer pipe in concrete for a distance of at least ten feet each side of the crossing or provide pressure pipe with no joint located within 36" of the crossing.
   1. Cross water lines in cases above sewage force mains of inverted siphons at least 24" above the sewer line.
   2. Encase in concrete those joints in the sewer main closer, horizontally, than 36" to the crossing.

C. Do not place water lines in the same trench with sewer lines or electric wiring.

3.6 JOINT DEFLECTION

A. Cast iron pipe:
   1. Maximum allowable deflection will be given in AWWA C600.
   2. Table I shows maximum deflections for 18-foot lengths of pipe. For other lengths, deflection may vary proportionately.
   3. If alignment requires deflection-exceeding limits shown in Table I, furnish special bends or a sufficient number of shorter lengths of pipe to provide angular deflections within the limits shown.
   4. Table I, deflection in inches:

Diameter:	Push-on joint pipe:	Mechanical joint pipe:
3"	19"	31"
4"	19"	31"
6"	19"	27"
8"	19"	10"

B. Plastic pipe: Unless a lesser amount is recommended by the pipe manufacturer, maximum allowable deflections from a straight line or grade or offsets, will be five degrees.

3.7 PLACING AND LAYING

A. General:
   1. Lower pipe and accessories into trench by means of derrick, ropes, belt slings or other equipment approved by the Architect.
   2. Do not dump or drop any of the materials of this Section into the trench.
   3. Except where necessary in making connections to other lines, lay pipe with the bells facing in the direction of laying.
   4. Rest the full length of each section of pipe solidly on the pipe bed, with recesses excavated

to accommodate bells, couplings and joints.

5. Take up and relay pipe that has the grade or joint disturbed after laying.
6. Do not lay pipe in water, or when trench conditions are unsuitable for the work; keep water out of the trench until jointing is completed.
7. Securely close open ends of pipe, fittings and valves when work is not in progress.
8. Where any part of coating or lining is damaged, repair to the approval of the Architect and at no additional cost to the Owner.

B. Plastic pipe:

1. Position pipe and fittings in trench in a manner that identifying markings will be readily visible for inspection.
2. Cutting and joining:
   a. Protect against abrasion from serrated holding devices.
   b. Remove burrs and glosses from surfaces to be jointed; use abrasive paper, file, or steel wool.
   c. Remove dirt, dust, and moisture by wiping clean with chemical cleaner or dry cloth.
   d. Using a pure bristle paint brush, apply an even coat of the specified solvent cement in the fitting socket and on the surface of the pipe to be joined.
   e. Promptly insert pipe into bottom of the fitting socket; turn the pipe slightly to assure an even distribution of cement.
   f. Remove excess solvent cement from exterior of the joint.
   g. Should cement begin to dry before the joint is made, reapply cement before assembling.
   h. Allow at least one hour for the joint to gain strength before handling or installing the pipe.
3. Do not thread plastic pipe; make connections only with the solvent cement or with special adapter fittings designed for the purpose
4. Align pipe system components without strain.
5. Support piping at intervals of not more than four feet, at ends, branch fittings and change of direction or elevation.
6. Support plastic pipe in trenches with a 3" layer of sand. Allow no rocks, debris, or potentially damaging substances within 6" of plastic pipe in trenches.
7. Provide an electrically continuous type TW insulated number 14 tracer wire in the trench along the pipe, fastened to the pipe at 20 foot intervals and terminating aboveground with a 12" lead taped around each riser.

C. Connections: Use special fittings to suit the actual conditions where connections are made between new work and existing mains. Use only those specials and fittings approved by the utility having jurisdiction.

D. Sleeves:

1. Where pipe passes through walls of valve pits or structures, provide cast iron wall sleeves.
2. Fill annular space between walls and sleeves with rich cement mortar.
3. Fill annular space between pipe and sleeves with mastic.

3.8 JOINTING

A. All joints:

1. Cast iron pipe, ductile iron pipe, mechanical joints, and push-on type joints: Install in accordance with AWWA C600, modified as necessary by the recommendation of the manufacturer to provide for special requirements of ductile iron pipe.
2. Make connections between different pipe and accessories with transition fittings.
3. Rubber gaskets: Handle, lubricate where necessary and install in strict accordance with the recommendations of the manufacturer.

3.9 SETTING VALVES AND VALVE BOXES

A. General:
1. Center valve boxes on the valves, setting plumb.
2. Tamp earth fill around each valve box to a distance of four feet on all sides or to the undisturbed trench face if less than four feet.
3. Tighten stuffing boxes and fully open and close each valve to assure that all parts are in working condition.

B. Service boxes:
1. Where water lines are located below paved streets having curbs, install boxes directly back of the curbs.
2. Where no curbing exists, install boxes in accessible locations beyond limits of street surfacing, walks, and driveways.

3.10 THRUST BLOCKS

A. General:
1. Provide thrust blocks, or metal tie rods and clamps or lugs, on plugs, caps, tees and bends deflecting 22-1/2 degrees or more either vertically or horizontally and on water lines 6" in diameter or larger.
2. Provide concrete thrust blocking with a compressive strength of 2,500 p.s.i in 28 days.

B. Installation:
1. Locate thrust blocking between solid ground and the fitting to be anchored.
2. Unless otherwise shown or directed by the Architect, place the base and thrust bearing sides of thrust blocking directly against undisturbed earth.
3. Sides of thrust blocking not subject to thrust may be placed against forms.
4. Place thrust blocking so the fitting joints will be accessible for repair.
5. Protect steel rods and clamps by galvanizing or by coating with bituminous paint.

3.11 TESTING AND INSPECTING

A. Closing uninspected work: Do not allow or cause any of the work of this Section to be covered up or enclosed until after it has been completely inspected and tested and has been approved by the Architect/owner.

B. Hydrostatic tests:
1. Where any section of a water line is provided with concrete thrust blocking for fittings, do not make hydrostatic tests until at least five days after installation of the concrete thrust blocking, unless otherwise directed by the Architect/owner.
2. Devise a method for disposal of wastewater from hydrostatic tests and for disinfecting, as approved in advance by the Architect/owner.

C. Pressure tests:
1. After the pipe is laid, the joints completed, fire hydrants permanently installed and the trench partially backfilled leaving the joints exposed for examination, subject the newly laid piping and valved sections of water distribution and service piping to a hydrostatic pressure of 200 p.s.i.
2. Open and close each valve several times during the test.
3. Carefully examine exposed pipe, joints, fittings and valves.
4. Replace or remake joints showing visible leakage.
5. Remove cracked pipe, defective pipe and cracked or defective joints, fittings and valves. Replace with sound material and repeat the test until results are satisfactory.
6. Make repair and replacement without additional cost to the Owner.

D. Leakage test:

1. Conduct leakage test after the pressure test has been completed satisfactorily.
2. Duration of each leakage test: At least two hours.
3. During the test, subject water lines to a pressure of 200 p.s.i.
4. Leakage is defined as the quantity of water to be supplied into the newly laid pipe or any valved or approved section thereof, necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled.
5. No piping installation will be accepted until the leakage is less than the number of gallons per hour as determined by formula, "L = 0.00304 ND x sq root of P," where:
   a. L = allowable leakage in gallons per hour;
   b. N = number of joints in length of pipe under test;
   c. D = nominal diameter of pipe in inches; and
   d. P = average test pressure in lbs per sq inch.
6. The allowable leakage in gallons per hour, per joint, at 200-psi average test pressure shall be in accordance with Table II.
7. Should any test of pipe disclose leakage greater than that specified in Table II, locate and repair the defective joint or joints until the leakage is within the specified allowance and at no additional cost to the Owner.
8. Table II:

Diameter:	Leakage in gal:	Diameter:	Leakage in gal:
2"	0.0153	12"	0.0915
3"	0.0231	14"	0.1070
4"	0.0306	16"	0.1225
6"	0.0458	18"	0.1375
8"	0.0610	20"	0.1530
10"	0.0765	24"	0.1830

E. Time for making test:

1. Except for joint material setting, or where concrete reaction backing necessitates a five day delay, pipelines jointed with rubber gaskets, mechanical, or push-on joints or couplings may be subjected to hydrostatic pressure, inspected and tested for leakage at any time after partial completion of backfill.
2. Asbestos cement pipe and cement mortar lined pipe may be filled with water as recommended by the manufacturer before being subjected to the pressure test and subsequent leakage test.

F. Disinfecting:

1. Before acceptance of the potable water system, disinfect each unit of completed water supply, distribution and service line in accordance with AWWA C601.
2. Perform all such tests and disinfecting in a manner approved by government agencies having jurisdiction.
3. Furnish two copies of a Certificate of Disinfecting to the Architect.

3.12 PAINTING

A. Paint valves, pipe and vents in accordance with the provisions of Section 09900.

END OF SECTION

02720

STORM SEWERAGE SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. Provide storm sewerage system where shown on the Drawings, as specified herein and as needed for a complete and proper installation.

B. Related work:

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

1.2 SUBMITTALS

A. Product data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Materials list of items proposed to be provided under this Section;
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
3. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01600.

PART 2 PRODUCTS

2.1 PIPE MATERIALS

A. Provide pipe and associated materials of the size indicated on the Drawings and meeting the following requirements.

1. Non-reinforced concrete pipe (NRCP): Provide "extra strength" complying ASTM C14.
2. Clay pipe (CP): Provide "extra strength" complying with ASTM C700.
3. Rectangular asbestos cement pipe (RACP) and transition units:
   a. Provide size as indicated on Drawings.
   b. Encase in concrete as shown on the Drawings.
   c. Acceptable products:
      (1) Manufactured by Industrial Building Materials Company, Los Angeles, California.
4. Polyvinyl chloride pipe (PVC):
   a. Acceptable products:
      (1) "Ringtite" plastic pipe and fittings, class 160, SDR 26, manufactured by Manville, Los Angeles, California.
5. Polyethylene material in plastic couplings: Comply with ASTM D2952.
6. Flexible watertight joints:

a. Provide rubber type gaskets for concrete pipe, complying with ASTM C433 but with shore durometer hardness type A, 40-55, in lieu of the hardness specified.
b. Provide factory-fabricated resilient materials for clay pipe, complying with ASTM C425.
c. Provide gasket and jointing materials with not more than one splice, except that two splices of rubber-gasket type will be permitted if the nominal diameter of the basket exceeds 54".

2.2 DRAINAGE STRUCTURES

A. General:
1. Construct manholes, inlets, and junction structures of reinforced concrete or precast reinforced concrete, complete with metal frames and covers or gratings and with fixed ladder rungs where indicated on the Drawings or required by codes.
2. Individual wall-mounted aluminum, plastic-covered steel or galvanized steel rungs are acceptable.

B. Materials:
1. Concrete: Comply with provisions for 3,000-psi concrete specified in Section 03300.
2. Mortar for pipe joints and connections to other drainage structures, and manhole construction:
a. Comply with requirements of ASTM C270, type M, except the maximum placement time shall be one hour.
b. Hydrated lime complying with ASTM C141, type B, may be added to the mixture of sand and cement in an amount equal to 25% of the volume of cement used.
c. Provide a quantity of water in the mixture sufficient to produce a stiff workable mortar, which shall be clean and free from harmful acids, alkalis, and organic impurities. Use the mortar within 30 minutes after water is added to the mix.
3. Precast reinforced concrete manholes:
a. Comply with ASTM C478, precast rings and cone sections.
b. Fully bed the joints between precast concrete risers and tops in mortar and smooth both interior and exterior surfaces uniformly.
c. Acceptable products:
(1) Manufactured by Alhambra Foundry, Alhambra, California.
4. Reinforcement: Provide intermediate grade billet steel complying with ASTM A615, grade 40.
5. Frames and covers or gratings:
a. Provide all gratings or covers from the same manufacturer.
b. Provide standard black finish, supplied as a total unit, sized as shown on the Drawings or larger sizes except where in a pavement area and with the wording "STORM DRAIN" cast into the cover.
c. Acceptable products:
(1) Manufactured by Alhambra Foundry, Alhambra, California.
6. Precast concrete catch basins:
a. Provide reinforced and bottom open for field pouring to ensure slope through the structure.
b. Contractor may select this option in lieu of cast-in-place concrete catch basins.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 EXCAVATING, TRENCHING AND BEDDING

A. Excavate, trench, and bed for site drains in accordance with pertinent provisions of Section 02220, and the following.

B. Movement of construction machinery:
   1. Use means necessary to avoid displacement of and injury to, pipe and structures while compacting by rolling or operating equipment parallel to the pipe.
   2. Movement of construction machinery over a culvert or storm drain at any stage of construction is solely at the Contractor's risk.

C. Bedding:
   1. Provide a bedding surface for the pipe with a firm foundation of uniform density throughout the entire length of the pipe.
   2. Bed the pipe carefully in a soil foundation accurately shaped and rounded to conform to the lower 1/4 of the outside perimeter of circular pipe or set the pipe in a bed of sand.
   3. Tamp bedding where necessary.
   4. Provide bell holes and depressions for pipe joints of only the length, depth, and width required for making the particular pipe joint properly.
   5. Where plastic pipe is used, provide a minimum of 4" of sand bedding over the top and under the pipe.

3.3 INSTALLING PIPE

A. General:
   1. Carefully examine each pipe prior to placing.
      a. Promptly set aside defective pipe and damaged pipe.
      b. Clearly identify defects.
      c. Do not install defective pipe or damaged pipe.
   2. Place pipe to the grades and alignment indicated, with a tolerance of one in 1000 vertical and one in 500 horizontal, unless otherwise directed by the Architect.
   3. Provide adequate facilities for lowering pipe safely into the trenches.
   4. Do not place pipe in water, nor place pipe when trench or weather is unsuitable for that work.

B. Concrete and clay pipe: Place by proceeding upgrade with the spigot ends of bell and spigot pipe and the tongue ends of tongue and groove pipe, pointing in the direction of flow.

3.4 JOINTS

A. Joining concrete pipe and clay pipe:
   1. Use the specified mortar ingredients.
   2. Use the mortar within 60 minutes from the time water is first added to the mix.
   3. Wipe the inside of the joint clean and smooth. Perform wiping by dragging a suitable swab or long handled brush through the pipe as installation progresses.
   4. Protect the mortar bead on the outside from air and sun with suitable covering until cured.
   5. Unless otherwise directed by the Architect, use one of the following methods of jointing for bell and spigot and tongue and groove pipe:
      a. Cement mortar bell and spigot joint:
         (1) Bed the first pipe to the established gradeline, with the bell end placed upstream.
         (2) Clean surface of bell with wet brush, and fill lower portion with mortar to such depth as to bring the inner surfaces of the abutting pipes flush and even.
         (3) Clean the spigot end of each subsequent pipe with a wet brush and uniformly match the bell so that the sections are closely fitted.
         (4) After laying each section, fill remainder of joint with mortar and form a bead around the outside of the joint with cheesecloth to retain mortar in place.
      b. Flexible watertight joints:

(1) Use the specified materials. Equal materials may be used when specifically approved in advance by the Architect.
(2) Install gaskets and joint materials in accordance with the manufacturers' recommendations as approved by the Architect.
(3) Protect from sun, blowing dust and other deleterious agents at all times.
(4) Align the pipe with previously installed pipe and pull the joint together. If, while making the joint, the gasket or jointing material becomes loose and can be seen through exterior joint recess when joint is pulled to within 1" of closure, remove pipe and remake the joint.
(5) Inspect gaskets, and replace loose and improperly affixed gaskets and jointing materials.

B. Polyvinyl chloride pipe joints: Install with the specified materials and in accordance with the manufacturers' recommendations as approved by the Architect, applying solvent cement to pipe and fitting as recommended in ASTM D2855.

C. Joining pipe of different materials: Provide fittings couplings made for the pipe material jointing, or provide a concrete collar as approved by the Architect.

D. Joining pipe of different sizes:
1. Provide reducer fittings to the larger pipe.
2. Where pipes are different materials as well as different sizes, use the same material for reducer fitting as in the larger pipe.
3. Use saddle connection when branch lines join a main or collector main.
4. Use eccentric collar joint when the slope of the pipe is less than 1%.

3.5 DRAINAGE STRUCTURES

A. Install drainage structures in accordance with the Drawings and with the manufacturers' recommendations as approved by the Architect.

3.6 BACKFILLING

A. Backfill and compact in accordance with pertinent provisions of Section 02220.

3.7 TESTING AND INSPECTING

A. Provide personnel and equipment necessary, and perform tests required to demonstrate that the work of this Section has been completed in accordance with the specified requirements.
B. Hydrostatic test on watertight joints:
1. Make a hydrostatic test on each watertight joint. Test one sample of each type watertight joint used. If one sample fails because of faulty workmanship, test an additional joint.
2. Demonstrate that joints in reinforced and unreinforced concrete pipe comply with ASTM C443.
3. Comply with ASTM C425 for tests of joints in clay pipe.
4. Make tests in concrete pipe and clay pipe at an internal hydrostatic pressure of 10 p.s.i for 24 hours.
5. Only joints within the building area and outside the building area but within ten feet of exterior walls or faces of the buildings need be tested.
6. Replace or repair joints found to be faulty. Repeat the test and repair cycle until joints are demonstrated to meet the specified requirements.

END OF SECTION

02730

SANITARY SEWERAGE SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. Provide sanitary sewerage system as shown on the Drawings, specified herein and needed for a complete and proper installation.

B. Related work:

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

1.2 SUBMITTALS

A. Product data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Materials list of items proposed to be provided under this Section;
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
3. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01600.

PART 2 PRODUCTS

2.1 PIPE AND FITTINGS

A. Cast iron soil pipe and fittings (CIP):

1. Comply with ASTM A74, class SV.
2. Use rubber gaskets complying with ASTM C564 for compression joints.

B. Clay pipe and fittings (VCP):

1. Use extra strength, minimum of SDR 35.
2. Comply with ASTM D3034.

C. Polyvinyl chloride pipe and fitting (PVC):

1. Use extra strength, minimum of SDR 35.
2. Comply with ASTM D3034.

D. Acrylonitrile butadine styrene pipe and fittings (ABS):

1. Comply with ASTM D2680.

2.2 MANHOLES

A. Precast:
1. Provide reinforced precast concrete manhole sections complying with ASTM C478, except use Portland cement as specified below.
2. Provide joints of mortar, with approved mastic or rubber gasket or an approved combination of those types.
3. Provide precast units of concrete rings and eccentric cone section with ladder rungs cast into the units.
4. Approved manufacturer:
a. Ameron Pipe Products Group.

B. Portland cement:
1. For concrete in manholes, comply with ASTM C150, type II.
2. For concrete in cradle and encasement: Type optional with the Contractor.

C. Concrete:
1. Provide 3000 psi concrete in accordance with pertinent provisions of Section 03300 of these Specifications.

D. Mortar:
1. Comply with ASTM C270, type M.

2.3 FRAMES AND COVERS

A. Use cast iron frames and covers, with the wording "SEWER" cast into the covers in letters 2" high and plainly visible, as manufactured by Alhambra Foundry.

2.4 CLEANOUTS

A. Provide cleanouts as required and where shown on the Drawings.
1. Provide traffic weight covers and frames where clean-outs are within pavement, with the letters "SSCO" cast into the cover.
2. Acceptable products:
a. Alhambra Foundry, Model A_2100, 10" round cover, unless otherwise shown on the Drawings.

B. Where cleanout is within a graded area, construct as shown on the Drawings or 100 ft on center minimum.

2.5 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 FIELD MEASUREMENTS

A. Make necessary measurements in the field to assure precise fit of items in accordance with the approved design.

3.3 INSTALLATION

A. Trench, backfill, and compact for the work of this Section in strict accordance with pertinent provisions of Section 02220 of these Specifications.

B. Location:

1. Where the sewer location is not located clearly by dimensions on the Drawings, locate the sewer:
    a. Where the bottom of the water pipe will be at least 12" above the top of the sewer pipe, the horizontal spacing may be a minimum of six feet.
    b. Where the gravity flow sewers cross above water lines, fully encase the sewer pipe for a distance of ten feet on each side of the crossing; or
    c. Use acceptable pressure pipe with no joint closer horizontally than three feet from the crossing.
    d. Where concrete encasement is used, provide not less than 4" thickness including that on pipe joints.

C. Pipe laying:

1. Protect pipe during handling against shocks and free fall. Remove extraneous material from the pipe interior.
2. Lay pipe by proceeding upgrade with the spigot ends of bell-and-spigot pipe pointing in direction of flow.
3. Lay each pipe accurately to the indicated line and grade, aligning so the sewer has a uniform invert.
4. Continually clear interior of the pipe free from foreign material.
5. Before making pipe joints, clean and dry all surfaces of the pipe to be joined.
6. Use lubricants, primers, and adhesives recommended for the purpose by the pipe manufacturer.
7. Place, fit, join, and adjust the joints to obtain the degree of water tightness required.

3.4 WYE BRANCHES

A. Provide wye branches where sewer connections are indicated or required.

1. Where joining an existing line, join by placing a saddle over the line, and make connection in a manner that will not obstruct or interfere with the existing flow.
2. When conditions are such that connection pipe cannot be supported adequately on undisturbed earth or compacted fill, encase the pipe in a concrete backfill or support on a concrete cradle.

B. Provide concrete required because of conditions resulting from faulty construction methods or negligence, at no additional cost to the Owner.

3.5 MANHOLES

A. General:

1. Shape the invert channels to be smooth and semicircular, conforming to the inside of the adjacent sewer section.
2. Make changes in direction of flow with a smooth curve of as large a radius as the size of the manhole will permit.
3. Make changes in size and grade of channels smoothly and evenly.
4. Form the invert channels directly in the concrete of the manhole base, with mortar, or by laying full section sewer pipe through the manhole and breaking out the top half after surrounding concrete has hardened.
5. Smooth the floor of the manhole outside the channels, and slope toward the channels at not less than 1" per foot nor more than 2" per foot.
6. Prevent free drop inside the manholes exceeding 18" measured from the invert of the inlet pipe to the top of the floor of the manhole outside the channels.

7. Construct drop manholes whenever the free drop otherwise would be greater than 18".

B. Manhole rungs:
   1. Provide each manhole with individual wall-mounted rungs fabricated of aluminum, plastic-covered steel or galvanized steel.
   2. Comply with the requirements of governmental agencies having jurisdiction.

C. Jointing and plastering:
   1. Completely fill mortar joints, and leave smooth and free from surplus mortar on the inside of the manhole.

D. Frames and covers: Unless otherwise shown on the Drawings, set frames and covers:
   1. In paved areas: So that the top of the cover will be flush with the finished pavement; or
   2. In unpaved areas: 2" higher than finished grade.

3.6 MANHOLE OVER EXISTING PIPE

A. Construct new manhole as specified, breaking upper half of existing pipe after base of manhole is completed so as not to obstruct flow of the existing pipe.

3.7 BUILDING CONNECTIONS

A. Terminate building connections where shown on the Drawings.

B. Provide temporary closures at terminals where the building pipe is not installed.
   1. Place marker post at grade end of plugged line.
   2. Where building piping has been installed, make connection to the building piping system.

3.8 TESTING AND INSPECTING

A. Do not allow or cause any of the work of this Section to be covered up or enclosed until after it has been inspected and tested and has been approved by the Architect.

B. Leakage tests:
   1. Test lines for leakage by exhilaration tests.
      a. Prior to testing for leakage, backfill the trench to at least the lower half of the pipe.
      b. If required, place sufficient additional backfill to prevent pipe movement during testing, leaving the joints uncovered to permit inspection.
   2. Water exhilaration tests:
      a. Test each section of sewer line between successive manholes by closing the lower end of the sewer to be tested and the inlet sewer of the upper manhole, using stoppers.
      b. Fill the manhole and pipe with water to a point four feet above the invert of the sewer at the center of the upper manhole; or, if groundwater is present, four feet above the average adjacent groundwater level.
      c. Allowable leakage will be computed by the formula:
         (1) For mortared joints: $E = 0.0001\ LD\ H$;
         (2) For all other joints: $E = 0.0002\ LD\ H$;
         (3) "L" is the length of sewer and house connections tested, in feet;
         (4) "E" is the allowable leakage in gallons per minute of sewer test;
         (5) "D" is the internal pipe diameter in inches;
         (6) "H" is the difference in elevation between the water surface in the upper manhole and the invert of the pipe at the lower manhole; or, if groundwater is present above the invert of the pipe in the lower manhole, the difference in elevation between water surface in the upper manhole and the groundwater at the lower manhole.
   3. Water infiltration test:
      a. If, in the opinion of the Architect, excessive groundwater is encountered in the

construction of a section of the sewer, the exhilaration test shall not be used.

b. Close the end of the sewer at the upper structure sufficiently to prevent the entrance of water.

c. Discontinue pumping of groundwater for at least three days, then test for infiltration.

d. Infiltration into each individual reach of sewer between adjoining manholes shall not exceed that allowed in the formula given for the exhilaration test, except that "H" in the formula shall be the difference between the groundwater surface and the invert of the sewer at the downstream manhole.

4. Provide and use measuring devices approved by the Architect.
5. Provide water, materials, and labor for making required tests.
6. Make tests in the presence of the Architect, gibing the Architect at least three days advance notice of being ready for test observation.

C. Submit test data to the Architect for review and approval.

END OF SECTION

03100

CONCRETE FORMWORK

PART 1 GENERAL

1.1 REFERENCES

A. ACI 301 - Structural Concrete for Buildings.
B. ACI 318 - Building Code Requirements for Reinforced Concrete.
C. ACI 347 - Recommended Practice For Concrete Formwork.
D. PS 1 - Construction and Industrial Plywood.

1.2 DESIGN REQUIREMENTS

A. Design, engineer and construct formwork, shoring and bracing to conform to design and code requirements; concrete to conform to required shape, line and dimension.

1.3 SUBMITTALS

A. Submit under provisions of Section 01300.
B. Product Data: Provide data on void form materials and installation requirements.

1.3 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 347.

1.4 REGULATORY REQUIREMENTS

A. Conform to applicable code for design, fabrication, erection and removal of formwork.

1.5 FIELD SAMPLES

A. Provide under provisions of Section 01400. Coordinate with requirements stated in Section 03100 and 03300.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01600.
B. Deliver void forms and installation instructions in manufacturer's packaging.
C. Store off ground in ventilated and protected manner to prevent deterioration from moisture.

1.7 COORDINATION

A. Coordinate this Section with other Sections of work that require attachment of components to formwork.
B. If formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement before proceeding, request instructions from Architect/Engineer.

PART 2 PRODUCTS

2.1 WOOD FORM MATERIALS

A. Plywood: Douglas Fir species; grade B/B plyform class 1 or 2; sound undamaged sheets with clean, true edges.

B. Lumber: Douglas Fir species; standard grade; with grade stamp clearly visible.

2.2 PREFABRICATED FORMS

A. Preformed Steel Forms: Minimum 16 gage matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.
B. Pan Type: Steel of size and profile required.
C. Tubular Column Type: Round, spirally wound laminated fiber material, surface treated with release agent, non-reusable, of sizes required.
D. Void Forms: Moisture resistant treated paper faces, biodegradable, structurally sufficient to support weight of wet concrete mix until initial set; 2 inches thick.

2.3 FORMWORK ACCESSORIES

A. Form Ties: Snap-off type, galvanized metal, fixed length, cone type, with waterproofing washer, free of defects that could leave holes larger than 1 inch in concrete surface.

B. Form Release Agent: Colorless mineral oil which will not stain concrete, or absorb moisture, or impair natural bonding or color characteristics of coating intended for use on concrete.

C. Dovetail Anchor Slot: Galvanized steel, 22 gauge thick, foam filled, release tape sealed slots, anchors for securing to concrete formwork.

D. Flashing Reglets: Galvanized steel, 22 gage thick, longest possible lengths, with alignment splines for joints, foam filled, release tape sealed slots, anchors for securing to concrete formwork.

E. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

F. Waterstops: Rubber, minimum 1,750 p.s.i tensile strength, minimum 50 degrees F to plus 175 degrees F working temperature range, wide, maximum possible lengths, ribbed profile, preformed corner sections, heat welded jointing.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.2 EARTH FORMS

A. Earth forms are not permitted except for spread and column footings, which are to be square and free of debris.

3.3 ERECTION - FORMWORK

A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with ACI 301.
B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to over stressing by construction loads.
C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
D. Align joints and make watertight. Keep form joints to a minimum.
E. Obtain approval before framing openings in structural members that are not indicated on Drawings.
F. Install void forms in accordance with manufacturer's recommendations. Protect forms from moisture or crushing.

3.4 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
B. Apply prior to placement of reinforcing steel, anchoring devices and embedded items.
C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.5 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for items to be embedded in passing through concrete work.
B. Locate and set in place items which will be cast directly into concrete.
C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts and components of other Work.
D. Install accessories in accordance with manufacturer's instructions, straight, level and plumb. Ensure items are not disturbed during concrete placement.
E. Install water-stops continuous without displacing reinforcement. Heat seal joints watertight.
F. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
G. Close temporary openings with tight fitting panels, flush with inside face of forms and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3.6 FORM CLEANING

A. Clean forms as erection proceeds, to remove foreign matter within forms.
B. Clean formed cavities of debris prior to placing concrete.
C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
D. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.7 FORMWORK TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 301.

3.8 FIELD QUALITY CONTROL

A. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design and that supports, fastenings, wedges, ties and items are secure.
B. Do not reuse wood formwork more than 2 times for concrete surfaces to be exposed to view. Do not patch formwork.

3.9 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.
B. Loosen forms carefully. Do not wedge pry bars, hammers or tools against finish concrete surfaces scheduled for exposure to view.
C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

END OF SECTION

03200

CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 REFERENCES

A. ACI 301 - Structural Concrete for Buildings.

B. ACI 318 - Building Code Requirements For Reinforced Concrete.

C. ACI SP-66 - American Concrete Institute - Detailing Manual.

D. ACI 315-99 – Details and Detailing of Concrete Reinforcement.

E. ANSI/ASTM A82 - Cold Drawn Steel Wire for Concrete Reinforcement.

F. ANSI/ASTM A184 - Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.

G. ANSI/ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.

H. ANSI/AWS D1.4 - Structural Welding Code for Reinforcing Steel.

I. ASTM A615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.

J. AWS D12.1 - Welding Reinforcement Steel, Metal Inserts and Connections in Reinforced Concrete Construction.

K. CRSI - Concrete Reinforcing Steel Institute - Manual of Standard Practice.

L. CRSI - Placing Reinforcing Bars.

1.2 QUALITY ASSURANCE

A. Perform Work in accordance with CRSI - Manual of Standard Practice & ACI 318.

1.3 COORDINATION

A. Coordinate work under provisions of Section 01039.
B. Coordinate with placement of formwork, formed openings and other Work.

PART 2 PRODUCTS

2.1 REINFORCEMENT

A. Reinforcing Steel: ASTM A615, yield grade; deformed billet steel bars, unfinished.
B. Reinforcing Steel Plain Bar and Rod Mats: ASTM A704, ASTM A615, Grade 60; steel bars or rods, unfinished.
C. Stirrup Steel: ANSI/ASTM A82, unfinished.
D. Welded Steel Wire Fabric: ASTM A815; in flat sheets.

2.2 ACCESSORY MATERIALS

A. Tie Wire: Minimum gage annealed type.

B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent vapor barrier puncture.

C. Special Chairs, Bolsters, Bar Supports, Spacers Adjacent to Weather Exposed Concrete Surfaces: Plastic coated steel; size and shape as required.

2.3 FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI Manual of Practice ACI SP-66.

PART 3 EXECUTION

3.1 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position.

B. Do not displace or damage vapor barrier.

C. Accommodate placement of formed openings.

D. Conform to applicable code for concrete cover over reinforcement.

END OF SECTION

03300

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 REFERENCES

A. ACI 301 - Structural Concrete for Buildings.

B. ACI 302 - Guide for Concrete Floor and Slab Construction.

C. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.

D. ACI 305R - Hot Weather Concreting.

E. ACI 306R - Cold Weather Concreting.

F. ACI 318 - Building Code Requirements for Reinforced Concrete.

G. ANSI/ASTM D994 - Preformed Expansion Joint Filler for Concrete (Bituminous Type).

H. ANSI/ASTM D1190 - Concrete Joint Sealer, Hot-Poured Elastic Type.

I. ANSI/ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).

J. ANSI/ASTM D1752 - Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

K. ASTM C33 - Concrete Aggregates.

L. ASTM C94 - Ready-Mixed Concrete.

M. ASTM C150 - Portland cement.

N. ASTM C260 - Air Entraining Admixtures for Concrete.

1.2 SUBMITTALS

A. Submit under provisions of Section 01300.
B. Product Data: Provide data on joint devices, attachment accessories and admixtures.

1.3 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301.

1.4 COORDINATION

A. Coordinate work under provisions of Section 01039.
B. Coordinate the placement of joint devices with erection of concrete formwork and placement of form accessories.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

A. Cement: ASTM C150, Type I - Normal, Type II - Moderate, Type V - Sulfate Resistant.
B. Fine and Coarse Aggregates: ASTM C33.
C. Water: Clean and not detrimental to concrete.

2.2 ADMIXTURES

A. Air Entrainment: ASTM C260.

2.3 ACCESSORIES

A. Bonding Agent: Polymer resin emulsion.
B. Vapor Barrier: thick clear polyethylene film.
C. Non-Shrink Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 psi in 48 hours and 7,000 psi in 28 days.

2.4 JOINT DEVICES AND FILLER MATERIALS

A. Joint Filler Type A: ASTM D1751; ASTM D994; Asphalt impregnated fiberboard or felt, 1/2" thick; tongue and groove profile.
B. Joint Filler Type B: ASTM D1752; Closed cell polyvinyl chloride foam, resiliency recovery of 95 percent if not compressed more than 50 percent of original thickness.
C. Joint Filler Type C; ASTM D1752; Pre-molded sponge rubber fully compressible with recovery rate of minimum 95 percent.
D. Expansion Joint Devices: ASTM B221 alloy, extruded aluminum; resilient filler strip with a Shore A hardness of 35 to permit plus or minus 25 percent joint movement with full recovery; extruded aluminum cover plate, of longest manufactured length at each location, flush Mounted, color as selected.
E. Sealant: ASTM D1190; polymer based asphalt or coal tar and rubber compound.

2.5 FIBEROUS REINFORCEMENT

A. Fiberous concrete reinforcement shall be one hundred percent (100%) virgin polypropylene fibrillated fibers specifically manufactured for use as concrete reinforcement, containing no reprocessed olefin materials. The fibers shall have the following physical characteristics:
    1. Specific gravity – 0.91.
    2. Tensile strength – 70,000 to 110,000 psi.
    3. Fiber length – per manufacturer's recommendation for specific use.
B. Add fiberous concrete reinforcement to concrete materials at the time the concrete is batched in the amounts recommended by the manufacturer (1.5 lb/cubic yard for sidewalks) or as indicated on the accepted plans.
C. Concrete shall be mixed in strict accord with the fiberous concrete reinforcement manufacturer's instructions and recommendations to assure uniform and complete dispersion.

2.6 CONCRETE MIX

A. All concrete shall be Type 1 cement with a compressive strength of 4,000 p.s.i. at 28 days.
B. Mix concrete in accordance with ACI 304. Deliver concrete in accordance with ASTM C94.
C. Use accelerating admixtures in cold weather only not to exceed 1%. Use of admixtures will not relax cold weather placement requirements.
D. Use calcium chloride only when approved by Architect/Engineer.

E. Use set retarding admixtures during hot weather only when approved by Architect/Engineer.
F. Add air entraining agent to normal weight concrete mix for work exposed to exterior.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify requirements for concrete cover over reinforcement.
B. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely and will not cause hardship in placing concrete.

3.2 PREPARATION

A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.
B. In locations where new concrete is dowelled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

3.3 PLACING CONCRETE

A. Place concrete in accordance with ACI 304 & ACI 301.

B. Notify Architect/Engineer minimum 24 hours prior to commencement of operations.

C. Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints are not disturbed during concrete placement.

D. Separate slabs on grade from vertical surfaces with ½" thick joint filler.

E. Place joint filler in floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

F. Extend joint filler from bottom of slab to within 1/2 inch of finished slab surface. Conform to Section 07900 for finish joint sealer requirements.

G. Install joint devices in accordance with manufacturer's instructions.

H. Install construction joint devices in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

I. Install joint device anchors. Maintain correct position to allow joint cover to be flush with floor and wall finish.

J. Install joint covers in longest practical length, when adjacent construction activity is complete.

K. Apply sealants in joint devices in accordance with Section 07900.

L. Place concrete continuously between predetermined expansion, control and construction joints.

M. Do not interrupt successive placement; do not permit cold joints to occur.

N. Place floor slabs in pattern indicated on drawings.
O. Saw cut joints within 24 hours after placing. Use 3/16" thick blade, cut into 1/4 depth of slab thickness. If in-slab-heating is used cut joints 1/2 inch deep.

P. Screed floors and slabs on grade level, maintaining surface flatness of maximum.

3.4 SEPARATE FLOOR TOPPINGS

A. Prior to placing floor topping, roughen substrate concrete surface and remove deleterious material. Broom and vacuum clean.
B. Place required dividers, edge strips, reinforcing, and other items to be cast in.
C. Apply bonding agent to substrate in accordance with manufacturer's instructions.

3.5 CONCRETE FINISHING

A. Provide formed concrete surfaces to be left exposed with smooth rubbed finish.
B. Finish concrete floor surfaces to requirements of Section 03346.

3.6 CURING AND PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
C. Cure concrete floor surfaces to requirements of Section 03370.
D. Cure floor surfaces in accordance with ACI 308.

3.7 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed in accordance with ACI 301 and under provisions of Section 01400.
B. Provide free access to Work and cooperate with appointed firm.
C. Submit proposed mix design to architect for review prior to commencement of Work.
D. Contractor shall supply testing of cement and aggregates to ensure conformance with specified requirements.
E. Contractor shall provide three concrete test cylinders per day for every 75 or less cu yards of concrete placed.
F. One additional test cylinder will be taken during cold weather concreting, cured on job site under same conditions as concrete it represents.
G. Contractor shall provide one slump test to be taken for each set of test cylinders taken.

3.8 PATCHING

A. Allow Architect/Engineer to inspect concrete surfaces immediately upon removal of forms.
B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Architect/Engineer upon discovery.
C. Patch imperfections as directed.

3.9 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
B. Repair or replacement of defective concrete will be determined by the Architect/Engineer.
C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect/Engineer for each individual area.

END OF SECTION

03346

CONCRETE FLOOR FINISHING

PART 1 GENERAL

1.1 REFERENCES

A. ACI 301 - Structural Concrete for Buildings.
B. ACI 302 - Guide for Concrete Floor and Slab Construction.
C. ASTM E1155 - Determining Floor Flatness and Levelness Using the F-Number System.

1.2 SUBMITTALS

A. Submit under provisions of Section 01300.
B. Product Data: Provide data on concrete hardener, sealer and slip resistant treatment, compatibilities and limitations.

1.3 MAINTENANCE DATA

A. Submit under provisions of Section 01700.
B. Maintenance Data: Provide data on maintenance renewal of applied coatings.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301 and ACI 302.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect, and handle products to site under provisions of Section 01039.
B. Deliver materials in manufacturer's packaging including application instructions.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Temporary Lighting: Minimum 200 W light source, placed above the floor surface, for each 100 square feet of floor being finished.
B. Do not finish floors until the interior heating system is operational.
C. Ventilation: Sufficient to prevent injurious gases from temporary heat or other sources affecting concrete.

1.7 COORDINATION

A. Coordinate the work with concrete floor placement and concrete floor curing.

PART 2 PRODUCTS

2.1 CURING/SEALING COMPOUNDS

A. Curing/sealing compound equal to Ashford Formula as distributed by:
Curecrete Chemical Company, Inc.
1201 W. Spring Creek Place
Springville, UT 84663
(801) 489-5663

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that floor surfaces are acceptable to receive the work of this section.

3.2 FLOOR FINISHING

A. Finish concrete floor surfaces in accordance with ACI 301 and ACI 302.
B. Steel trowel surfaces that will receive carpeting, resilient flooring and seamless flooring.
C. Steel trowel surfaces that areas scheduled to be exposed.
D. In areas with floor drains, maintain design floor elevation at walls; slope surfaces uniformly to drains at nominal.

3.3 FLOOR SURFACE TREATMENT

A. Apply sealer in accordance with manufacturer's instructions on floor surfaces.

3.4 TOLERANCES

A. Maximum Variation of Surface Flatness For Exposed Concrete Floors: 1/4 inch.
B. Maximum Variation of Surface Flatness Under Seamless Resilient Flooring: 1/8 in.
C. Maximum Variation of Surface Flatness Under Carpeting: 1/8 in.

END OF SECTION

03370

CONCRETE CURING

PART 1 GENERAL

1.1 REFERENCES

A. ACI 301 - Structural Concrete for Buildings.
B. ACI 302 - Recommended Practice for Concrete Floor and Slab Construction.
C. ACI 308 - Standard Practice for Curing Concrete.
D. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
E. ASTM D2103 - Polyethylene Film and Sheeting.

1.2 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301 and ACI 302.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products under provisions of Section 01600.
B. Deliver curing materials in manufacturer's packaging including application instructions.

PART 2 PRODUCTS

2.1 MATERIALS

A. Curing/sealing compound equal to Ashford Formula as distributed by:
Curecrete Chemical Company, Inc.
1201 W. Spring Creek Place
Springville, UT 84663
(801)489-5663

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces are ready to be cured.

3.2 EXECUTION - HORIZONTAL SURFACES

A. Cure floor surfaces in accordance with ACI 308.

3.3 EXECUTION - VERTICAL SURFACES

A. Cure surfaces in accordance with ACI 308.

3.4 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Section 01500.
B. Do not permit traffic over unprotected floor surface.

END OF SECTION

04100

MORTAR AND MASONRY GROUT

PART 1 GENERAL

1.1 QUALITY ASSURANCE

A. Perform work in accordance with ACI 530 and ACI 530.1.

1.2 ENVIRONMENTAL REQUIREMENTS

A. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.
B. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

PART 2 PRODUCTS

2.1 MATERIALS

A	Premix Mortar:	ASTM C387, using gray cement, normal strength.
B.	Mortar Aggregate:	ASTM C144, standard masonry type.
C.	Hydrated Lime:	ASTM C207, Type S.
D.	Grout Aggregate:	ASTM C404.
E.	Water:	Clean and potable.
F.	Bonding Agent:	Epoxy type.

2.2 MORTAR MIXES

A. Mortar for Masonry Below Grade and in Contact with Earth: ASTM C270, Type M.
B. Mortar for Reinforced Masonry: ASTM C270, Type S.
C. Mortar for Reinforced Masonry: ASTM C270, Type S.
D. Mortar for Non-load Bearing Walls and Partitions: ASTM C270, Type S or Type N.

2.3 MORTAR MIXING

A. Thoroughly mix mortar ingredients in quantities needed for immediate use in accordance with ASTM C270.
B. Add admixtures in accordance with manufacturer's instructions.
C. Do not use antifreeze compounds to lower the freezing point of mortar.

2.4 MORTAR COLOR

A. Mortar Color: Mineral oxide pigment, color as selected by Architect.

2.5 GROUT MIXES

A. Grout: Mixed in accordance with ASTM C476; provide consistency required at time of placement to fill completely all spaces indicated to be grouted.
    1. Use fine grout in spaces less than 2 inches in least horizontal dimension.
    2. Use coarse grout in spaces 2 inches or more in least horizontal dimension.

2.6 GROUT MIXING

A. Thoroughly mix mortar ingredients in quantities needed for immediate use in accordance with ASTM C476.
B. Do not use anti-freeze compounds to lower the freezing point of grout.

2.7 MIX TESTS

A. Testing of Mortar Mix: In accordance with ASTM C780.
B. Testing of Grout Mix: In accordance with ASTM C1019.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install mortar in accordance with ASTM C780.

B. Perform all grouting by means of low-lift technique.
1. Maintain minimum dimension of 2 inches and minimum area of 6 square inches in cells to be grouted. Extend vertical reinforcement above pour height as required for splicing.
2. Lay masonry units to maximum pour height, not to exceed 32 inches.
3. Place grout continuously and consolidate immediately; do not interrupt pour for more that one hour.
4. Stop vertical pours 1-1/2 inches below bond beams to interlock with vertical cores.

C. Work grout into masonry cores and cavities to eliminate voids. Do not displace reinforcement.

END OF SECTION

04300

UNIT MASONRY SYSTEM

PART 1 GENERAL

1.1 REFERENCES

A. Masonry Reinforcement and Accessories
   1. Metals: cold drawn steel wire, ASTM A82; welded steel wire fabric, ASTM A185 or A497; sheet metal, ASTM A366; plate, headed, and bent bar ties, ASTM A36; reinforcing steel ASTM A 615.
   2. Corrosion protection: hot-dip galvanized steel, ASTM A123, ASTM A153, Class B.
   3. Joint reinforcement: ASTM A951.

B. Masonry Units
   1. ASTM C90 – Standard Specification for Load-bearing Concrete Masonry Unit
   2. ASTM C129 – Standard Specification for Nonload-bearing Concrete Masonry Unit
   3. ASTM C140 – Standard test methods of sampling and testing concrete masonry units.
   4. ASTM C207 – Standard Specification for Hydrated Lime for Masonry Purposes.
   5. ASTM C423 – Standard Test Methods for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
   6. ASTM C744 – Standard specification for prefaced concrete calcium silicate masonry units.
   7. ASTM C1262 – Standard test method for evaluating the freeze-thaw durability of manufactured concrete masonry units and related concrete units.
   8. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
   9. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials.
   10. ASTM E119 – Standard Test Methods for fire tests of building construction and materials.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01300.
B. Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
C. Manufacturer's Certificates: Certify that products meet or exceed specified requirements.
D. Verification Samples: For each finish product specified, one full size sample representing actual product, color, and patterns.
E. Field Constructed Mock-Ups: Construct a sample panel, no less than 4' x 4', of exterior assembly.
F. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, finishes, polishes and waxes.

1.3 DELIVERY, STORAGE AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.
B. Deliver masonry units to the jobsite on banded pallets with individual protective covers on each block face. Keep protective block covers on the blocks until installation.
C. Store pallets in single-stacks on level ground and cover with waterproof covering to protect the blocks from inclement weather. Handle blocks carefully to avoid breakage and damage to the finished surface.

1.4 PRODUCTS CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
B. Do not lay masonry units that are wet or frozen.
C. Remove ice or snow formed on masonry bed by carefully applying heat until top surface is dry to the touch.
D. Remove masonry damaged by freezing conditions.
E. Protect completed masonry and masonry not being worked on in the following manner: For grouted masonry, temperature ranges below apply to anticipated minimum night temperatures. For all other masonry, temperature ranges below apply to mean daily air temperature.
    1. 40 degrees to 32 degrees F: Protect masonry from rain or snow for at least 24 hours by covering with weather-resistant membrane.
    2. 32 degrees to 25 degrees F: Completely cover masonry with weather-resistant membrane for at least 24 hours.
    3. 25 degrees to 20 degrees F: Completely cover masonry with weather-resistant insulating blankets or similar protection for at least 24 hours; 48 hours for grouted masonry.
    4. 20 degrees F and below:
        a. Except as otherwise indicated, maintain masonry temperatures above 32 degrees F for 24 hours, using enclosures and supplementary heat, electric heating blankets, infrared lamps, or other methods proven to be satisfactory.
    b. For grouted masonry, maintain heated enclosure to 40 degrees F for 48 hours.
F. Cover open walls to protect from wet conditions and damage from other trades that can stain or damage the finished masonry surfaces. Protect corners by covering with plywood.

PART 2 PRODUCTS

2.1 CONCRETE MASONRY UNITS

A. Hollow Non-Load Bearing Block Units (CMU): ASTM C129, Type I - Moisture Controlled; normal weight.
B. Decorative Block Units: ASTM C90, Type I - Moisture Controlled; color as selected.
    1. Ribbed and split face with three vertical ribs.
C. Concrete Brick Units: ASTM C55, Grade N, Type I - Moisture Controlled; of same Grade, Type, and Weight as block units.
D. Size and Shape: Nominal modular size of 8 x 8 x 16 and 4 x 8 x 16 inches. Provide special units for 90-degree corners, bond beams, lintels and bullnosed corners.

2.2 REINFORCEMENT AND ANCHORAGE

A. Single Wythe Joint Reinforcement: Truss type; steel wire, hot dip galvanized to ASTM A641 Class 3 after fabrication, cold drawn steel wire conforming to ASTM A82, 3/16 inch side rods with 1/16 inch cross ties.
B. Wall Ties: bent steel shape, 1 x 6 inch size x 18 gauge thick, hot dip galvanized to ASTM A123 finish.

2.3 FLASHINGS

A. Galvanized Steel: ASTM A525, 24-gauge core steel.

2.4 ACCESSORIES

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, heat fused joints.
B. Building Paper: No. 15 asphalt saturated felt.

C. Nailing Strips: Softwood, preservative treated for moisture resistance, dovetail shape, sized to masonry joints.
D. Weeps: Preformed plastic tubes, hollow.
E. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.5 SEALERS

A. Provide sealer to exterior concrete masonry units equal to Sure Klean; Blok-Guard S or Weather Seal Siloxane WB Concentrate as manufactured by: ProSoCo, Inc.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.
B. Verify items provided by other sections of work are properly sized and located.
C. Verify that built-in items are in proper location and ready for roughing into masonry work.

3.2 PREPARATION

A. Direct and coordinate placement of metal anchors supplied to other sections.
B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.3 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.
B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
C. Concrete Masonry Units:
    1. Bond: Running.
    2. Coursing: One unit and one mortar joint to equal 8 inches.
    3. Mortar Joints: Beveled.

3.4 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
B. Lay hollow masonry units with face shell bedding on head and bed joints.
C. Buttering corners of joints or excessive furrowing of mortar joints are not permitted.
D. Remove excess mortar as work progresses.
E. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
F. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

3.5 WEEPS

A. Install weeps in veneer at 24 inches o.c. horizontally above through-wall flashing, above shelf angles and lintels, and at bottom of walls.

3.6 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

A. Install horizontal joint reinforcement 16 inches O.C.
B. Place masonry joint reinforcement in first horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place joint reinforcement continuous in first joint below top of walls.
D. Lap joint reinforcement ends minimum 6 inches.
E. Secure wall ties to stud framed back-up and embed into masonry veneer at maximum 16 inches O.C. vertically and 36 inches o.c. horizontally. Place at maximum 3 inches o.c. each way around perimeter of openings, within 12 inches of openings.
F. Reinforce unit joint corners and intersections with strap anchors 16 inches O.C.

3.7 MASONRY FLASHINGS

A. Extend flashings horizontally at foundation walls, above ledge or shelf angles and lintels and at bottom of walls.
B. Turn flashing up minimum 8 inches and seal to sheathing over wood or steel stud back-up.
C. Lap end joints minimum 6 inches and seal watertight.
D. Urn flashing; fold and seal at corners, bends and interruptions.

3.8 LINTELS

A. Install loose steel or precast concrete lintels over openings.
B. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled.
C. Openings Up To 42 inches Wide: Place two No. 4 M9 reinforcing bars 1 inch from bottom web.
D. Openings From 42 inches Up To 78 inches Wide: Place two No. 5 M16 reinforcing bars 1 inch from bottom web.
E. Openings Over 78 inches: Reinforce openings as detailed.
F. Do not splice reinforcing bars.
G. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
H. Place and consolidate grout fill without displacing reinforcing.
I. llow masonry lintels to attain specified strength before removing temporary supports.
J. Maintain minimum 6 inch bearing on each side of opening.

3.9 CONTROL AND EXPANSION JOINTS

A Do not continue horizontal joint reinforcement through control and expansion joints.
B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
C. Size control joint in accordance with Section 07900 for sealant performance.
D. Form expansion joint as detailed.

3.10 TOLERANCES

A. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
B. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
C. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
D. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.
E. Maximum Variation of Joint Thickness: 1/8 inch in 3 ft.
F. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.11 CUTTING AND FITTING

A. Cut and fit for chases, pipes, conduit, sleeves and grounds. Coordinate with other sections of work to provide correct size, shape and location.
B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.12 FIELD QUALITY CONTROL

A. Field inspection will be performed under provisions of Section 01400.
B. Inspect all masonry work.

3.13 CLEANING

A. Clean work under provisions of 01700.
B. Remove excess mortar and mortar smears as work progresses.
C. Replace defective mortar. Match adjacent work.
D. Clean soiled surfaces with cleaning solution.
E. Use non-metallic tools in cleaning operations.

3.14 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Section 01500.
B. Without damaging completed work, provide protective boards at exposed external corners, which may be damaged by construction activities.

END OF SECTION

05500

METAL FABRICATIONS

PART 1 GENERAL

1.1 REFERENCES

A. ASTM A36 - Structural Steel.
B. ASTM A53 - Hot-Dipped, Zinc-coated Welded and Seamless Steel Pipe.
C. ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
D. ASTM A283 - Carbon Steel Plates, Shapes and Bars.
E ASTM A307 - Carbon Steel Bolts and Studs, 60,000 p.s.i Tensile Strength.
F. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.
G. ASTM A501 - Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
H. AWS A2.0 - Standard Welding Symbols.
I. AWS D1.1 - Structural Welding Code.
J. SSPC (Steel Structures Painting Council) - Steel Structures Painting Manual.

PART 2 PRODUCTS

2.1 MATERIALS - STEEL

A. Steel Sections: ASTM A36.
B. Steel Tubing: ASTM A500, Grade B.
C. Plates: ASTM A283.
D. Pipe: ASTM A53, Grade B, Schedule 40.
E. Bolts, Nuts, and Washers: ASTM A325 galvanized to ASTM A153 for galvanized components.
F. Welding Materials: AWS D1.1; type required for materials being welded.
G. Ladders: ANSI A14.3.
H. Shop and Touch-Up Primer: SSPC 15, Type 1, red oxide.

2.2 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.
B. Fabricate items with joints tightly fitted and secured.
C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush and hairline. Ease exposed edges to small uniform radius.
D. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.3 FABRICATION TOLERANCES

A. Squareness: 1/8-inch maximum difference in diagonal measurements.
B. Maximum Offset Between Faces: 1/16 inch.
C. Maximum Misalignment of Adjacent Members: 1/16 inch.
D. Maximum Bow: 1/8 inch in 48 inches.
E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

2.4 FINISHES - STEEL

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Do not prime surfaces in direct contact with concrete or where field welding is required.
C. Prime paint items with one coat.
D. Structural Steel Members: Galvanize after fabrication to ASTM A123. Provide minimum 1.25 oz/sq ft galvanized coating.
E. Non-structural Items: Galvanized after fabrication to ASTM A123. Provide minimum 1.25 oz/sq ft galvanized coating.
F. Chrome Plating: ASTM B177, weight, nickel-chromium alloy, satin finish.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.
B. Supply steel items required to be cast into concrete or embedded in masonry with setting templates to appropriate sections.

3.3 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.
B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
C. Field weld components indicated on Drawings.
D. Perform field welding in accordance with AWS D1.1.
E. Obtain approval prior to site cutting or making adjustments not scheduled.
F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.4 ERECTION TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
B. Maximum Offset From True Alignment: 1/4 inch.
C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

05531

GRATINGS AND FLOOR PLATES

PART 1 GENERAL

1.1 REFERENCES

A. ASTM A36/A36M - Structural Steel.

B. ASTM A123 - Zinc (Hot Galvanized) Coatings on Fabricated from Rolled, Pressed and Forged Steel Shapes, Plates, Bars and Strip.

C. ASTM A510 - Wire Rods and Coarse Round Wire, Carbon Steel.

D. ASTM A525 - Steel Sheet, Zinc-coated (Galvanized) by the Hot-Dip Process.

E. ASTM A569/A569M - Steel, Carbon (0.15 Maximum Percent), Hot-Rolled Sheet and Strip Commercial Quality.

F. AWS D1.1 - Structural Welding Code.

G. AWS A2.0 - Standard Welding Symbols.

H. NAAMM A202.1 - Metal Bar Grating Manual.

I. SSPC - Steel Structures Painting Council: Steel Structures Painting Manual.

1.2 PERFORMANCE REQUIREMENTS

A. Conform to BOCA code for applicable loads.
B. Maximum Spacing Between Bars: To restrict pedestrian shoe heels.3/8 inch.

1.3 SUBMITTALS FOR REVIEW

A. Section 01300 - Submittals: Procedures for submittals.
B. Shop Drawings: Indicate details of gratings, plates, component supports, anchorage, openings and perimeter construction details.
C. Indicate welded connections using standard AWS A2.0 welding symbols. Indicate net weld lengths.

1.4 PROJECT CONDITIONS

A. Coordinate the Work with placement of frames, tolerances for placed frames and openings.

PART 2 PRODUCTS

2.1 MATERIALS

A. Sheet Steel For Die Stamping: ASTM A525; with raised lug pattern.
B. Cross Bars: ASTM A510.
C. Welding Materials: AWS D1.1, type required for materials being welded.
D. Shop and Touch-Up Primer: SSPC 15, Type 1, red oxide.

2.2 ACCESSORIES

A. Fasteners and Saddle Clips: Flange Blocks: J-Hooks: Galvanized steel.
B. Perimeter Closure: Of same material as grating.
C. Edge Banding: At edges and at intermediate panel edges.

2.3 FABRICATION

A. Fabricate grates and plates to accommodate design loads.
B. Mechanically clinch joints of intersecting metal sections.
C. Fabricate support framing for openings.
D. Top Surface: Serrated or raised lug.

2.4 FINISHES

A. Clean surfaces of rust, scale, grease and foreign matter prior to finishing.
B. Do not prime surfaces in direct contact with concrete or where field welding is required.
C. Prime paint items with one coat.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that opening sizes and dimensional tolerances are acceptable.
B. Verify that supports and anchors are correctly positioned.

3.2 INSTALLATION

A. Place frames in correct position, plumb and level.
B. Mechanically cut galvanized finish surfaces. Do not flame cut.
C. Anchor by welding to saddle clips or bolting to flange blocks.
D. Set perimeter closure flush with top of grating and surrounding construction.
E. Secure to prevent movement.

3.3 TOLERANCES

A. Conform to NAAMM A202.1.

3.4 CLEANING

A. Clean welds and damaged coatings and apply one coats of touch-up primer.

END OF SECTION

06112

FRAMING AND SHEATHING

PART 1 GENERAL

1.1 REFERENCES

A. AHA (American Hardboard Association) A135.4 - Basic Hardboard.
B. ALSC (American Lumber Standards Committee) - Softwood Lumber Standards.
C. ANSI A208.1 - Mat-Formed Wood Particleboard.
D. APA (American Plywood Association).
E. NFPA (National Forest Products Association).
F. SPIB (Southern Pine Inspection Bureau).
G. WCLIB (West Coast Lumber Inspection Bureau).
H. WWPA (Western Wood Products Association).

1.2 SUBMITTALS FOR REVIEW

A. Shop Drawings For Site Fabricated Truss Frame: Indicate dimensions, wood species and grades, component profiles, drilled holes, fasteners, connectors, erection details and sequence.

1.3 QUALITY ASSURANCE

A. In lieu of grade stamping exposed to view lumber and plywood, submit manufacturer's certificate certifying that products meet or exceed specified requirements.
B. Design structural shop fabricated trusses under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State of Missouri.

1.4 DELIVERY, STORAGE AND PROTECTION

A. Section 01600 - Material and Equipment: Transport, handle, store and protect products.
B. Protect trusses from warping or other distortion by stacking in vertical position, braced to resist movement.

PART 2 PRODUCTS

2.1 SHEATHING MATERIALS

A. Plywood Roof Sheathing: APA Rated Sheathing Structural I Exposure Durability 1; unsanded.
B. Wall Sheathing: ANSI A208.1 Oriented Strand Board. (OSB)
C. Plywood Floor Sheathing: APA Rated Sheathing; Exposure Durability 2; sanded.
D. Telephone and Electrical Panel Boards: Plywood.

2.2 UNDERLAYMENT MATERIALS

A. Particleboard Underlayment: Structural Particleboard; wood flakes set with waterproof resin binder. Sanded faces.

2.3 SHEATHING AND UNDERLAYMENT LOCATIONS

A. Sloped Roof Sheathing: ½" thick, 48 x 96 inch sized sheets, square edges.
B. Above Grade Wall Sheathing: ½ inch thick, 48 x 96 inch sized sheets, square edges.
C. Floor Sheathing: ¾" thick, 48 x 96 inch sized sheets, tongue and groove edges.

D. Floor Underlayment: 3/8" thick, 48 x 96 inch sized sheets.

2.4 ACCESSORIES

A. Fasteners and Anchors:
   1. Fasteners: Stainless steel for high humidity and treated wood locations, galvanized steel elsewhere.
B. Sill Flashing (Under Sill Gasket): Galvanized steel.
C. Subfloor Glue: APA AFG-01, waterproof of solvent base, air cure type, cartridge dispensed.
D. Building Wrap: Tyvek building wrap, 7.1 mils. or equal.
E. Termite Shield: Galvanized sheet steel.

PART 3 EXECUTION

3.1 FRAMING

A. Set structural members level and plumb, in correct position.

B. Make provisions for erection loads and for sufficient temporary bracing to maintain structure safe, plumb and in true alignment until completion of erection and installation of permanent bracing.

C. Place horizontal members, crown side up.

D. Construct load bearing framing members' full length without splices.

E. Double members at openings over 24 inches wide. Space short studs over and under opening to stud spacing.

F. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists. Framed rigidly into joists.

G. Bridge joists or other framing in excess of 8 feet span at mid-span. Fit solid blocking at ends of members. Bottom plate of the double top plate is not to stop short of nearest stud. It must fall on top of stud.

H. Place full width continuous sill flashings under framed walls on cementitious foundations. Lap flashing joint 4 inches.

I. Coordinate installation of wood decking, wood chord metal joists, glue laminated structural units, prefabricated wood trusses or plywood web joists.

3.2 SHEATHING

A. Secure roof sheathing with longer edge perpendicular to framing members and with ends staggered and sheet ends over bearing.

B. Use sheathing clips between sheets between roof framing members. Provide solid edge blocking between sheets. Fully engage tongue and groove edges.

C. Secure wall sheathing with long dimension parallel to wall studs, with ends over firm bearing and staggered.

D. Place plywood or structural-use panel sheeting at building corners for a horizontal distance of 48 inches.

E. Place building paper horizontally over wall sheathing; weather lap edges and ends.

F. Secure subfloor sheathing with longer edge perpendicular to floor framing and with end joints staggered and sheet ends over bearing. Attach with subfloor glue and drywall screws.

G. Place building paper between floor underlayment and subflooring.

H. Install flooring underlayment after dust and dirt generating activities have ceased and prior to application of finished flooring. Apply perpendicular to subflooring, stagger joints of underlayment.

I. Install telephone and electrical panel backboards with plywood sheathing material where required. Size the backboard by 12 inches beyond size of electrical panel.

3.3 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.
B. Surface Flatness of Floor: 1/4 inch in 10 feet maximum and 1/2 inch in 30 feet maximum.

END OF SECTION

07210

BUILDING INSULATION

PART 1 GENERAL

1.1 SUMMARY

A. Provide building insulation where shown on the Drawings, as specified herein and as needed for a complete and proper installation.

B. Related work:

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

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Upon completion of this portion of the Work, complete and post a certificate of insulation compliance in accordance with pertinent requirements of governmental agencies having jurisdiction.

1.3 DELIVERY, STORAGE AND HANDLING

A. Comply with pertinent provisions of Section 01600.

PART 2 PRODUCTS

2.1 MATERIALS

A. Provide the following building insulation where shown on the Drawings or otherwise needed to achieve the degree of insulation required under pertinent regulations of governmental agencies having jurisdiction.

1. Exterior Wall Insulation - R-25 fiberglass batt insulation installed between the girts. Provide full height 6 mil. vapor barrier fabric between the girts and interior liner panels.
2. Exterior Wall Insulation - Equal to Simple Saver System, R-19 Double Layer Wall System. The outer layer to be placed between the wall sheets and girts, the inner layer to be installed between the grits. Provide full height .02 vapor barrier fabric between the girts and interior liner panels.
3. Roof Insulation - Equal to Simple Saver System, R-30 Double Layer System. The upper layer of fiberglass to be installed between the roof panels and the purlins, the lower layer to be installed between the purlins. The Simple Saver Suspension System to be all white with white grid system, fully encapsulating the purlins.
4. Exterior Wall Insulation - 6-1/4" thickness single faced glass fiber thermal batt insulation. Equal to Owens-Corning Fiberglass Corporation, Toledo, Ohio 43659.
5. Interior Wall Insulation - 3-1/2" thick, unfaced glass fiber acoustical insulation complying with ASTM 665, Type I. Equal to Owens-Corning Fiberglass Corporation, Toledo, Ohio 43659. (Typical of all interior walls).
6. Roof Insulation - 6-1/4" thick, unfaced glass fiber thermal batt insulation. The first layer laid between the bottom chords of the trusses, the second layer laid perpendicular across the top of the truss bottom chord. Equal to Owens-Corning Fiberglass Corporation, Toledo, Ohio 43659.
7. Polyco - Polyfoil Single bubble reflective insulation with tape/adhesive installed over

trusses.

2.2 OTHER MATERIALS

A. Provide 6 mil. vapor barrier where specified on drawings.
B. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.
C. Provide as follows (1) 22” x 48” insulation baffle between each 24” rafter spacing or (1) 16” x 48” insulation baffle between each 16” rafter spacing or (2) 22” x 48” insulation baffles between each 4’-0” rafter spacing or (5) 22” x 48” insulation baffles between each 10’-0” rafter spacing down the length of building both sides.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.
B. Remove, or protect against, projections in construction framing that may damage or prevent proper insulation.

3.2 INSTALLATION

A. Install the work of this Section in strict accordance with the original design, requirements of governmental agencies having jurisdiction, and the manufacturer's recommended installation procedures as approved by the Architect, anchoring all components firmly into position.

END OF SECTION

07212

BOARD INSULATION

PART 1 GENERAL

1.1 REFERENCES

A. ASTM C208 - Insulating Board (Cellulosic Fiber), Structural and Decorative.
B. ASTM C240 - Testing Cellular Glass Insulating Block.
C. ASTM C578 - Preformed, Cellular Polystyrene Thermal Insulation.
D. ASTM C612 - Mineral Fiber Block and Board Thermal Insulation Board.
E. ASTM C728 - Perlite Thermal Insulation Board.
F. ASTM C578 - Preformed Cellular Polystyrene Thermal Insulation.
G. ASTM D2842 - Water Absorption of Rigid Cellular Plastics.
H. ASTM E96 - Test Methods for Water Vapor Transmission of Materials.

1.2 SYSTEM DESCRIPTION

A. Materials of This Section: Provide continuity of thermal barrier at building enclosure elements.
B. Materials of This Section: Provide thermal protection to vapor retarder in conjunction with vapor retarder materials.
C. Materials of This Section: Provide thermal protection to air seal materials at building enclosure elements in conjunction with air barrier materials.

1.3 ENVIRONMENTAL REQUIREMENTS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

1.4 SEQUENCING

A. Sequence work to ensure fireproofing, firestop, vapor retarder and air barrier materials are in place before beginning the Work of this section.

1.5 COORDINATION

A. Coordinate the work with installation of vapor retarder and air seal materials.

1.6 ACCESSORIES

A. Sheet Vapor Retarder Type 1: Black polyethylene film for above grade application, 10 mil thick.
B. Insulation Fasteners: Impaling clip of unfinished steel with washer retainer and clips, to be adhered to surface to receive board insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

PART 2 PRODUCT

2.1 MATERIALS

A. Provide the following perimeter insulation where shown on the Drawings or otherwise needed to achieve the degree of insulation required under pertinent regulations of governmental agencies having jurisdiction.
    1. 2" rigid insulation board having a minimum “R” - Value of 10 at 25 degrees F per ASTM tests C518.
    a. Acceptable Products:

(1) "Styrofoam" brand, Square Edge as manufactured by Dow Chemical Company, 2020 Willard H. Dow Center, Midland, Michigan 48674, (800) 232-2436.
(2) Similar products may be substituted with prior approval from the Architect.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate, adjacent materials and insulation boards are dry and ready to receive insulation and adhesive.
B. Verify substrate surface is flat, free of honeycomb, fins, irregularities or materials or substances that may impede adhesive bond.

3.2 INSTALLATION - FOUNDATION PERIMETER

A. Adhere a 6-inch wide strip of polyethylene sheet over construction joints with double beads of adhesive each side of joint.
1. Tape seal joints.
2. Extend sheet full height of joint.

B. Install boards on foundation wall or grade beam perimeter horizontally.
1. Place boards in a method to maximize contact bedding.
2. Stagger end joints.
3. Butt edges and ends tight to adjacent board and to protrusions.

C. Extend boards over control or expansion joints, unbonded to foundation 4 inches on one side of joint.

D. Cut and fit insulation tight to protrusions or interruptions to the insulation plane.

E. Immediately following application of board insulation, place protective boards over exposed insulation surfaces. Apply Type I adhesive in five continuous beads per board length.
1. Install boards horizontally base of foundation to top of insulation.
2. Butt board joints tight; stagger from insulation joints.

3.3 INSTALLATION - EXTERIOR WALLS

A. Adhere a 6 inch wide strip of polyethylene sheet over joint with double beads of Type I adhesive each side of joint.
1. Tape seal joints between sheets.
2. Extend sheet full height of joint.

B. Apply Type I adhesive in three continuous beads per board length to full bed 1/8 inch thick. Daub adhesive tight to protrusions.

C. Install boards on wall surface, vertically. Place membrane surface of insulation against the adhesive.

D. Place boards in a method to maximize contact bedding. Stagger end joints. Butt edges and ends tight to adjacent board and to protrusions.

E. Cut and fit insulation tight to protrusions or interruptions to the insulation plane.

F. Place 6-inch wide polyethylene sheet at perimeter of wall openings, from adhesive vapor retarder bed to window or door frame. Tape seal in place to ensure continuity of vapor retarder and air seal.

G. Tape insulation board joints.

3.4 INSTALLATION - CAVITY WALLS

A. Secure impale fasteners to substrate at a frequency of 6 per insulation board.

B. Adhere a 6-inch wide strip of polyethylene sheet over control joint with double beads of Type I adhesive each side of joint between sheets. Extend sheet full height of joint.

C. Apply Type I adhesive in three continuous beads per board length to full bed 1/8 inch thick on substrate. Daub adhesive tight to protrusions to ensure continuity of vapor retarder and air seal.

D. Install boards horizontally between wall reinforcement.

E. Place membrane surface against adhesive. Tape seal board joints.

F. Place boards in a method to maximize contact bedding. Stagger end joints. Butt edges and ends tight to adjacent board and no protrusions.

G. Cut and fit insulation tight to protrusions or interruptions to the insulation plane.

H. Place 66-inch wide polyethylene sheet at perimeter of wall openings, from adhesive vapor retarder bed to window or door frame. Tape seal in place to ensure continuity of vapor retarder and air seal.

3.5 INSTALLATION - UNDER CONCRETE SLABS

A. Place insulation under slabs on grade after base for slab has been compacted.
B. Cut and fit insulation tight to protrusions or interruptions to the insulation plane.
C. Prevent insulation from being displaced or damaged while placing vapor retarder and placing slab.

3.6 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Section 01500.
B. Do not permit work to be damaged prior to covering insulation.

END OF SECTION

07465

ALUMINUM SOFFIT PANELS

PART 1 GENERAL

1.1 SUMMARY

A. Preformed aluminum soffit panels, trim, and accessories for enclosing exterior roof overhangs.

1.2 REFERENCES

A. AAMA 1402-86 – Aluminum Siding, Soffit, and Fascia.
B. ASTM B 209 – Aluminum and Aluminum-Alloy Sheet and Plate.
C. ASTM D 226 – Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
D. ASTM E 84 – Surface Burning Characteristics of Building Materials.

1.3 PERFORMANCE REQUIREMENTS

A. Soffits shall be fabricated and installed to withstand positive and negative wind pressure loads in accordance with applicable codes.
B. Soffit system to accommodate without damage to components or failure of weather barrier movement caused by seasonal temperature cycling and deflection of structural support framing.
C. Moisture entering or condensation occurring within soffit system shall drain to exterior.

1.4 SUBMITTALS

A. Provide in accordance with Section 01300:
   1. Product data including material descriptions, dimensions, and profiles.
   2. Shop drawings showing layout, location of vents, dimensions, penetrations, trim, and installation methods.
   3. 4 inch long minimum samples of soffit panel and trim in color selected.
   4. Certificates documenting soffit system complies with requirements specified.
   5. Manufacturer’s installation instructions.
   6. Copy of warranty for review by Architect.

1.5 QUALITY ASSURANCE

A. Manufacturer: Company with a minimum 5 years’ successful experience manufacturing aluminum soffit.
B. Single Source Responsibility: To ensure functional and appearance compatibility, soffit panels and all trim pieces shall be products of single manufacturer.
C. Aluminum soffit system shall be fabricated and installed to comply with:
   1. AAMA 1402-86.
   2. International Code Council-ES Legacy – Report No. 97-64.
   3. International Conference of Building Officials (ICBO): Report No. 2027.

1.6 PRODUCT HANDLING

A. Deliver components in manufacturer’s protective cartons clearly labeled as to specific products contained.
B. During delivery and storage keep cartons flat and supported along entire length.
C. Store material off ground, out of weather, in dry place. Provide ventilation. Protect from falling objects and construction activities.
D. Handling: Avoid gouging, scratching, and denting.

1.7 WARRANTY

A. Provide under provisions of section 01700 – Closeout Submittals: Fifty (50) year lifetime limited, non-prorated, transferable warranty.

PART 2 PRODUCTS

2.1 MATERIALS

A. Fabricate soffit panels and trim from sheet aluminum complying with ASTM B 209, AA3000 Alloy:
B. Minimum Aluminum Properties:
   1. Ultimate Strength: 25 KSI.
   2. Yield Strength: 22 KSI.
   3. Modulus of Elasticity: 10,000 KSI.
   4. Coefficient of Linear Thermal Expansion: 1.31 x 10(-5) inch/inch/degree F.
   5. Melting Range: 1175 to 1210 degrees F.

2.2 SOFFIT PANELS

A. Type: Fully vented, hi-tensil, double V-groove soffit panel with installation flanges along both edges.
   1. Dimensions: 12 inches exposed width by 144 inches long.
   2. Thickness: 0.016 inches.
   3. Profile: V-grooves forming three (3) 4-inch wide panels with all panels vented.
   4. Net Free Open Area: 11.6 square inches per linear foot.
   5. Surface: Smooth.
   6. Finish Color: Colors pick by District Facilities Manager.

2.3 TRIM

A. Provide trim pieces as detailed on manufacturer's installation manual and as required for complete, weathertight, functional installation.
B. Aluminum Trim: Fabricate from same material as soffit to shape, dimensions, and profile required to accommodate soffit panel and project conditions. Provide with channels to receive panels, flanges for concealed weathertight attachment, and slotted attachment holes. Color shall match or coordinate with soffit color. In order to eliminate or minimize visible joints, form in longest possible lengths with 10 feet being minimum.
   1. J-channel: ½ inch wide channel to receive soffit panels with ½ inch attachment flange.
   2. Reverse Frieze Molding: F-shaped piece with ½ inch wide channel to receive aluminum soffit panels.
   3. Soffit T-Bar: Double channel to receive two soffit panels with exposed face.

2.4 ACCESSORIES

A. Fasteners: Weather and corrosion resistant nails of type, size, and spacing as recommended by soffit manufacturer.
   1. Plain Shank Nails: Use for wood studs, furring, and other framing with minimum lengths of 1-1/2 inches. Allow ¾ inch minimum penetration into wood framing.
   2. Screw Shank Nails: Use for plywood sheathing.
   3. Exposed Nails: Trim nails that match soffit and trim.
B. Sealants: Silicone type as recommended by soffit manufacturer.

PART 3 EXECUTION

3.1 GENERAL

A. Prepare substrate and install soffit in accordance with manufacturer's instructions, approved shop drawings, and manufacturer's soffit installation manual.
B. Coordinate work with provisions and installation of exterior insulation finish system to ensure compatibility and weathertight, neat transition from vertical surface to horizontal soffit panels.

3.2 PREPARATION

A. Inspection: Verify that soffit support framing is rigid, level, and spacing does not exceed 24 inches. Do not proceed until deficiencies are addressed.

3.3 INSTALLATION

A. Field Cutting: Accurately measure and cut soffit panels and trim. Use power circular saw with 10-point aluminum cutting blade, duckbill sheet metal snips, or hacksaw as recommended by manufacturer for specific cutting operation.
B. Trim: Prior to installing soffit panels, locate and anchor perimeter to receive channels.
C. Soffit Panels:
    1. Layout panels as detailed on approved shop drawings. Provide vented panels to provide sufficient ventilation of space above soffit.
    2. Insert panel into receiver channel, flex panel, and insert other end into opposing receiver channel. Ensure panels are perpendicular to perimeter and aligned. Fasten panel to supports by nailing through attachment flanges.
    3. Oerlap, engage, and lock subsequent panels over preceding ones.
    4. At corners, miter cut soffit panels and install with soffit T-bar. Align joints and grooves of intersecting panels.
D. Expansion Joints: Where soffit panel engages receiver channel and where aluminum components butt or adjoin other materials, leave expansion gap:
    1. Hot weather with aluminum components partially expanded: 1/16 inch.
    2. Cold weather with aluminum components partially contracted: 1/8 inch.
E. Fastening: Install panels and trim with nails. Where exposed, use trim nails with color to match aluminum components.
    1. Drive fasteners straight and level. Do not slant fasteners.
    2. Do not drive head of fastener tightly against attachment flange. Allow 1/32 inch clearance between fastener head and aluminum surface.
    3. Do not place fastener through face of soffit panel.
    4. Spacing: Fasten soffit panels at 24 inches maximum.
E. Sealants: Apply sealants where indicated on manufacturer's approved shop drawings and as required to provide weathertight installation. Depth of sealant bead shall be ¼ inch minimum.

3.4 CLEANING AND PROTECTION

A. Clean aluminum soffits and trim. Use detergent as required. Do not use solvents, abrasive, wire brushes, or streel scrapers.
B. Remove Excess materials and debris from site.
C. Protect soffit from subsequent construction operations. If damage occurs, remove and replace damaged components to provide installation in original, undamaged condition.

END OF SECTION

07600

FLASHING AND SHEET METAL

PART 1 GENERAL

1.1 DISCRIPTION OF WORK

A. Fascia Systems.
B. Metal Roof Flashing and Trim.

1.2 REFERENCES

A. ASTM A 526 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality.
B. ASTM A 527 – Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Lock-Forming Quality.
C. ASTM B 209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
D. National Roofing Contractors Association (NRCA) – "Roofing and Waterproofing Manual" third edition.
E. Sheet Metal and Air Conditioning Contractor's National Association (SMACNA) – Architectural Sheet Metal Manual.

1.3 SUBMITTALS

A. Submit under provisions of Section 01300.
B. Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation method.
C. Shop Drawings:
   1. Indicate material profile, dimensions, jointing pattern, jointing details, fastening methods, flashing, termination, and installation details.
   2. Show the layout of wall sections, attachment, joint details, trim flashing, accessories and air infiltration seals.
   3. Show thickness of treated wood nailers and substrate.
D. Design Data:
   1. Submit manufacturer's certification that product supplied meets Factory Mutual Research Corporation's (FMRC) requirements for Roof Perimeter Flashing for use in Zone 1 and Zone 2 Windstorm Resistance Areas as defined in FME & R Loss Prevention Data Sheet 1-7 and 1-49 design recommendations, and meets the wind resistance requirements specified.
   2. Certify that perimeter metal edge systems furnished meet the specified design pressures as tested using ANSI/SPRI ES-1-98 test method RE-2 or RE-3 test methodology.
   3. Certify that membrane attachment by perimeter edge systems exceeds 100 lb/ft of force as tested by ANSI/SPRI ES-1-98 test method RE-1.
E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches square, representing actual product, color, and pattern.

1.4 QUALITY ASSURANCE

A. Installer qualifications: Companies specializing in sheet metal work with 5 years documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.
B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.
C. Materials shall be delivered with identification labels, warnings and storage recommendations.
D. Materials shall be stored in a clean, dry location prior to installation to prevent any damage to the contents. Store materials off the ground and protect from damage and deterioration as required by the material manufacturer.
E. Handle materials to prevent damage to their surfaces, edges and ends of metal items. Damaged material shall be rejected and immediately removed from the site.

1.6 PROJECT CONDITIONS

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

1.7 WARRANTY

A. Warranty Certification: Installing contractor shall certify that sheet metal work has been installed per National Sheet Metal System's printed details and specifications.
B. Manufacturer warrants sheet metal fabrications are warranted to be free of defects in material and workmanship for a period of five (5) years from date of shipment.
C. Provide manufacturer's Twenty (20) year finish warranty for standard coil-coated 40-year polyester finish colors against peeling, chalking, fading, checking and crazing, commencing upon date of final completion.
D. No other warranties either expressed or implied are acceptable unless so stated in writing.

PART 2 PRODUCTS

2.1 MANUFACTURES

A. Central States or equal; Toll Free 1-800-356-2733.
Local supplier- Mac Steel Inc., 17982 Elder Road, Diamond MO 64840. macstell@jscomm.net
Phone: 1-677-209-0886.
A. Equal to 26 ga. Panel-Loc Plus 40 year polyester paint with minimum of 0.80 top coat thickness.
B. Other manufacturer's as approved by the Architect.

2.1 FASCIA AND ROOF EDGE SYSTEMS

A. Provide fascia/flashing system which meets the criteria recommended by Factory Mutual Research Corporation's (FRMC) requirements for Roof Perimeter Flashing for use in Zone 1 and Zone 2 Windstorm Resistance Areas as defined in FME & R Loss Prevention Data Sheet 1-7 and 1-49.
B. 2-Piece Fascia:
1. As shown on details.
C. Accessories:
1. Closure Cleat.
2. Custome Fabrications as shown on details.
D. Fascia Covers and Accessories to be Fabricated from:
1. .050 inch aluminum ASTM B 209 3105-H14 alloy.

E. Waterdam Components:
1. 0.040 inch aluminum ASTM B 209 3105-H14 alloy.
F. Standard Length of Product: Produce components in longest possible lengths for system specified.
G. Aluminum Finish:
1. 40-year polyester paint with minimum of 0.80 top coat thickness from manufacturer's

standard coil-coated colors.

a. Color – Picked by District Facilities Manager.

2.2 METAL ROOF FLASHING & TRIM

A. Profile: As indicated on Roof Manufacturer's standard details.
   1. Pitch Break.
   2. Valley Flashing.
   3. Peak Flashing.
   4. Ridge/Hip Flashing.
   5. Eave Flashing.
   6. Outside Corner Flashing.
   7. Inside Corner Flashing.
   8. Material and Finish: 26 ga. Steel galvanneal/paint grip.

B. Steel Finish:
   1. Prefinished steel with 40-year polyester paint from manufacturer's standard colors.

2.3 MATERIALS

A. Prefinished Zinc-Coated Steel: Hot-dip galvanized steel, commercial quality A1 S1 G90 extra smooth, primed on both sides and finished on 1 side with 40-year polyester paint with minimum of 0.80 top coat thickness.
   1. Strippable coating: Shop-applied liquid to front side of pre-finished metal to protect finish during fabrication, shipment, and field handling.

B. Prefinished Aluminum Sheet: ASTM B 209, alloy 3003, coil-coated, 40-year polyester paint based on minimum of 0.80 top coat thickness.

2.4 FABRICATION

A. General Metal Fabrication: Shop-fabricate work to the greatest extent possible. Comply with details indicated on Drawings, and with applicable requirements of SMACNA. Fabricate for waterproof and weather-resistant performance; with expansion provisions for running work. Form work to fit substrates. Comply with material manufacturer instructions and recommendations for forming material. Form exposed sheet metal work without excessive oil-canning, buckling, and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.

B. Seams: Fabricate non-moving seams in sheet metal with flat-lock seams. Form seams and solder tin edges to be seamed.

C. Expansion and Contraction:
   1. Provide for thermal expansion and contraction, and building movement in completed work, without over-stressing the material, breaking connections, or producing wrinkles and distortion in finished surfaces. Make watertight and weather-resistive.
   2. Where subject to thermal expansion and contraction, attach members with clips to permit movement without damage, or provide slotted or oversize holes with washers only, as acceptable to Architect.
   3. Make lock seam work flat and true to line, and sweat full of solder, except where installed to permit expansion and contraction.

   a. Lap flat lock seams and soldered lap seams according to pitch, but in no case less than 3 inches. Make seams in direction of flow.

D. Sealant Joints: Where movable, non-expansion type joints are indicated, or required for proper performance of work, form metal to provide for proper installation of sealant per SMACNA standards.

E.

F. Metal Separation: Separate metal from non-compatible metal or corrosive substrates by coating concealed surfaces at locations of contact with bituminous coatings or other permanent separation as recommended by manufacturer.

G. Soldering:
   1. Clean material and tin prior to soldering. Solder with heavy coppers of blunt design, properly tinned before use.
   2. Solder slowly with well-heated coppers. Heat seams thoroughly and completely fill with solder.
   3. Make exposed joints on finish surfaces full flowing and smooth.
   4. Wash acid flux with soda solution after soldering, and remove soldering flux on exposed and painted surfaces.

H. Accessories:
   1. Factory assemblies shall be furnished to maintain watertight integrity.
   2. Provide matching accessories or other special fabrications from the manufacturer; color to match specified profile unless noted otherwise.

I. Fascia/flashing sections furnished with strippable protective vinyl masking shall have film removed immediately before installation to prevent damage to the coating if left exposed to the ultra-violet rays of sunlight.

PART 3 EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Except as otherwise indicated, comply with SMACNA recommendations.
C. Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units. Conceal fasteners wherever possible, and set units true to line and level. Install work with laps, joints, and seams that will be permanently watertight and weather-restive.
D. Strictly follow the material manufacturer's printed installation requirements.
E. Completed work shall be true to line without buckling, creasing, warp or wind in finished surfaces. "Oil-canning" surfaces are not acceptable.
F. Isolate dissimilar metals, masonry or concrete from metals using bituminous paint, tape or slip-sheet. Use gasketed fasteners where required to prevent corrosive actions.
G. Allow sufficient clearances for expansion and contraction of linear metal components. Secure metal using continuous cleats, clips and fasteners as required by the system. No exposed face fastening shall be accepted.

3.4 PROTECTION

A. Protect installed products until completion of project.
B. Maintain prefinished surfaces in undamaged condition until date of final completion. Repair or replace damaged components, any touch-up to be indistinguishable from undamaged surface/finish.

C. Upon completion of work, a final inspection by the owner's representative shall be made. Any necessary corrective actions will be noted and the installing contractor shall make corrections within five (5) working days. Upon acceptance of the project, any applicable warranties shall be presented to the owner's representative.

END OF SECTION

07612

SHEET METAL ROOFING

PART 1 GENERAL

1.1 REFERENCES

A. AAMA 603.8 - Voluntary Performance Requirements and Test Procedures for Pigmented Organic Coatings on Extruded Aluminum.
B. AAMA 605.2 - Specification for High Performance Organic Coatings on Architectural Extrusions and Panels.
C. ASTM A526/A526M - Standard Specification for Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process, Commercial Quality.

1.2 SUBMITTALS FOR REVIEW

A. Section 01300 - Submittals: Procedures for submittals.
B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations and installation details.
C. Product Data: Provide data on metal types, finishes and characteristics.

1.3 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA Architectural Sheet Metal Manual requirements, except as otherwise noted.
B. Fabricator and Installer Qualifications: Company specializing in sheet metal roof installations with minimum four years experience.

1.4 DELIVERY, STORAGE, AND PROTECTION

A. Section 01600 - Material and Equipment: Transport, handle, store, and protect.
B. Stack material to prevent twisting, bending or abrasion and to provide ventilation. Slope metal sheets to ensure drainage.
C. Prevent contact with materials that may cause discoloration or staining.

1.5 WARRANTY

A. Section 01700 - Contract Closeout. 01740 - Warranties.

PART 2 PRODUCTS

2.1 METAL ROOF PANELS

2.2 MANUFACTURES

B. Central States or equal; Toll Free 1-800-356-2733.
Local supplier- Mac Steel Inc., 17982 Elder Road, Diamond MO 64840. macstell@jscomm.net
Phone: 1-677-209-0886.

2.3 METAL PANELS

A. Specs for Prime Panel-Loc Plus or equal:

1. 26 Gauge/.020 thickness.
2. Paint Thickness Top Coat Paint: .80 mils.
3. Top Coat Primer: .20 mils.
4. Bottom Coat backer: .35 mils.
5. Bottom Coat Primer: .35 mils.
6. Rust Protectant Substrate Galvalume AZ50, Painted.
7. Galvalume AZ55, Acrylic Bare.
8. Steel Strength 80,000 PSI min.
9. Paint System CentralGuard, powered by Valspar's WeatherX.
10. Warranty 40 year paint adhesion.
11. 30 year chalk and fade.
12. 20 year galvalume perforation warranty.
13. UL Ratings UL580, Class 90 for Wind Uplift resistance
14. UL2218, Class 4 for Impact Resistance
15. UL790 for Fire Resistance
16. Panel Height: 3/4-inch minimum.
17. Color: As selected by Architect from Manufacture's standard colors.

B. Clips and Fasteners: Supply items required for installation of panels in accordance with manufacturer's installation instructions and other indicated items; supply galvanized clips and fasteners.

2.3 ACCESSORIES

A. Fasteners: The steel panels shall be fastened to building framing by plated steel sharp point screws with zinc/.aluminum/cast nonferrous alloy hex washer heads pre-assembled with aluminum bond seal washers, which cannot red rust and are compatible with steel panel. Woodzac by Construction Fasteners, Inc., or equal are acceptable.

B. Snow Guards:
1. Design Requirements: Continuous linear roof snow retention system along front of building should have a minimum performance of 500# per lineal foot of bar without deflection. Connection must be used at every roof seam.
2. Bar: 26 ga. galvanized steel with 40-year polyester paint finish. The snow guard bar color to match metal roof or as selected by Architect.
3. Connection: As required with stainless screws.

C. Warranty:
1. Panel-Loc Plus:
   a. 30 years chaulk and fade.
   b. 40 years paint adhesion.
   c. 20 years Galvalume perforation warranty.

2. Closure Strips: 1" wide closed-cell linked expanded polyurethane, to match panel corrugation.

2.4 FABRICATION

A. Form sections true to shape, accurate in size, square and free from distortion or defects.
B. Fabricate cleats of same material as sheet, minimum 3" wide, interlockable with sheet.
C. Fabricate starter strips of same material as sheet, intermittent to minimum 3 inches wide, interlockable with sheet.
D. Form pieces in longest practical lengths.
E. Hem exposed edges on underside ½", miter and seam corners.
F. Form material with standing seams, except where otherwise indicated. At moving joints, use sealed

lapped, bayonet-type or interlocking hooked seams.

G. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

H. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

I. Fabricate flashings to allow toe to extend 2 inches over roofing. Return and brake edges.

J. Fabricate snow guards in accordance with SMACNA Plate.

PART 3 EXECUTION

3.1 EXAMINATION

A. Inspect roof deck to verify deck is clean and smooth, free of depressions, waves or projections, properly sloped to drains, valleys and/or eaves.

B. Verify deck is dry and free of snow or ice.

C. Verify correct placement of wood nailers [and insulation positioning between nailers].

D. Verify roof openings, curbs, pipes, sleeves, ducts or vents through roof are solidly set; reglets are in place and nailing strips located.

E. Verify roofing termination and base flashings are in place, sealed, and secure.

3.2 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Install surface mounted reglets true to lines and levels. Seal top of reglets with sealant.

C. Back paint concealed metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mils.

3.3 INSTALLATION - FLASHINGS

A. Conform to SMACNA details.

B. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.

C. Cleat and seam all joints.

D. Apply plastic cement compound between metal flashings and felt flashings.

E. Fit flashings tight in place. Make corners square with surfaces true and straight in planes and lines accurate to profiles.

F. Seal metal joints watertight.

3.4 PROTECTION OF FINISHED WORK

A. Section 01700 - Contract Closeout: Protecting installed work.

B. Do not permit traffic over unprotected roof surface.

END OF SECTION

07631

GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.1 REFERENCES

A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

1.2 DESIGN REQUIREMENTS

A. Conform to SMACNA Manual CDA Handbook for sizing components for rainfall intensity determined by a storm occurrence of 1 in 5 years.

1.3 SUBMITTALS FOR REVIEW

A. Section 01300 - Submittals: Procedures for submittals.
B. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations and installation details.
C. Samples: Submit two samples, 12 inches long illustrating component design, finish, color and configuration.

1.4 DELIVERY, STORAGE, AND PROTECTION

A. Section 01600 - Material and Equipment: Transport, handle, store and protect.
B. Stack material to prevent twisting, bending or abrasion and to provide ventilation. Slope to drain.
C. Prevent contact with materials during storage that may cause discoloration, staining or damage.

1.5 PROJECT CONDITIONS

A. Coordinate the work with downspout discharge pipe inlet.

PART 2 PRODUCTS

2.1 MATERIALS

A. Pre-Finished Aluminum Sheet: ASTM B209; 0.032 inch thick; plain finish shop pre-coated with acrylic coating; color as selected from manufacturer's standard.

2.2 COMPONENTS

A. Gutters: SMACNA Square style profile.
B. Connectors: Furnish required connector pieces for PVC (Polyvinyl Chloride) components.
C. Anchors and Supports: Profiled to suit gutters and downspouts.
    1. Anchoring Devices: Type recommended by fabricator.
    2. Gutter Supports: Hanger Straps with intergral screws.
    3. Downspout Supports: Straps.
D. Fasteners: Aluminum. Same material and finish as gutters and downspouts, with soft neoprene washers.

2.3 ACCESSORIES

A. Splash Pads: Precast concrete type, size and profiles indicated; minimum 3,000 p.s.i. at 28 days, with minimum 5 percent air entrainment.
B. Downspout Boots: Plastic.

2.4 FABRICATION

A. Form gutters and downspouts of profiles and size indicated.
B. Fabricate with required connection pieces.
C. Form sections square, true and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.
D. Hem exposed edges of metal.
E. Fabricate gutter and downspout accessories; seal watertight.

2.5 FACTORY FINISHING

A. Modified silicone polyester coating: Baked enamel system conforming to AAMA 603.8.
B. Primer Coat: Finish concealed side of metal sheets with primer compatible with finish system, as recommended by finish system manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that contact surfaces are ready to receive work.

3.2 PREPARATION

A. Paint concealed metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil.

3.3 INSTALLATION

A. Install gutters, downspouts and accessories in accordance with manufacturer's instructions.
B. Slope gutters 1/8 inch per foot .
C. Connect downspouts to downspout boots or shoes at 8 inches above grade or into storm sewer system. Seal connection watertight.
D. Set splash pads under downspouts.

END OF SECTION

07900

JOINT SEALERS

PART 1 GENERAL

1.1 REFERENCES

A. ASTM C834 - Standard Specification for Latex Sealing Compounds.
B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
C. ASTM C1193 - Standard Guide for Use of Joint Sealants.
D. ASTM D1056 - Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.
E. ASTM D1565 - Standard Specification for Flexible Cellular Materials -Vinyl Chloride Polymers and Copolymers (Open-Cell Foam).
F. ASTM D1667 - Standard Specification for Flexible Cellular Materials -Vinyl Chloride Polymers and Copolymers (Closed-Cell Foam).

1.2 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years experience.
B. Applicator Qualifications: Company specializing in performing the work of this section and approved by manufacturer.

1.3 ENVIRONMENTAL REQUIREMENTS

A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.4 COORDINATION

A. Coordinate the work with all sections referencing this section.

1.5 WARRANTY

A. Section 01700 - Warranties.
B. Correct defective work within a five-year period after Date of Completion.
C. Warranty: Include coverage for installed sealants and accessories which fail to achieve airtight seal and exhibit loss of adhesion or cohesion or do not cure.

1.6 SEALANTS

A. Type I - General Purpose Exterior Sealant: Polyurethane or Polysulfide; ASTM C920, Grade NS, Class 25, Uses M, G and A; single or multi- component.
    1. Standard colors matching finished surfaces.

B. Type II - Exterior Expansion Joint Sealer: Precompressed foam sealer; urethane with water-repellent:
    1. Face color: Gray.
    2. Size as required providing watertight seal when installed.
    3. Provide product recommended by manufacturer for traffic-bearing use.
    4. Applications: Use for:
        a. Exterior wall expansion joints.
        b. Paving surface joints.
        c. Set in floor components.

C. Type III - Exterior Metal Lap Joint Sealant: Butyl or polyisobutylene, non-drying, non-skinning, non-curing.
1. Applications: Use for:
a. Concealed sealant bead in sheet metal work.
b. Concealed sealant bead in siding overlaps.

D. Type IV - General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, single component, paintable.
1. .Standard colors matching finished surfaces. Applications: Use for:
a. Interior wall and ceiling control joints.
b. Joints between door and window frames and wall surfaces.
c. Other interior joints for which no other type of sealant is indicated.

E. Type V - Bathtub/Tile Sealant: White silicone; ASTM C920, Uses M and A; single component, mildew resistant.
1. Applications: Use for:
a. Joints between plumbing fixtures and floor and wall surfaces.
b. Joints between kitchen and bath countertops and wall surfaces.

F. Type VI - Interior Floor Joint Sealant: Polyurethane, self-leveling; ASTM C920, Grade P, Class 25, Uses T, M and A; single or multi-component.
1. Approved by manufacturer for wide joints up to 1-1/2 inches.
2. Standard colors matching finished surfaces.
3. Applications: Use for:
a. Expansion joints in floors.

G. Type VII - Sealant for Continuous Water Immersion: Polysulfide or Polyurethane; self-leveling, ASTM C920, Grade NS, Class 25, Uses M and A; approved by manufacturer for continuous water immersion; single or multi- component.
1. Standard colors matching finished surfaces.
2. Applications: Use for:
a. Vehicle washing booths

H. Type VIII - Concrete Paving Joint Sealant: Polyurethane, self-leveling; ASTM C920, Class 25, Uses T, M and A; single or multi- component.
1. Gray color.
2. Applications: Use for:
a. Joints in sidewalks and vehicular paving.

I. Cold Joint Expansion Joint Material equal to Homex 300, ½" x 6" pull top. Model #1381260.

PART 2 PRODUCTS

2.2 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
C. Joint Backing: Round foam rod compatible with sealant; ASTM D1056, sponge or expanded rubber; oversized 30 to 50 percent larger than joint width.
D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces and joint openings are ready to receive work.
B. Verify that joint backing and release tapes are compatible with sealant.

3.2 PREPARATION

A. Remove loose materials and foreign matter that might impair adhesion of sealant.
B. Clean and prime joints in accordance with manufacturer's instructions.
C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
D. Protect elements surrounding the work of this section from damage or disfiguration.

3.3 INSTALLATION

A. Perform installation in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
B. Perform installation in accordance with ASTM C1193.
C .Measure joint dimensions and size joint backers to achieve width-to-depth ratio,neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
D. Install bond breaker where joint backing is not used.
E. Install sealant free of air pockets, foreign embedded matter, ridges and sags.
F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
G. Tool joints concave.
H. Precompressed Foam Sealant: Do not stretch; avoid joints except at corners, ends, and intersections; install with face 1/8 to 1/4 inch below adjoining surface.
I. Compression Gaskets: Avoid joints except at ends, corners, and intersections; seal all joints with adhesive; install with face 1/8 to 1/4 inch below adjoining surface.

3.4 CLEANING

A. Clean adjacent soiled surfaces.

3.5 PROTECTION OF FINISHED WORK

A. Protect sealants until cured.

END OF SECTION

08111

STANDARD STEEL DOORS

PART 1 GENERAL

1.1 REFERENCES

A. ANSI A117.1 - Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People.
B. ASTM A525 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
C. ASTM E152 - Methods of Fire Tests of Door Assemblies.
D. NFPA 80 - Fire Doors and Windows.
E. NFPA 252 - Fire Tests for Door Assemblies.
F. SDI-100 - Standard Steel Doors and Frames.
G. UL 10B - Fire Tests of Door Assemblies.

1.2 SUBMITTALS FOR REVIEW

A. Section 01300 - Submittals: Procedures for submittals.
B. Shop Drawings: Indicate door elevations, internal reinforcement, closure method and cutouts for glazing and louvers.

1.3 SUBMITTALS FOR INFORMATION

A. Section 01300 - Submittals: Procedures for submittals.
B. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Manufacturer: Specializing in manufacturing products specified in this section with three years experience.

1.5 REGULATORY REQUIREMENTS

A. Installed Door and Panel Assembly: Conform to NFPA 80 for fire rated class as scheduled.

1.6 DELIVERY, STORAGE AND PROTECTION

A. Section 01600 - Material and Equipment: Transport, handle, store and protect products.
B. Accept doors on site in manufacturer's packaging. Inspect for damage.
C. Break seal on site to permit ventilation.

1.7 PROJECT CONDITIONS

A. Coordinate frame installation with size, location, and installation of service utilities.
B. Coordinate the work with door opening construction, doorframes and door hardware installation.
C. Sequence installation to ensure wire connections are achieved in an orderly and expeditious manner.

PART 2 PRODUCTS

2.1 ACCEPTABLE PRODUCTS:

A. Allied Steel Products, Inc.

B. Amweld/Div. American Welding & Mfg. Co.
C. Ceco Corp.
D. Curries Mfg., Inc.
E. Mesker Door, Inc.
F. Steelcraft/Div. American Standard Co.
G. Republic Builders Products Corp./Subs. Republic Steel.

2.2 DOORS AND PANELS

A. Astragals for Double Doors: Steel T shaped, specifically for double doors (As required).
B. Fabricate doors with hardware reinforcement welded in place.
C. Attach fire rated label to each fire rated door unit.
D. Configure exterior doors with special profile to receive recessed weather stripping.
E. Type and Design:
1. Tightly hemmed vertical seam on lock and hinge edges, with top flush channel and beveled lock edge, in the dimensions and types shown on the drawings, reinforced for the finish hardware being provided under Section 08710 of these Specifications, and in the following gauges:
a. Interior Doors: 18 gauge honeycomb core. Labeled and/or Non-labeled.
b. Exterior Doors: 16 gauge insulated core. Labeled and/or Non-labeled.

2.3 FINISH

A. Steel Sheet: Exterior doors to be galvanized to ASTM A525.
B. Primer: Air-dried.
C. Paint per Specification Section 09900: color as selected.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that opening sizes and tolerances are acceptable.

3.2 INSTALLATION

A. Install doors in accordance with SDI-100 and DHI.
B. Coordinate installation of glass and glazing.
C. Install door louvers, plumb and level.
D. Coordinate installation of doors with installation of frames and hardware specified in Section 08710.
E. Touch-up finished doors.

3.3 ERECTION TOLERANCES

A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.4 ADJUSTING

A. Section 01650 - Starting of Systems: Adjusting installed work.
B. Adjust door for smooth and balanced door movement.

3.5 SCHEDULE

A. Refer to Door and Frame Schedule on architectural drawings.

END OF SECTION

08112

STANDARD STEEL FRAMES

PART 1 GENERAL

1.1 REFERENCES

A. ANSI A117.1 - Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People.
B. ASTM A525 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
C. ASTM E152 - Methods of Fire Tests of Door Assemblies.
D. DHI - Door Hardware Institute: The Installation of Commercial Steel Doors and Steel Frames, Insulated Steel Doors in Wood Frames and Builder's Hardware.
E. NFPA 80 - Fire Doors and Windows.
F. NFPA 252 - Fire Tests for Door Assemblies.
G. SDI-100 - Standard Steel Doors and Frames.
H. UL 10B - Fire Tests of Door Assemblies.

1.2 SUBMITTALS FOR REVIEW

A. Section 01300 - Submittals: Procedures for submittals.
B. Shop Drawings: Indicate frame elevations, reinforcement, anchor types and spacing, location of cutouts for hardware and finish.

1.3 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.4 REGULATORY REQUIREMENTS

A. Fire Rated Frame Construction: Conform to NFPA 252 or UL 10B.
B. Installed Frame Assembly: Conform to NFPA 80 for fire rated class same as fire door.

1.5 DELIVERY, STORAGE AND PROTECTION

A. Section 01600 - Material and Equipment: Transport, handle, store and protect products.
B. Accept frames on site in manufacturer's packaging. Inspect for damage.

1.6 PROJECT CONDITIONS

A. Coordinate the work with frame opening construction, door and hardware installation.

B. Sequence installation to ensure wire connections are achieved in an orderly and expeditious manner.

1.7 FRAMES

A. Frames: To suit SDI-100 Grade and Model of door specified in Section 08111.

PART 2 PRODUCTS

2.1 FRAMES

A. 16 gauge. To suit SDI-100 Grade.

1. Provide drywall wrap around frames for interior and exterior doors.

2.2 ACCESSORIES

A. Removable Stops: Rolled steel channel shape, butted corners; prepared for countersink style tamper proof screws.
B. Bituminous Coating: Fibered asphalt emulsion.
C. Primer: Zinc chromate type.
D. Silencers: Specified in Section 08710.
E. Weatherstripping: Specified in Section 08710.

2.3 FABRICATION

A. Fabricate frames as welded unit.
B. Mullions for Double Doors: Fixed type, of same profiles as jambs.
C. Transom Bars for Glazed Lights: Fixed type, of same profiles as jamb and head.
D. Fabricate frames with hardware reinforcement plates welded in place. Provide mortar guard boxes.
E. Reinforce frames wider than 4" with roll formed steel channels fitted tightly into frame head, flush with top.
F. Configure exterior frames with special profile to receive recessed weather stripping.
G. Attach fire rated label to each fire rated door unit.

2.4 FINISH

A. Steel Sheet: Galvanized.
B. Primer: Air-dried.
C. Paint per Specification Section 09900: color as selected.
D. Coat inside of frame profile with bituminous coating.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that opening sizes and tolerances are acceptable.

3.2 INSTALLATION

A. Install frames in accordance with SDI-100 and DHI.
B. Coordinate with masonry, gypsum board or concrete wall construction for anchor placement.
C. Coordinate installation of glass and glazing.
D. Coordinate installation of frames with installation of hardware specified in Section 08710 and doors in Section 08111.
E. Install roll formed steel reinforcement channels between two abutting frames. Anchor to structure and floor.

3.3 ERECTION TOLERANCES

A. Maximum Diagonal Distortion: 1/8" measured with straight edges, crossed corner to corner.

3.4 SCHEDULE

A. Refer to Door Schedule on drawings.

END OF SECTION

08351

OVERHEAD COILING DOORS

PART 1 GENERAL

1.1 SUMMARY

A. Provide overhead coiling doors where shown on the Drawings, as specified herein and as needed for a complete and proper installation.

B. Related work:

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

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01300.

B. Product data: Within 45 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Materials list of items proposed to be provided under this section.
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
3. Shop Drawings in sufficient detail show fabrication, installation, anchorage and interface of the work of this Section with the work of adjacent trades.
4. Manufacturer's recommended installation procedures which, when approved or rejecting actual installation procedures used on the Work.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workman who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for the proper performance of the work of this Section.

1.4 DELIVERY, STORAGE AND HANDLING

A. Comply with the pertinent provisions of Section 01600.

PART 2 PRODUCTS

2.1 OVERHEAD COILING DOORS

A. Provide standard rollup service doors of the dimensions and arrangements shown on the Drawings and with the following attributes:

1. Design wind load: 20PSF.
2. Curtain: Interlocking, rolling formed, fully foamed-in-place, insulated, flat profile. The front slat shall be fabricated from minimum 22 gauge-galvanized steel, with the back slat to be fabricated from minimum 24 gauge.
3. Bottom Bar: Extruded aluminum member, to reinforce the curtain in the guides and will have a vinyl weather seal attached.
4. Guides: Hot-dipped galvanized structural steel shapes attached to continuous steel wall angle for door(s). Three structural steel angles with a minimum thickness of 3/16"for door(s). Guides will be weather stripped with a vinyl weather seal at each jamb on the interior and exterior curtain side.
5. Brackets: Galvanized steel plate to support the counterbalance curtain and hood.
6. Counterbalance: Helical torsion springs housed in a galvanized steel tube.

7. Weatherseals: Vinyl bottom seal, exterior guide and internal hood seals. Include header brush or broom seal with aluminum extrusion.
8. Hood: Aluminum.
9. Operation: Motor and chain.
10. Finish: Curtain slats shall be galvanizes per ASTM A-525 and shall receive a rust-inhibitive, roll coating process, including bonderizing, baked on prime paint to be .2 mils thick and a baked on polyester top coat to be .6 mils thick. All non-galvanized exposed ferrous surfaces will receive one coat of rust-inhibitive primer. All aluminum will be furnished in a clear mill finish. Door(s) to have factory white paint on both sides.
11. Electric Sensing Edge: Provide for each door. Provide safety edges by Air Wave, Miller Edge, Model number MTAW21YB-U-door width minus 2" with coil cord or equal, extend full width of the door. Provide AW12 Air Wave waterproof switch. Upon contact with an obstruction the downward travel of the door shall be stopped or reversed.

B. Provide electric motor operator with three position pushbutton operation, in capacity recommended by the manufacturer. See specification Section 08720.

C. Acceptable products:
1. Model 625 Series face mounted rolling service door manufactured by Overhead Door Corporation P.O. Box 809046, Dallas, Texas 75380. 1-800-887-3667.
2. Equal products of other manufacturers when approved in advance by the Architect.

2.2 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor to the approval of the Architect.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the area and conditions under which work of this Section will be performed. Correct conditions detrimental to the timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

B. Install the work of this Section in strict accordance with the original design, the approved Shop Drawings per requirements of government agencies having jurisdiction, and the manufacturer's recommended installation procedures as approve by the Architect, anchoring all components firmly into position for long life under hard use.

C. Upon completion of the installation, put all items through at least ten operating cycles. Make required adjustments and assure that components are in optimum operating condition.

END OF SECTION

08710

DOOR HARDWARE

PART 1 GENERAL

1.1 SUMMARY

A. Provide hardware for wood, hollow steel and aluminum doors.
B. Provide thresholds.
C. Provide weatherstripping, seals and door gaskets.

1.2 REFERENCES

A. NFPA 80 - Fire Doors and Windows.
B. NFPA 101 - Life Safety Code.
C. NFPA 252 - Fire Tests of Door Assemblies.
D. UL 10B - Safety Fire Tests of Door Assemblies.

1.3 SUBMITTALS FOR REVIEW

A. Section 01300 - Submittals: Procedures for submittals.
B. Shop Drawings:
   1. Indicate locations and mounting heights of each type of hardware, schedules and catalog cuts.
   2. Submit manufacturer's parts lists and templates.
C. Samples:
   1. Submit 1 sample of hinge, latchset, lockset and closer, illustrating style, color and finish.
   2. Samples will be incorporated into the Work.

1.4 SUBMITTALS AT PROJECT CLOSEOUT

A. Section 01700 - Operation and Maintenance Data.
B. Section 01300 - Procedures for submittals.
C. Maintenance Data: Include data on operating hardware, lubrication requirements and inspection procedures related to preventative maintenance.
D. Keys: Deliver with identifying tags to Owner by security shipment direct from hardware supplier.

1.5 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc., as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE AND PROTECTION

A. Section 01600 - Material and Equipment: Transport, handle, store, and protect products.
B. Package hardware items individually, label and identify each package with door opening code to match hardware schedule.

1.7 PROJECT CONDITIONS

A. Coordinate the work with other directly affected sections involving manufacture or fabrication of internal reinforcement for door hardware and recessed items.
B. Sequence installation to ensure utility connections are achieved in an orderly andexpeditious manner.

C. Coordinate Owner's keying requirements during the course of the Work.

1.8 WARRANTY

A. Provide five-year manufacturer warranty for door closers.

1.9 MAINTENANCE PRODUCTS

A. Section 01700 - Operation and Maintenance Data.
B. Provide special wrenches and tools applicable to each different or special hardware component.
C. Provide maintenance tools and accessories supplied by hardware component manufacturer.

1.10 EXTRA MATERIALS

A. Section 01700 - Operation and Maintenance Data.

PART 2 PRODUCTS

2.1 KEYING

A. Door Locks: Keyed in like-groups. Master keyed.
B. Include construction keying, and control keying with removable core cylinders. Key to the existing keying system where requested.
C. Supply keys in the following quantities:
   1. Two master keys.
   2. Four construction keys.
   3. Three change keys for each lock.

2.2 KEY CABINET

A. Cabinet Construction: Sheet steel construction, piano hinged door with lockmaster keyed to building system.
B. Cabinet Size: Size for project keys plus 10 percent growth.
C. Hooks for all keys.
D. Horizontal plastic strips for key hook labeling with clear plastic strip cover over labels.
E. Finish: Baked enamel, finish, colors as selected.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that doors and frames are ready to receive work and dimensions are as indicated on shop drawings.
B. Verify that electric power is available to power operated devices and is of the correct characteristics.

3.2 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions.
B. Use templates provided by hardware item manufacturer.

3.3 FIELD QUALITY CONTROL

A. Section 01400 - Quality Control 01650 - Starting of Systems: Field inspection, testing, and adjusting.

B. Architectural Hardware Consultant will inspect installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's instructions and as specified.

3.4 ADJUSTING

A. Section: 01650 - Starting of Systems: Adjusting installed work.
B. Adjust hardware for smooth operation.

3.5 SCHEDULE

Hardware Group 1:	Doors **x & x**	
1 ½ Pr. Butts (hinges)	BB1168 x 26D x 4 ½ x 4 ½	Hager
1 Passage Lockset	93KON15D-S3-626	Best
3 Silencers	608	Rockwood
1 Door Crash Stop	CS115-25	Ives

END OF SECTION

08720

ELECTRIC DOOR OPERATORS

PART 1 GENERAL

1.1 SUMMARY

A. Provide electric trolley type sectional overhead door operator and electric rolling door operator, where shown on the Drawings, as specified herein and as needed for a complete and proper installation.

B. Related work:

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

1.2 SUBMITTALS

A. Product data: Within 30 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Materials list of items proposed to be provided under this Section;
2. Manufacturers' specifications and other data needed to prove compliance with the specified requirements;
3. Shop drawings showing general layout, installation, materials, construction and assembly wiring.
4. Manufacturers' recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

B. Upon completion of this portion of the work and as a condition of its acceptance, deliver to the owner three copies of the operation and maintenance manual.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Comply with all governmental agencies having jurisdiction in this work.

C. Each operator shall have a minimum one (1) year manufacturer's warranty.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01600.

PART 2 PRODUCTS AND MATERIAL

2.1 REQUIRED ATTRIBUTES

A. Trolley Type:

1. Motor - 115/230V single phase, 1/2 hp instant reversing with automatic reset thermal overload. Equal to Overhead Door Corp. Model “RSX”.
2. Reversing Contactor - Heavy duty, electrically and mechanically interlocked.
3. Limit Switches - Adjustable rotary type synchronized with door operation.
4. Control Circuit - 24 volt class 2, three button, OPEN-CLOSE-STOP.
5. Reduction - Primary-V-belt, secondary-chain and sprocket.
6. Clutch - Adjustable disc friction type.
7. Brake - Solenoid actuated drum type.

8. Where required provide car wash modification, electrical enclosure and 3-button station meeting NEMA 1.
9. Pneumatic safety edge with photo cells.

B. Upward-Acting:
1. Motor - 115/230V single phase, 1/2 hp instant reversing with automatic reset thermal overload. Equal to Overhead Door Corp. Model “RSX”.
2. Track - Heavy duty.
3. Jackshaft - Side mount.
4. Brake - Solenoid actuated.
5. Quick Disconnect - For manual or emergency operation.
6. Control Circuit - 24 volt, three button, OPEN-CLOSE-STOP enclosure meeting NEMA 1.
7. Reversing Contactor - Heavy Duty, electrically and mechanically interlocked.
8. Provisions for the connection of a 2-wire monitored photo electric eye cell system.

C. Front of Hood Mount Type: (with car wash modification)
1. Motor - 115/230V single phase, **1 hp, 1/2 hp.** Model "RHX” with hand chain hoist & 24V three button open-close-stop control, NEMA 4, from Overhead Door Corp. or equal.
2. Reversing Contactor - Heavy Duty, electrically and mechanically interlocked.
3. Provisions for the connection of a 2-wire monitored photo electric eye cell system.

2.2 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

B. Provide a one-button remote for each garage door opener.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install the work of this section in strict accordance with the manufacturer's recommendations and shop drawings and in accordance with pertinent requirements of governmental agencies having jurisdiction.
B. Electrical contractor will run electricity to the electric door operator. Final connection to the door operator shall be the responsibility of the electric door operator installer.

3.3 ADJUSTMENTS AND INSTRUCTIONS

A. Upon completion of the installation, carefully inspect each component and verify that all items have been installed in the proper location, adequately anchored and adjusted to achieve optimum operation.
B. Demonstrate to the owner, operation and maintenance procedures.

END OF SECTION

09900

PAINTING

PART 1 GENERAL

1.1 SUMMARY

A. Provide surface preparation.
B. Provide field application of paints, stains, varnishes and other coatings.

1.2 REFERENCES

A. ASTM D16 - Standard Terminology Relating to Paint, Varnish, Lacquer and Related Products.
B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials.
C. NACE (National Association of Corrosion Engineers) - Industrial Maintenance Painting.
D. NPCA - Guide to U.S. Government Paint Specifications; National Paint and Coatings Association.
E. PDCA - Architectural Specifications Manual; Painting and Decorating Contractors of America.
F. SSPC - Steel Structures Painting Manual; Steel Structures Painting Council.

1.3 DEFINITIONS

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

1.4 SUBMITTALS FOR REVIEW

A. Section 01300 - Submittals: Procedures for submittals.
B. Samples:
   1. Submit two paper chip samples, 2 x 4 inches in size illustrating range of colors and textures available for each surface finishing product scheduled.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
B. Applicator Qualifications: Company specializing in performing the work of this section with minimum three years experience.

1.6 DELIVERY, STORAGE AND PROTECTION

A. Section 01600 - Material and Equipment: Transport, handle, store and protect products.
B. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
C. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation and instructions for mixing and reducing.
D. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01600 - Material and Equipment: Environmental conditions affecting products on site.
B. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
C. Do not apply exterior coatings during rain or snow or when relative humidity is outside the

humidity ranges required by the paint product manufacturer.

D. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior, unless required otherwise by manufacturer's instructions.

E. Minimum Application Temperature for Varnish Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.

F. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

1.8 PROJECT CONDITIONS

A. Section 01039 - Coordination and Meetings.

B. Sequence application to the following:

1. Do not apply finish coats until paintable sealant is applied.
2. Back prime wood trim before installation of trim.

1.9 EXTRA MATERIALS

A. Section 01700 - Operation and Maintenance Data.

B. Supply 1 gallons of each color, type and surface texture; store where directed.

C. Label each container with color, type, texture and room locations in addition to the manufacturer's label.

PART 2 PRODUCTS

2.1 MATERIALS

A. Coatings: Ready mixed, except field-catalyzed coatings. Prepare pigments:

1. To a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating.
2. For good flow and brushing properties.
3. Capable of drying or curing free of streaks or sags.

B. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified; commercial quality.

C. Patching Materials: Latex filler.

D. Fastener Head Cover Materials: Latex filler.

2.2 FINISHES

A. Refer to finish schedule on drawings for surface finish.

2.3 BRAND OF PAINT

A. Sherwin-Williams or equal.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01039 - Coordination and Meetings: Verification of existing conditions before starting Work.

B. Verify that surfaces and substrate conditions are ready to receive Work as instructed by the product manufacturer.

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

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

E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes

unless moisture content of surfaces is below the following maximums:

1. Plaster and Gypsum Wallboard: 12 percent.
2. Masonry, Concrete and Concrete Unit Masonry: 12%.
3. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
4. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.
5. Concrete Floors: 8 percent.

3.2 PREPARATION

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

B. Surfaces: Correct defects and clean surfaces that affect work of this section.

C. Marks: Seal with shellac those that 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. Asphalt, Creosote, or Bituminous Surfaces Scheduled for Paint Finish: Remove foreign particles to permit adhesion of finishing materials. Apply compatible sealer or primer.

G. Insulated Coverings: Remove dirt, grease and oil from canvas and cotton.

H. Concrete Floors: Remove contaminations, acid etch and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow it to dry.

I. Copper Surfaces Scheduled for Paint Finish: Remove contamination by steam, high-pressure water or solvent washing. Apply vinyl etch primer immediately following cleaning.

J. Copper Surfaces Scheduled for a Natural Oxidized Finish: Remove contamination by applying oxidizing solution of copper acetate and ammonium chloride in acetic acid. Rub on repeatedly for required effect. Once attained, rinse surfaces with clear water and allow to dry.

K. Gypsum Board Surfaces: Fill minor defects with filler compound. Spot prime defects after repair.

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

M. Concrete and Unit Masonry Surfaces Scheduled to Receive Paint Finish: Remove dirt, loose mortar, scale, salt or alkali powded and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow it to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow it to dry.

N. 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.

O. Uncoated Steel and Iron Surfaces: Remove grease, mill scale, weld splatter, dirt and rust. Where heavy coatings of scale are evident, remove by [hand] [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.

P. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with a solvent. Prime paint bare steel surfaces.

Q. Interior Wood Items Scheduled 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.

R. Interior Wood Items 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.

S. 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 calking compound after prime coat has been applied.

T. 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 calking

compound after sealer has been applied.

U. Wood Doors Scheduled for Painting: Seal wood door top and bottom edge surfaces with clear sealer.

V. Metal Doors Scheduled for Painting: Prime metal door top and bottom edge surfaces.

3.3 APPLICATION

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

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.

D. Sand wood surfaces lightly between coats to achieve required finish.

E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

F. Where clear finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

G. Prime concealed surfaces of interior woodwork with primer paint.

H. Prime concealed surfaces of interior wood surfaces scheduled to receive stain or varnish finish with gloss varnish reduced 25 percent with thinner.

3.4 CLEANING

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

3.5 SCHEDULE - EXTERIOR SURFACES

A. Wood - Painted (Opaque):
   1. One coat of latex primer sealer.
   2. Two coats of alkyd enamel, semi-gloss.

B. Wood - Transparent:
   1. One coat of stain.

C. Concrete, Concrete Block, Restored Masonry Cement Plaster:
   1. One coat of primer sealer latex.
   2. One coat of alkyd, flat.

D. Gypsum Board Soffits
   1. One coat of primer sealer latex.
   2. One coat alkyd, flat.

E. Steel - Unprimed:
   1. One coat of alkyd primer.
   2. Two coats of alkyd enamel, gloss.

F. Steel - Shop Primed:
   1. Touch-up with zinc chromate primer.
   2. Two coats of alkyd enamel, gloss.

G. Steel - Galvanized:
   1. One coat galvanize primer.
   2. Two coats of alkyd enamel, gloss.

H. Aluminum - Mill Finish:
   1. One coat etching primer.
   2. One coat of alkyd enamel, gloss.

3.6 SCHEDULE - INTERIOR SURFACES

A. Wood - Painted:
   1. One coat of latex prime sealer.
   2. One coat of alkyd enamel, semi-gloss.

B. Wood - Transparent:
   1. Filler coat (for open grained wood only).
   2. One coat of stain.
   3. One coat sealer.
   4. Two coats of varnish, satin.

C. Concrete, Concrete Block, Restored Masonry Cement Plaster:
   1. One coat of block filler.
   2. Two coats of high-gloss polyamide epoxy.

D. Interior Gypsum Drywall
   1. One coat of vinyl latex primer sealer.
   2. Two coats of latex eggshell enamel.

E. Steel - Unprimed:
   1. One coat of alkyd primer.
   2. Two coats of alkyd enamel, gloss.

F. Steel - Shop Primed:
   1. Touch-up with zinc chromate primer.
   2. Two coats of alkyd enamel, gloss.

END OF SECTION

15050

MATERIALS AND METHODS

PART 1 GENERAL

1.1 OPERATION PRIOR TO ACCEPTANCE

A. When any equipment is operable, and it is to the advantage of the Contractor to operate the equipment, he may do so provided that he properly supervises the operation, and retains full responsibility for the equipment operated. Before final acceptance by the owner, the Contractor shall properly clean the equipment, install clean filter media, make all required adjustments and complete all punch list items.

1.2 WARRANTY

A. Warrant to Owner that materials, equipment, and workmanship provided under this Division of the Specifications will be free from defects for a period of one year from the date of acceptance by Owner. Additional equipment warranty requirements are stated in other sections of the specifications.

PART 2 PRODUCTS

2.1 MATERIALS

A. Products are to be new and free from defects, and are to be installed by competent specialist for each trade in accordance with the manufacturer's recommendations. Materials or equipment not meeting these standards, or the acceptance of the Engineer, may be rejected and will be replaced at no additional costs to the owner.

PART 3 EXECUTION

3.1 PIPING INSTALLATION

A. Conceal piping in pipe chases, walls, furred spaces and above ceiling, unless otherwise indicated.
B. Should any condition arise which would cause piping or ductwork to be exposed in finished areas,it will be called to the architect/owner's attention immediately and corrected in accordance withthe architect/owner's instructions.

3.2 HANGERS AND SUPPORTS

A. Provide and install per ANSI Standards SP-58 and SP-69.

B. Adequately support pipes throughout the buildings, both horizontal and vertical.

C. Hanger Schedule

PIPE SERVICE	HANGER SIZE	TYPE	GRINNELL NO.
Uninsulated Steel	2" & smaller	Split Ring	108 with 114
Uninsulated Copper	2" & smaller	Ring	CT 99

Cast Iron Soil Pipe	All	Clevis	590
Insulated Steel	4" & smaller	Clevis	260 with shield
Insulated Copper	2" & smaller	Clevis	CT 65

D. Multiple or Trapeze Hangers" Steel channels with angles or unistrut spacers and hanger rods.

E. Wall Support 2 1/2 inch and over: Welded steel bracket and wrought steel clamp.

F. Vertical Support: Steel riser clamp.

G. Provide copper plated hangers and supports for copper piping or provide sheet plastic tape wrapping between hanger or support and piping.

H. Equivalent products of Fee and Mason or Elcen are acceptable substitutes for the Grinnell hangers specified.

I. Maximum horizontal pipe hanger support spacing and minimum rod diameter for rigid rod hangers (see chart).

J. Install hangers to provide minimum 1/2-inch clear space between finished covering and adjacent work.

K. Place a hanger within one foot of each horizontal elbow.

L. Support horizontal soil pipe near each hub, with 10 feet maximum spacing between hangers.

M. Support PVC piping per manufacturer's recommendations.

3.3 ELECTRICAL WIRING OF MOTORS AND EQUIPMENT

A. Follow manufacturer's published directions in the delivery, storage, protection, installation, piping and wiring and start-up of equipment and materials.

3.4 ACCESS PANELS AND DOORS

A. Install access panels and doors for concealed equipment and valves.

3.5 TESTS

A. Field test mechanical equipment furnished and installed under this Contract as required by the Engineer Tests.
B. Perform tests required by governing authorities, in addition to tests specified in individual Sections.
C. Complete final installation and testing 14 days prior to Contract Completion Date.
D. All pipe work shall be tested at the pressure equal to the design working pressure of the pipe for the intended service and maintain this pressure for not less than two hours with not more than 1% drop in pressure.
E. Notify architect/owner of any test failures. Submit weekly pipe test log listing service; section tested, initial and final pressure, time and temperature.

END OF SECTION

15440

PLUMBING FIXTURES

PART 1 GENERAL

1.1 SUMMARY

A. Provide:
1. Plumbing fixtures and trim.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's descriptive literature for all products specified.

PART 2 PRODUCTS

2.1 FITTINGS AND PIPING

A. Provide brass fittings and piping in connection with plumbing fixtures; polished chrome-plated where exposed to view.
B. Provide tight-fitting wall or floor escutcheons of chrome-plated brass wherever pipes pass through floors, walls or ceilings.
C. Provide required water, waste, soil, and vent connections to plumbing fixtures and equipment, together with fittings, supports, fastening devices, cocks, valves and traps, leaving all in complete working order.

2.2 FIXTURES

A. Provide new plumbing fixtures, first quality, free from mars or chips. Sufficient means to support each fixture in an adequate and rigid manner that permits no perceptible movement of fixture by manually applied forces. Fixtures to be standard products as manufactured by American Standard, Crane, Eljer or Kohler. The space between fixtures and floor or walls to be sealed with silicone sealant.
B. Each fixture shall be complete with required trim, and exposed piping and trim shall be polished chrome-plated brass. Each fixture shall be furnished with stop valves having metal-to-metal seats.
C. Provide for each lavatory and sink, a flow-limiting device that will limit flow to not more than 3 g.p.m. Devices shall be integral with fixture trim, wherever possible and shall be products of the fixture trim Manufacturer in all cases.
D. Provide plumbing fixtures as scheduled on Drawings.
E. See Specification Section 15410 - Compressed Air Piping, 2.2 Valves and Specialties.

PART 3 EXECUTION

3.1 INSTALLATION

A. Plumbing fixtures and equipment shall be set in place at locations indicated on the Drawings, leveled and connected. Fixtures shall be protected from damage during construction.
B. Installation procedures shall be in accordance with these Specifications and the Manufacturer's directions.

3.2 ADJUSTING AND CLEANING

A. Prior to final acceptance, inspect faucets, flush valves, stop valves, and similar devices, to determine that they operate properly and discharge the proper quantities of water. Correct any deficiencies as directed by the Engineer.

B. Clean fixtures, trim and accessories of foreign materials, including labels.

END OF SECTION

15490

NATURAL GAS PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Provide:
   1. Natural gas piping.
B. Comply with Division 15 as applicable. Refer to other Divisions for coordination of work.

PART 2 PRODUCTS

2.1 NATURAL GAS PIPING (ABOVE GRADE)

A. Piping to be black steel, standard weight. Schedule 40 ASTM A120. Installation shall conform to NFPA 54 and applicable local codes.

2.2 GAS VALVES

A. Valves 2" and smaller shall be 125 psi bronze or cast iron body, flat head cock, with bronze plug, as manufactured by Crane, Jenkins or Powell.

2.3 GAS SERVICE REGULATORS

A. Furnish and install regulators as needed for a complete and proper installation as manufactured by Rockwell or Fisher.

PART 3 EXECUTION

3.1 INSTALLATION

A. Mechanical Contractor to extend gas piping to all gas appliances and install valved, dirt leg, and union at each appliance.
B. Pipe welders to be certified and bear evidence of certification 30 days prior to commencing work on this project.

3.2 NATURAL GAS PIPING - TESTING

A. After completion of work, the entire system will be tested.
B. For each line intended to be operated at pressure of less than 1 PSIG, give leak test a 3 pressure of 25 PSIG for 2 hours, or as required by local authority if more stringent.
C. For each line intended to be operated at a pressure of 1 PSIG and above, give leak test at a pressure of 100 PSIG for 2 hours, or as required by local authority if more stringent.

END OF SECTION

15500

HEATING, VENTILATING AND AIR CONDITIONING

PART 1 GENERAL

1.1 SUMMARY

A. Provide heating, ventilating, and air conditioning systems where shown on the Drawings, as specified herein and as needed for a complete and proper installation including but not necessarily limited to:
   1. Heating and Central Air Condenser Unit.
   2. Air conditioning supply and return ductwork system with grilles and diffusers.
   3. Gas-fired, ceiling-hung Unit Heaters.
   4. Temperature control system including low-voltage wiring.
   5. Acoustical and thermal insulation of ducts.
   6. Engineering and design, refer to drawings.

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

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01300.

B. Product data: Within 30 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
   1. Manufacturers catalogs, samples and other items needed to fully demonstrate the quality of the proposed materials and equipment.

C. Record drawings:
   1. Comply with pertinent provisions of Section 01700.
   2. Include a copy of the Record Drawings in each copy of the operation and maintenance manual described below.

D. Upon completion of this portion of the Work, and as a condition of its acceptance, deliver to the Architect two copies of an operation and maintenance manual compiled in accordance with the provisions of Section 01700 of these Specifications.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Without additional cost to the Owner, provide such other labor and materials as are required to complete the work of this Section in accordance with the requirements of governmental agencies having jurisdiction, regardless of whether such materials and associated labor are called for elsewhere in these Contract Documents.

C. Provide minimum 1-year manufacturer's warranty on all units.

1.4 DELIVERY, STORAGE AND HANDLING

A. Comply with pertinent provisions of Section 01600.

PART 2 PRODUCTS

2.1 DUCTWORK

A. For exhaust systems and for the heating, ventilating, and air conditioning systems, provide galvanized sheet metal ducts fabricated and installed to pertinent ASHRAE and SMACNA standards or to the requirements of governmental agencies having jurisdiction, whichever requirement is more stringent.

B. Size the ducts for pressure drop of 0.1" H20 per 100 feet.

C. Seal all duct seams, transverse and longitudinal, air tight with 6 ox canvas secured in place with "WC800" or equal duct sealing compound, an approved lagging adhesive or duct tape.

2.2 FLEXIBLE DUCT

A. Provide factory fabricated insulated low-pressure flexible duct with the following attributes:
   1. Zinc-coated spring steel helix, with 1" thick fiberglass insulation, sheathed in a seamless vapor barrier jacket.
   2. Interior fire-resistive coated to prevent fiber erosion;
   3. Straight run sound absorption of 3 db per ft, and 5 db per ft sound absorption at 45 degree bends;
   4. Composite assembly, including insulation and vapor barrier, meeting Class 1 requirements of flame spread of 25 or less and smoke developed of 50 or less as set forth in NFPA Bulletin 90-A and bearing UL label as an air duct.

B. Provide flexible duct in fully extended condition, free from sags and kinks.
   1. Use only the minimum length required to make the connection.
   2. Do not exceed 8'-0" in length.
   3. Where horizontal support is required, provide at least 3/4" wide banding material hangers at not more than 36" centers.
   4. Make joints and connections with 1/2" wide positive locking steel straps.

C. Acceptable products:
   1. Insulated low pressure flexible duct "Type S-181" manufactured by Glass Insulation Co., Los Angeles.
   2. For toilet exhaust or return air connectors and runouts, aluminum flexible ducts such as "Flexmaster" or "Van-guard" may be used if acceptable to the governmental agencies having jurisdiction.

2.3 INSULATION

A. General:
   1. Provide materials complying with NFPA Bulletin 90-A, as determined by UL method NFPA 225-ASTM E84, and complying with the governing code, with flame spread rating under 25 and smoke developed rating under 50.
   2. Where vapor barriers are used, provide intact and continuous throughout.
   3. Acceptable manufacturers:
      a. Owens/Corning Fiberglass;
      b. Manville.
      c. Certainteed.

B. All supply ducts:
   1. Insulate supply ducts with 1" thick fiberglass blanket such as Fiberglas "FRK ED-100," or equal approved in advance by the Architect.
   2. Insulate return ducts with 3/4-pcf 1" thick fiberglass duct wrap blanket.

C. Acoustical duct liner: For ducts exposed to the weather and for supply ducts from supply fan to first branch ducts:
   1. Line with one of the following 1" thick materials:
      a. CSG No. 300, coated;
      b. PPG 3 pcf;
      c. Superine (or Textrafine) Fiberglass PF-615;
      d. Manville 3 pcf Micortex coated duct liner.
   2. Apply duct liner with coated side facing air stream and secured to the sheet metal with "ED104" adhesive or with mechanical clips recommended by the manufacturer.
   3. Make joints tightly butted and heavily sized with "Lag-gas" or "Arabolt Lagging Adhesive," assuring continuity of surfaces.

2.4 AIR OUTLETS

A. Ceiling diffusers:
   1. Provide Hart & Cooley or Approved Equal, in size, capacity and pattern noted on the Drawings.
   2. Provide insulated adaptor boxes above each diffuser neck to permit connection of flexible duct.
B. Grilles: Provide Hart & Cooley or Approved Equal in size, capacity and pattern noted on drawings.
C. Provide factory-applied or site-applied black coating on the inside of all air outlets and connecting plenums.
D. Provide sponge rubber under all flanges.

2.5 VIBRATION ISOLATION AND FLEXIBLE CONNECTIONS

A. At ducts to equipment, provide vent-fabric flexible connections with a minimum of 6" full length and approved by the governmental agencies having jurisdiction.
B. Provide additional sound isolation as required to limit the noise level in conditioned space to a maximum of NC-40.

2.6 HEATING AND CENTRAL AIR UNIT

A. Install High Efficiency, Direct Vent, Condensing Upflow Gas Furnaces with necessary appurtenances, per HVAC Schedule. See Construction Documents, equal to Carrier.
B. Install High Efficiency Air Conditioners with necessary appurtenances, per Split Systems HVAC Units Schedule sheet 26 of 29, equal to Carrier.
C. Install Carrier Model TSTATCCPAC01-B 7 day programmable thermostats, or approved equals, per manufacturer's instructions and specifications.
D. Location of units per drawings.
E. Vent furnace unit per Manufacturer's instructions and specifications and as per drawings.

2.7 UNIT HEATERS

A. Unit Heater. Furnish gas fired, propeller fan and unit heaters as manufactured by one of the following companies: Crane, Reznor, National, Pearless, Carrier, Tran Bryant, or equal in the capacity shown on the plans. Units shall be A.G.A. certified, completely assembled and be operationally tested before shipment from factory.
B. Unit Heater Exchanger. Shall be stainless steel seam or arc welded with tubes and headers not lighter than 20 gauge thickness. Draft diverters shall be aluminized steel or equal. Electrical characteristics as required.
C. Burners. The burners shall be of cast iron or stainless steel construction that will give quiet, smooth ignition throughout the length of the burner. They shall be equipped with adjustable air shutters to regulate flame characteristics for maximum efficiency. All burners shall be individually removable.

D. Pilot. Shall be of the intermittent pilot systems type using gas only when the system calls for heat, is lit by high voltage capacitive discharge spark, turns off automatically when demand for heat is satisfied or flame is lost. If flame is lost, unit shuts off main valve, re-starts ignition sequence.

E. Wiring. Units shall be factory wired for high limit and fan control. Fan motor shall be 115 volt, single phase, 60 cycle totally enclosed with overload protection.

F. Gas Valve. The gas valve shall be standard type 24-volt single phase, 60 cycle arranged for 100% safety shut off on main and pilot burner. 115/24-volt transformer to be supplied with unit heater and factory wired on low voltage side to gas valve.

2.8 PIPING

A. For refrigerant piping, provide Type "L" copper, refrigerant grade, with wrought copper fittings,and with joints thoroughly cleaned prior to soldering.

2.9 AUTOMATIC TEMPERATURE CONTROL

A. Provide a system of temperature control with the attributes listed below.
   1. Include thermostats, sensors, temperature controllers, and air piping as requiring for a complete and operable system compatible with approved Heating and Central Air Unit.
   2. Provide devices calibrated and adjusted with the actual operating conditions.

2.10 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 COORDINATION

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

3.3 EQUIPMENT INTERFACE

A. Provide all required shutoff valves, unions and final connections of piping to the work of this Section.

B. For electrically operated equipment, verify the electrical characteristics actually available for the work of this Section and provide equipment meeting those characteristics.

3.4 PAINTING

A. Paint inside of all air outlets and connecting plenums with one coat of black paint or provide all such items factory preprinted.

3.5 INSULATION

A. Wrap insulation firmly around ductwork, covering all surfaces including standing seams and with all joints lapped at least 2".

B. Securely fasten the insulation in place with 16 gauge soft annealed black or galvanized wire spaced approximately 12" on centers for straight runs and 3" on centers for elbows and fittings.

C. Take special care to avoid excessive stretching and compressing and to achieve securing at lapped sections where possible.

3.6 INSTRUCTIONS

A. Upon completion of this portion of the Work, and prior to its acceptance by the Owner, provide a qualified engineer and fully instruct the Owner's maintenance personnel in the proper operation and maintenance of items provided under this Section.

B. Demonstrate the contents of the approved operation and maintenance manual required under Article 1.2 above.

3.7 TESTING AND ADJUSTING

A. Test and adjust each piece of equipment and each system as required to assure proper balance and operation.

1. Test and regulate ventilation and air conditioning systems to conform to the air volumes shown on the approved design drawings.
2. Make tests and adjustments in apparatus and ducts for securing the proper volume and face distribution of air for each grille and ceiling outlet.
3. Where required, provide pulleys for fans at no additional cost to the Owner and set to drive the fans at the speed needed to give the indicated volume.
4. For each system, take the following data in tabulated form:
    a. Air volumes at all supply return and exhaust outlets;
    b. Total c.f.m. supplied;
    c. Total c.f.m. returned;
    d. Total static pressure at each fan and at each system;
    e. Motor speed, fan speed and input ampere rating for each fan.

B. Submit two sets of test and balance reports to the Architect for approval.

C. Eliminate noise and vibration, and assure proper function of all controls, maintenance of temperature and operation in accordance with the approved design.

D. Secure required approval from governmental agencies having jurisdiction.

END OF SECTION

15990

TESTING AND BALANCING

PART 1 GENERAL

1.1 SUMMARY

A. This section specifies the requirements and procedures for total mechanical systems testing, adjusting and balancing. Requirements include measurement and establishment of the fluid quantities of the mechanical system as required to meet design specifications, recording and reporting the results and operation of all systems to demonstrate satisfactory performance to the Owner.

B. Test, adjust and balance the following mechanical systems:
   1. Supply, return and exhaust air systems.
   2. Hydronic heating and cooling systems.
   3. Verify temperature control system operation.

C. This Section does not include:
   1. Specifications for materials for patching mechanical systems.
   2. Specifications for materials and installation of adjusting and balancing devices. If devices must be added to achieve proper adjusting and balancing, refer to the respective system sections for materials and installation requirements.
   3. Requirements and procedures for piping and ductwork systems leakage tests.

1.2 DEFINITIONS

A. Systems testing, adjusting, and balancing is the process of checking and adjusting all the building environmental systems to produce the design objectives. It includes:
   1. The balance of air and water distribution.
   2. Adjustment of total system to provide design quantities.
   3. Electrical measurement.
   4. Verification of performance of all equipment and automatic controls.
   5. Sound and vibration measurement.

B. Test: To determine quantitative performance of equipment.

C. Adjust: To regulate the specified fluid flow rate and air patterns at the terminal equipment (e.g. reduce fan speed, throttling).

D. Balance: To proportion flows within the distribution system (sub mains, branches and terminals) according to specified design quantities.

E. Procedure: Standardized approach and execution of sequence of work operations to yield reproducible results.

F. Report Forms: Test data sheets arranged for collecting test data in logical order for submission and review. These data sheets should also form the permanent record to be used as the basis for required future testing, adjusting and balancing.

G. Terminal: The point where the controlled fluid enters or leaves the distribution system. There are supply inlets on water terminals, supply outlets on air terminals, return outlets on water terminals, and exhaust or return inlets on air terminal such as registers, grilles, diffusers, louvers and hoods.

H. Main: Duct or pipe containing the system's major or entire fluid flow.

I. Submain: Duct or pipe containing part of the system's capacity and serving two or more branch mains.

J. Branch Main: Duct or pipe serving two or more terminals.

K. Branch: Duct or pipe serving a single terminal.

1.3 SUBMITTALS

A. Agency Data:
1. Submit proof that the proposed testing, adjusting, and balancing agency meets the qualifications specified below. The firm or individuals performing the work herein specified may be the installing firm or individuals or may be separate and independent firm or individuals employed by the contractor but in either case the personnel performing the work shall be qualified and certified as specified.

B. Engineer and Technicians Data:
1. Submit proof that the proposed testing, adjusting, and balancing agency meets the qualifications specified below. The firm or individuals performing the work herein specified may be the installing firm or individuals or may be a separate and independent firm or individuals employed by the Contractor, but in either case the personnel performing the work shall be qualified and certified as specified.

C. Procedures and Agenda: Submit a synopsis of the testing adjusting and balancing procedures and agenda proposed to be used for this project.

D. Maintenance Date: Submit maintenance and operating data that includes how to test, adjust and balance the building system. Include this information in maintenance data specified in Division 15 - Basic Mechanical Requirements.

E. Sample Forms: Submit sample forms, if other than those standard forms prepared by the AABC or NEBB are proposed.

F. Certified Reports: Submit testing, adjusting, and balancing reports bearing the seal and signature of the Test and Balance Engineer. The reports shall be certified proof that the systems have been tested, adjusted, and balanced in accordance with the referenced standards; are an accurate representation of how the systems have been installed; are a true representation of how the systems are operating at the completion of the testing, adjusting, and balancing procedures; and are an accurate record of all final quantities measured, to establish normal operating values of the systems. Follow the procedures and form as specified below:

G. Reports: Upon completion of testing, adjusting, and balancing procedures, prepare reports on the approved forms. Reports may be hand written, but must be complete, factual, accurate and legible. Submit 3 complete sets of reports. Only 2 complete sets of draft reports will be returned.

H. Report Format: Report forms shall be those standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted and balanced. Bind report forms complete with schematic systems diagrams and other data in reinforced, vinyl, three-ring binders. Provide binding edge labels with the project identification and a title descriptive of the contents. Divide the contents of the binder into the below listed divisions, separated by divider tabs.
1. General Information and Summary.
2. Air Systems.
3. Temperature Control Systems.

I. Report Contents: Provide the following minimum information, forms and data:

1. General Information and Summary: Inside cover sheet to identify testing, adjusting and balancing agency, contractor, Owner, Architect, Engineer and Project. Include addresses, and contact names a telephone numbers. Also include a certification sheet containing the seal and name, address, telephone number and signature of the Certified Test and Balance Engineer. Include in this division a listing of the instrumentation used for the procedures along with the proof of calibration.
2. The remainder of the report shall contain appropriate forms containing as a minimum, the information indicated on the standard report forms prepared by the AABC and NEBB, for each respective item and system to accompany each respective report form. The report shall contain the following information, and all other data resulting from the testing, adjusting and balancing work:
3. All nameplate and specification data for all pumps, air handling equipment and motors.
4. Inlet water and outlet water temperatures of each heating and cooling element.
5. Water pressure drop through each heating and cooling coil.
6. Operating suction and discharge pressure and final total discharge head for each pump.
7. Water flow readings at all pumps and coils.
8. Actual metered running amperage for each phase of each motor on all pumps and air handling equipment.
9. Actual metered voltage at each pump and each piece of air handling equipment (phase to phase for all phases).
10. Static pressure for each piece of air handling equipment and at each location in ductwork system where static pressure controllers are located.
11. Fan RPM for each piece of air handling equipment.
12. Total actual DCM being handled by each piece of air handling equipment.
13. Entering and leaving air temperature of all air handling unit heating coils and cooling coils.
14. Actual CFM of systems by rooms.

1.4 CERTIFICATION

A. Agency Qualifications:

1. Employ the services of a certified testing, adjusting and balancing agency meeting the qualifications specified below, to be the single source of responsibility to test, adjust and balance the building mechanical systems, identified above, to produce the design objectives. Services shall include checking installations for conformity to design, measurement and establishment of the fluid quantities of the mechanical systems as required to meet design specifications, recording and reporting the results and operation of all systems to demonstrate satisfactory performance to the Owner.
2. The testing, adjusting, and balancing agency certified by National Environmental Balancing Bureau (NEBB) or Associated Air Balance Council (AABC) in those testing and balancing disciplines required for this project and having at least one person certified by NEBB or AABC as a Test and Balance Engineer.

B. Codes and Standards

1. NEBB: “Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems”. Or
2. AABC: “National Standards for Total System Balance”, And
3. ASHRAE: “ASHRAE Handbook”, 1984 Systems Volume, Chapter 37, Testing, Adjusting and Balancing.

C. Pre-balancing Conference: Prior to beginning of the testing, adjusting, and balancing procedures, schedule and conduct a conference with the Architect/Engineer and representatives of installers of the mechanical system. The objective of the conference is final coordination and verification of system operation and readiness for testing, adjusting and balancing.

1.5 PROJECT CONDITIONS

A. Systems Operation: System shall be fully operational and clean prior to beginning procedures.

1.6 SEQUENCING AND SCHEDULING

A. Test, adjust and balance the air systems before Hydronic, steam and refrigerant systems.
B. Test, adjust, and balance air conditioning systems during summer season and heating systems during winter season, including at least a period of operation at outside conditions within 5 deg. F. Wet bulb temperature of maximum summer design condition and within 10 deg. F. Dry bulb temperature of minimum winter design condition. Take final temperature readings during seasonal operation.

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

3.1 PRELIMINARY PROCEDURE FOR AIR SYSTEM BALANCING

A. Before operating the system, perform these steps:
1. Walk the system from the system air handling equipment to terminal units to determine variations of installation from design.
2. Check filters for cleanliness and to determine if they are the type specified.
3. Check dampers (both volume and fire) for correct and locked position. Check automatic operating and safety controls and devices to determine that they are properly connected, functioning and at proper operating set point.
4. Check automatic control dampers to determine that they are functioning properly, that they will close tightly and those they will open and close smoothly without binding or backlash.
5. Prepare report test sheets for both fans and outlets. Obtain manufacturer's outlet factors and recommended procedures for testing. Prepare a summation of required outlet volumes to permit a cross check with required fan volumes.
6. Determine best locations in main and branch ductwork for most accurate duct traverses.
7. Place outlet dampers in the full open position.
8. Prepare schematic diagrams of system "as-built" ductwork and piping layouts to facilitate reporting.
9. Lubricate all motors and bearings.
10. Check fan belt tension.
11. Check fan rotation.

3.2 MEASUREMENTS

A. Provide all required instrumentation to obtain proper measurements, calibrated to the tolerances specified in the referenced standards. Instruments shall be properly maintained and protected against damage.

B. Provide instruments meeting the specifications of the referenced standards.

C. Use only those instruments that have the maximum field measuring accuracy and are best suited to the function being measured.

D. Apply instrument as recommended by the manufacturer.

E. Use instruments with minimum scale and maximum subdivision and with scale ranges proper for the value being measured.

F. When averaging values, take a sufficient quantity of readings that will result in a repeatability error of less that 5 percent. When measuring a single point, repeat readings until 2 consecutive identical values are obtained.

G. Take all readings with the eye at the level of the indicated value to prevent parallax.

H. Use pulsation dampeners where necessary to eliminate error involved in estimating average of rapidly fluctuating readings.

I. Take measurements in the system where best suited to the task.

3.3 PERFORMANCE TESTING, ADJUSTING, AND BALANCING

A. Perform testing and balancing procedures on each system identified, in accordance with the detailed procedures outlined in the referenced standards. Balancing of the air systems and hydronic systems shall be achieved by adjusting the automatic controls, balancing valves, dampers, air terminal devices and the fan/motor drives within each system.

B. Cut insulation, ductwork and piping for installation of test probes to the minimum extent necessary to allow adequate performance of procedures.

C. Patch insulation, ductwork and hosing, using materials identical to those removed.

D. Seal ducts and piping, and test for and repair leaks.

E. Seal insulation to re-establish integrity of the vapor barrier.

F. Mark equipment settings, including damper control positions, valve indicators, fan speed control levers and similar controls and devices, to show final settings. Mark with paint or other suitable, permanent identification materials.

G. Retest, adjust and balance systems subsequent to significant system modifications and resubmit test results.

3.4 RECORD AND REPORT DATA

A. Record all data obtained during testing, adjusting, and balancing in accordance with, and on the forms recommended by the referenced standards and as approved on the sample report forms.

B. Prepare report of recommendations for correcting unsatisfactory mechanical performances when system cannot be successfully balanced.

3.5 DEMONSTRATION

A. Training:

1. Train the Owner's maintenance personnel on trouble shooting procedures and testing, adjusting and balancing procedures. Review with the Owner's personnel, the information contained in the Operating and Maintenance Data specified in Division 15.
2. Schedule training with Owner through Engineer with at least 7 days prior notice.

END OF SECTION

16100

ELECTRICAL WORK

16101 GENERAL

A. Requirements of the conditions of the contract and Instruction to Bidders, and General Conditions, apply to all work of this Section.

B. Provide complete electrical service where shown on the drawings, as specified herein, and as needed for a complete and proper installation including, but not necessarily limited to:
   1. Panelboards as needed.
   2. Branch circuit wiring, in conduit for lighting, receptacles, junction boxes and motors.
   3. Hangers, anchors, sleeves, chases, supports, for fixtures and other electrical material and equipment in association therewith.
   4. Lighting fixtures and lamps.
   5. Wiring system, in conduit, for equipment and control provided under other Sections of these specifications.
   6. Other items and services required to complete the system.

C. Related Work
   1. Documents affecting work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions and Sections in Division 1 of these specifications.

16102 FIELD CONDITIONS AND MEASUREMENTS

A. The Electrical Contractor shall visit the site of the work and familiarize himself with all available information concerning the structural, excavations, the location condition bearing on transportation, handling, and storage of materials. The Electrical Contractor shall make his own estimate of the facilities needed, and difficulties of execution of the contract including local conditions, availability of labor, uncertainties of weather, transportation, and other contingencies. Failure of the contractor to acquaint himself with all available information concerning these conditions will not relieve him from responsibility for estimating the difficulties and costs or successfully performing the complete work.

16103 CLEANUP

A. The Electrical Contractor shall have electrical rubbish and debris removed from the premises as directed. On completion of the electrical contract all associated debris and rubbish shall be removed from the premises.

B. All electrical equipment and materials furnished by this contractor shall be thoroughly cleaned and ready for use upon completion of the work.

16104 GUARANTEE

A. Contractor guarantees by his acceptance of the contract, that all work installed shall be free from any defects in workmanship and/or materials and that all apparatus will develop capacities and characteristics specified and that if, during a period of one year or as therefore specified, from completion of work, any such defects in workmanship, materials or performance appear, he will with no cost to owner remedy such defect.

16105 CODES

A. All electrical work shall be done in strict accordance with the National Electrical Code and all regulations, laws and ordinances which may be applicable.

16106 SUBMITTALS

A. Product data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
   1. Materials list of items proposed to be provided under this section.
   2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.

3. Manufacturer's recommended installation procedures which, when approved by the owner/architect, will become the basis for accepting or rejecting actual installation procedures used on the work.

B. Submittals shall include the following:
   1. Panelboards.
   2. Lighting fixtures.
   3. Wiring devices.

C. Samples
   1. When so requested by the owner/architect, promptly provide samples of items scheduled to be exposed in the final structure.
   2. When specifically so requested by the Contractor and approved by the Architect, approved samples will be returned to the Contractor for installation on the work.

D. Manuals: Upon completion of this portion of the work, and as a condition of its acceptance, deliver to the owner/architect two copies of an operation and maintenance manual. Include with each manual.
   1. Copy of the approved record documents for this portion of work.
   2. Copies of all circuit directories.
   3. Copies of all warranties and guarantees.

16107 QUALITY ASSURANCE

A. Use adequate number of skilled workmen who are thoroughly trained and experienced in the crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

B. Without additional cost to the owner, provide such other labor and materials as are required to complete the work of this section in accordance with the requirements of governmental agencies having jurisdiction, regardless of whether such materials and associated labor are called for elsewhere in these contract documents.

16108 CONDUIT

A. All interior wiring above grade shall be installed in electrical metallic tubing with screw coupling fittings.

B. All interior wiring below slab shall be Galvanized Rigid Steel conduit. Schedule 40 PVC conduits may be used if approved by Owner/Architect. If PVC is used the last two feet to point of emergence shall be Galvanized Rigid Steel conduit with grounding bushing and a grounding conductor sized according to ART. 250-95 of the National Electrical Code shall be installed.

C. Wiring in office areas shall be concealed, unfinished areas in shop and storage areas shall be surfaced mounted.

D. All exterior wiring shall be in galvanized Rigid Steel Conduit.

E. Type MC cable with grounding conductor or type AC cable may be used for maximum 6 foot fixture whips.

16109 WIRE AND CABLE

A. Building wire and cable with 600 volt insulation shall be 98% conductivity copper unless otherwise noted. The minimum size conductor for lighting and power shall be No. 12 AWG. The minimum size conductor for control shall be No. 14 AWG.

B. Conductors sized No. 10 and smaller shall be Type "THHN" solid or stranded as required unless otherwise noted, sizes No. 8 and larger shall be type "THHN" stranded unless otherwise noted.

C. Conductors shall be colored coded as required by governmental agencies having jurisdiction or as required by the National Electrical Code.

D. Contractor shall provide and install all telephone and data cable and equipment as required by the project and per specifications sections 16930.

E. Contractor shall provide and install all of the grounding and grounding field as required by this project and per specification section 16931.

F. Tele/ data cables installed above accessible ceilings may be installed without conduit. Tele/data cables installed above non-accessible ceilings and on surface shall be in conduit. Open cables installed in space used for environmental air shall be rated for plenum use.

G. Contractor shall install ¾" EMT conduit from data receptacle to 2" above acoustical ceiling tile. Tele/ data cabling by MoDOT.

16110 JUNCTION AND OUTLET BOXES

A. Outlet Boxes
   1. Provide standard one-piece units, galvanized or sherardized steel of shape and size best suited to that particular location, of sufficient size to contain enclosed wires according to ART. 370-16 of the National Electrical Code.
   2. Provide outlet boxes 2 1/8" deep for 1" conduits.
   3. For lighting outlets, provide standard 4" octagon or square units with 3/8" fixture stud and box hanger where required.
   4. For switches and receptacles, provide standard boxes with plaster or dry wall ring with stainless steel cover plate for concealed devices and pressed steel boxed with galvanized or cadmium plated steel cover plates for exposed devices.

B. Junction or Pull Boxes
   1. Interior junction boxes shall be galvanized code-gauge sheet steel units with screw-on covers, of size and shape required to accommodate wires without crowding, and to suit the location.
   2. Exterior boxes shall meet NEMA 3R or 4 standards.

16111 LIGHTING FIXTURES

A. Install lighting fixtures, complete with lamps, as shown on drawings and schedules. Manufacturers shown on schedules are for quality and type only, manufacturers of equal quality will be accepted if approved by owner.
   1. Recessed fixtures:
      a. Provide unit having an attached pull box and with UL label.
      b. Provide local label in addition if so required by governmental agencies having jurisdiction..
   2. Fluorescent fixtures
      a. Provide ballasts thermally protected against overheating by built-in thermal protectors sensitive to ballast winding temperature and current.
      b. Provide protector preventing winding temperature from exceeding 120 degrees C, allowing winding temperatures to reach 105 degrees C under normal operating conditions at 40 degrees C ambient and, after opening, not reclosing above 80 degrees C.
      c. Exterior ballast shall be cold weather type.
      d. Where fixture substitutes are proposed, submit a sample fixture with materials list required to be submitted under Art. 16106 above.
      e. Light fixtures in work areas shall be located so as not to interfere with the operation of overhead doors.

16112 WIRING DEVICES

A. Toggle switches - Mount 48" above finished floor.
   1. Single pole Leviton 5521-I.
   2. 3-way Leviton 5523-I.

B. Receptacles - Mount 18" above Finished Floor in office area 48" above Finished Floor in garage and storage areas and above splashboard over counters.
   1. Duplex receptacles Leviton 5800-I.
   2. Weatherproof duplex receptacles Leviton 6599-I mounted in FS box and 6196-VFS cover.
   3. Ground Fault Interrupter duplex receptacles Leviton 6599-I.
   4. Isolated ground receptacles Leviton 5262-IG.

C. Telephone and Computer Outlets shall be 4" x 4" x 1 1/2" outlet box with plaster ring. Install 3/4" EMT from box to just above accessible ceiling as required.

D. Outlets in finished walls shall be 4' x 4" x x1 1/2" outlet box with plaster ring and a cover plate.

E. Outlets on surface shall be 4" x 4" x 1 1/2" outlet box and 4" x 4" raised cover plate.

F. Devices of the following manufacturers will be accepted as equal.
   1. Hubbel
   2. Arrow-Hart
   3. General Electric

16113 PANELBOARDS

A. Panelboards shall be Sq. 'D' Type with circuit breakers as shown on drawings and schedules, and shall be Service Entrance Rated.

B. Devices of the following manufactures will be accepted as equal.
   1. General Electric
   2. Cuttler-Hammer

16114 TRANSFORMERS

A. Service Entrance Transformer is not part of this contract.

16115 DISCONNECT SWITCHES

A. Disconnect switches shall be Sq. 'D' Class 3130 General Duty fusible or non-fusible as shown on drawings. Interior switches shall be NEMA 1 and Exterior switches shall be NEMA 3R.

16116 GROUNDING

A. Install a 5/8" x 10' copperclad ground rod at service entrance with a #6 bare copper conductor between ground rod and grounding bus in Panel board.

B. All grounding shall comply with ART. 250 of the National Electrical Code.

16117 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation as approved by the Architect.

16118 EXECUTION

A. Surface Conditions
   1. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

16119 PREPARATION

A. Coordinate
   1. Coordinate as necessary with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this section.
   2. Coordinate the installation of electrical items with the schedule for work of other trades to prevent unnecessary delays in the total work.

B. Data indicated on the drawings and in these specifications are as exact as could be secured but there absolute accuracy is not warranted. The exact locations, distances, levels and other conditions will be governed by actual construction and the drawings and specifications should be used only for guidance in such regard.

C. Verify all measurements at the building. No extra compensation will be allowed because of differences between work shown on the drawings and actual measurements at the site of construction.

D. Branch circuit wiring and arrangement of home runs have been designed for maximum economy consistent with adequate sizing for voltage drops and other considerations. Install the wiring and circuits arranged exactly as shown on the Drawings, except as otherwise approved in advance by the architect.

E. The electrical drawings are diagrammatic, but are required to be followed as closely as actual construction and work of other trades will permit. Where deviations are required to conform actual construction and the work of other trades, make such deviations without additional cost to the owner.

16120 TRENCHING AND BACKFILLING

A. Perform trenching and backfilling associated with the work of this section in strict accordance with the provisions of the appropriate sections of these specifications.

16121 INSTALLATION OF RACEWAYS AND FITTINGS

A. Where conduit is installed concealed in the walls or above the ceiling, or exposed in work areas, provide rigid galvanized conduit or electrical metallic tubing with screw type fittings.

B. Use flexible metal conduit only for short motor connections or where subject to vibration.

C. Provide necessary sleeves and chases where conduits pass through floors and walls, and provide other necessary openings and spaces, arranging for in proper time to prevent unnecessary cutting in connection with the work. Perform cutting and patching in accordance with the provisions for the original work.

D. Where conduit is exposed, run parallel to or at right angle with lines of the building.

E. Securely and rigidly support conduits throughout the work. Conduits and wiring above a ceiling assembly shall not be supported to, or supported by, the ceiling assembly, including the ceiling support wires.

16122 INSTALLATION OF CONDUCTORS

A. Unless otherwise shown use #12 type THHN conductors for all branch circuits protected by 20 amp circuit breakers. Where so indicated on the drawings, use larger wires to limit voltage drops.

B. Use identified (white) neutrals and color-coded phase wires for all branch circuit wiring.
   1. Make splices electrically and mechanically with pressure-type connectors.
      a. For wire size #6 AWG and smaller, provide “Scotch-Lock” connectors.
   2. Insulate splices with a minimum of two half-lapped layers of Scotch Brand #33 vinyl-plastic electrical tape where insulation is required.

C. Tape all joints with rubber tape 1 1/2 times the thickness of the conductor insulation, than cover with vinyl-plastic electrical tape specified above.

D. The drawings do not indicate the home runs. Continue all home runs to the panel as though the routes were shown completely.

16123 INSTALLATION OF PANELS

A. Install panels as shown on drawings and specifications or as directed by the owner/architect.
B. Mount a typewritten directory behind glass or plastic on the inside of each panel door and, on the directory, show the number and complete description of all outlets on each circuit.

16124 TESTING AND INSPECTION

A. Make required tests in the presence of the owners representative and required approvals from the owner/architect and governmental agencies having jurisdiction.

B. Make written notice to the owner/architect adequately in advance of each of the following stages of construction.
1. In the underground condition prior to placing concrete floor slab, when all associated electrical is in place.
2. When all rough in is complete, but not covered.
3. At completion of the work of this section.

C. When material and/or workmanship is found to not comply with the specified requirements, within three days after receipt of notice of such non-compliance remove the non-complying items from the job site and replace them with items complying with the specified requirements, all at no additional cost to the owner.

D. In the owner/architect's presence:
1 Test all parts of the electrical systems for phase to phase and phase to ground short circuits and prove that all such items provided under this section function electrically in the required manner.
2. Immediately submit to the architect a report of maximum and minimum voltages and a copy of the recording voltmeter chart.
3. Also measure voltages between phase wires and neutral and report these voltages to the Architect.

16125 PROJECT COMPLETION

A. Upon completion of the work of this section, thoroughly clean all exposed portions of the electrical installation, removing all traces of soil, labels, grease, oil, and other foreign material and using only the type cleaner recommended by the manufacturer of the item being cleaned.
B. Thoroughly indoctrinate the owner's operation and maintenance personnel in the contents of the operations and maintenance manual required to be submitted under article 16106 of this section of these specifications.

END OF SECTION