

TECHNICAL SPECIFICATIONS TABLE OF CONTENTS

GRIFFIN SOCCER COMPLEX – PHASE 6

These Special Provisions are included in and are a part of the Bidding Documents for this project.

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STATEMENT OF QUALIFICATIONS GRIFFIN PARK - PHASE 6

The low bidder will be asked to complete a Statement of Bidder's Qualifications prior to award of the contract. Should the low bidder be found not qualified the next lowest bidder will be asked to complete the Qualifications Statement.

The Owner reserves the right to reject the bid of any Bidder or disapprove any subcontractor who has not been pre-qualified or has previously failed to perform properly, or to complete on time, contracts of similar nature; who is not in a position to perform the contract; or who has habitually and without just cause neglected the payment of bills or otherwise disregarded his obligations to subcontractors, material-men or employees. In addition, the following elements will be considered: Whether the person or firm involved (1) maintains a permanent place of business; (2) has adequate equipment available to do the work properly and expeditiously; (3) has suitable financial resources to meet the obligations incident to the work; (4) has appropriate technical experience.

Said prime contractor shall have at least five (5) years of experience in projects of similar nature prior to submission of his bid. The Bidder shall offer proof of his qualifications in meeting this standard. For all other contracts, the City reserves the right to consider as unqualified to do the work, any Bidder or subcontractor who does not habitually perform, with his own work forces, the basic work involved.

All questions must be answered. The data must be clear and comprehensive. If it is necessary to give a more complete answer, you may add separate sheets.

The contractor shall have financial stability in order to fulfill all warranty requirements Contractor may be required to provide financial statements.

The following criteria will serve as a guide and will be used by the owner to evaluate the contractor.

- The prime bidder shall have at least five (5) years of experience in projects of a nature similar to the proposed project prior to submission of bids.
- Attest to the fact that the contractor has met the required level of experience per the specifications.

The following criteria will serve as a guide and will be used by the owner to evaluate the sub-contractors.

- The sub-contractors must meet all requirements of the specifications.
- Attest to the fact that the sub-contractor has met the required level of experience per the specifications.

GENERAL CONTRACTOR'S QUALIFICATIONS STATEMENT

- 1. Name of Bidder _____
- 2. Permanent Main Office Address _____
- 3. When organized _____
- 4. If incorporated, when and where _____
- 5. How many years have you been engaged in the contracting business under your present firm or trading name? _____
- 6. General character of work performed by your company _____
- 7. Have you ever been informed you were not qualified to bid a project? _____
- 8. Have you ever failed to complete any work awarded to you? _____
- 9. Bonding Capacity:

Total Bonding Capacity	\$
Total Currently under Contract	\$
Total Currently out for Bid or Award	\$

- 10. State 5 trade references with whom you do business:

- 1. _____
- 2. _____
- 3. _____
- 4. _____
- 5. _____

**STATEMENT OF QUALIFICATIONS
GENERAL CONTRACTOR
GRIFFIN PARK PHASE 6**

11. List three (3) previous projects completed by General Contractor prior to bid submission date involving work of a similar nature to this proposed project. Show job name, contact person, phone number, size, cost, and completion date.

Project	Owner	Owner Contact Information	Type (Prime or Sub)	% with own forces	Size in Dollars	Completion Date

Add additional sheets if necessary

12. Experience in work similar in importance to this contract. _____
13. Average number of employees on your payroll during the past year: _____
14. Have you ever been declared ineligible to receive awards on contracts from the Federal, State or local Governments? _____
15. If any Bidder feels that any information other than that requested above is pertinent to a determination of bidder's qualifications, such information may be added hereto and submitted together with this statement.

The undersigned will furnish any other information that Owner/Architect may request and the undersigned hereby authorizes request any person, firm or corporation to furnish any information requested by the Owner/Architect in verification of the recitals comprising this statement of Bidder's Qualifications.

Dated at _____ this _____ day of _____, 202__

(Name of Bidder)

By:

Title:

State of: _____)

County of: _____) SS.

, being duly sworn deposes and says that he is of lawful age and that the answers to the foregoing questions and all statements contained herein are true and correct.

SWORN to before me this _____ day of _____, 202__

Notary Public

**STATEMENT OF QUALIFICATIONS
SUB-CONTRACTOR
GRIFFIN PARK - PHASE 6**

1. List three (3) previous projects completed by Sub-Contractor prior to bid submission date involving work of a similar nature to this proposed project. Show job name, contact person, phone number, size, cost, and completion date.

Project	Owner	Owner Contact Information	Type (Prime or Sub)	% with own forces	Size in Dollars	Completion Date

Add additional sheets if necessary

**SECTION 01050
FIELD ENGINEERING**

PART I - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Provide and pay for field engineering services required for project.
 - 1. Survey work required in execution of project.
 - 2. Civil, structural or other professional engineering services specified, or required to execute Contractor's construction methods.
 - 3. Record drawings.

1.02 QUALIFICATIONS OF SURVEYOR OR ENGINEER

- A. Qualified engineer or registered land surveyor, acceptable to Contractor and Owner.
- B. Registered professional engineer in the State of Oklahoma, of the discipline required for the specific service required.

1.03 SURVEY REFERENCE POINTS

- A. Existing basic horizontal and vertical control points for the project are those designated on drawings.
- B. Locate and protect control points prior to starting site work and preserve all permanent reference points during construction.
 - 1. Make no changes or relocations without prior written notice to Architect and Owner.
 - 2. Report to Architect or Owner's Representative when any reference point is lost or destroyed or requires relocation because of necessary changes in grades or locations.

1.04 PROJECT SURVEY REQUIREMENTS

- A. Establish a minimum of one permanent bench mark on each site, referenced to data established by survey control points.
 - 1. Record locations with horizontal and vertical data on project record documents.
- B. Establish lines and levels, locate and lay out, by instrumentation and similar appropriate means.

1. Site improvements:
 - a. Stakes for grading, fill and topsoil placement.
 - b. Utility slopes for invert elevations.
 2. Batter boards for structures.
 3. Building foundation, column locations and floor levels.
 4. Controlling lines and levels required for Divisions 15 and 16.
- C. From time to time, verify layouts by same methods.

1.05 RECORDS

- A. Maintain a complete, accurate log of all control and survey work as it progresses.

1.06 SUBMITTALS

- A. Submit name and address of surveyor and professional engineer to Owner's Representative.
- B. Submit certificates signed by registered surveyor certifying that elevations and locations of improvements are in conformance or non-conformance with contract documents.

PART 2 - PRODUCTS

Not used

PART 3 - EXECUTION

Not used

END OF SECTION

**SECTION 01152
APPLICATION FOR PAYMENT**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work included: Comply with procedures described in this Section when applying for progress payment and final payment under the Contract.
- B. Related work:
 - 1. Proposal and contract documents.

1.02 QUALITY ASSURANCE

- A. Prior to start of construction, secure the Architect and Owner's Representative's approval of the schedule of values required to be submitted.
- B. During progress of the work, modify the schedule of values as approved by the Architect or Owner's Representative to reflect changes in the contract sum due to change orders or other modifications of the Contract.
- C. Base requests for payment on the approved schedule of values.

1.03 SUBMITTALS

- A. Informal submittal: If directed by the Architect:
 - 1. Make an informal submittal of request for payment by filling in, with erasable pencil, pertinent portions of AIA Document G702, "Application and Certificate for Payment", plus continuation sheet or sheets or other form as approved by the Owner.
 - 2. Make this preliminary submittal to the Architect at the last regular job meeting of each month.
 - 3. Revise the informal submittal of request for payment as agreed at the job meeting, initialing all copies.
- B. Formal submittal: Unless otherwise directed by the Architect:
 - 1. Make formal submittal of request for payment by filling in the agreed data, by typewriter or neat lettering in ink, on AIA Document G702, "Application and Certificate for Payment", plus continuation sheet or sheets, or other form as approved by Architect or Owner.
 - 2. Sign and notarize the Application and Certificate for Payment and the City "Uniform Voucher and Invoice for Construction Services".
 - 3. Submit the original of the Application and Certificate of Payment plus three (3) identical copies of the continuation sheet or sheets to the Architect.
 - 4. The Architect will compare the formal submittal with the approved

informal submittal and, when approved, will sign the Application and Certificate for Payment, make the required copies and distribute:

- a. One original and two copies to Owner;
- b. One copy to Owner's Representative.

PART 2 - PRODUCTS

Not used

PART 3 - EXECUTION

Not used

END OF SECTION

**SECTION 01200
PROJECT MEETINGS**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work included: To enable orderly review during progress of the work and to provide for systematic discussion of problems, the Owner's Representative will conduct project meetings throughout the construction period.
- B. Related work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, Proposal and Contract Documents and Sections in Division 1 of these Specifications.
 - 2. The Contractor's relations with his subcontractors and materials suppliers, and discussions relative thereto, are not the Architect or Owner's Representative responsibility and normally are not part of project meetings content.

1.02 QUALITY ASSURANCE

- A. For those persons designated by the Contractor to attend and participate in project meetings, provide required authority to commit the Contractor to solutions agreed upon in the project meetings.

1.03 SUBMITTALS

- A. Job notes:
 - 1. The Compiler will compile job notes of each project meeting and will furnish copies to the Architect and to the Owner.
 - 2. Recipients of copies may make and distribute such other copies as they wish.

PART 2 - PRODUCTS

No products are required in this Section.

PART 3 - EXECUTION

3.01 MEETING SCHEDULE

- A. Except as noted below for Pre-construction Meeting, project meetings will be held weekly.
- B. Coordinate as necessary to establish mutually acceptable schedule for meetings.

3.02 MEETING LOCATION

- A. The Architect and Owner will establish meeting location. To the maximum extent practicable, meetings will be held at the job site.

3.03 PRECONSTRUCTION MEETING

- A. A Pre-construction meeting will be scheduled after issuing the Notice to Proceed.
 - 1. Provide attendance by authorized representatives of the Contractor and major subcontractors.
 - 2. The Owner will advise other interested parties, including the Owner's Representative, and request their attendance.
- B. Minimum agenda: Data will be distributed and discussed on at least the following items.
 - 1. Organizational arrangement of Contractor's forces and personnel, and those of subcontractors, materials suppliers and Architect and Owner's Representative.
 - 2. Channels and procedures for communication.
 - 3. Construction schedule, including sequence of critical work and closing of any facilities.
 - 4. Contract documents, including distribution of required copies of original documents and revisions.
 - 5. Processing of shop drawings and other data submitted to Architect.
 - 6. Rules and regulations governing performance of the work.
 - 7. Procedures for safety and first aid, security, quality control, housekeeping and related matters.
 - 8. Location of underground utilities.
 - 9. Notification procedures for adjacent property owners.

3.04 PROJECT MEETINGS

- A. Attendance:
 - 1. To the maximum extent practicable, assign the same person or persons to represent the Contractor at project meetings throughout progress of the work.
 - 2. Subcontractors, materials suppliers, and others may be invited to attend those project meetings in which their aspect of the work is involved.
- B. Minimum agenda:
 - 1. Review, revise and approve job notes of previous meetings.
 - 2. Review progress of the work since last meeting, including status of submittals for approval.
 - 3. Identify problems which impede planned progress.
 - 4. Develop corrective measures and procedures to regain planned schedule.
 - 5. Complete other current business.

END OF SECTION

**SECTION 01340
SUBMITTALS**

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Procedures:
 - 1. Wherever possible throughout the Contract Documents the minimum acceptable quality of workmanship and materials has been defined by manufacturer's name and catalog number, reference to recognized industry and government standards, or description of required attributes and performance.
 - 2. To ensure that the specified products are furnished and installed in accordance with design intent, procedures have been established for advance submittal of design data and for their review by the Owner's Representative and Owner.
 - 3. Make all submittals required by the Contract Documents and revise and resubmit as necessary to establish compliance with the specified requirements.
- B. Construction progress schedules.
- C. Schedule of values.
- D. Shop drawings, product data and samples.
- E. Manufacturer's instructions and certificates.
- F. Submittal log.

1.02 RELATED REQUIREMENTS

- A. Individual requirements for submittals are described in pertinent sections of these Specifications.
- B. Related work:
 - Section 01410: Testing Laboratory Reports.
 - Section 01700: Contract Closeout: Project Record Documents, Operating and Maintenance Data, Warranties and Bonds.

1.03 QUALITY ASSURANCE/CONTRACTOR RESPONSIBILITIES

- A. Coordination of submittals: Before each submittal, carefully review and coordinate all aspects of each item being submitted and verify that each item, and the submittal for it, conforms in all respects with the requirements of the Contract

Documents. Coordinate with other trades as required. By affixing the Contractor's signature to each submittal, certify that this coordination has been performed.

- B. Grouping of submittals: Unless otherwise specified, make all submittals in groups containing all associated items to ensure that information is available for checking each item when it is received. Partial submittals may be rejected as not complying with the provisions of the Contract Documents and the Contractor shall be strictly liable for all delays so occasioned.
- C. Timing: Make all submittals far enough in advance of scheduled dates for installation to provide all time required for reviews, for securing necessary approvals, for possible revisions and resubmittals, and for placing orders and securing deliveries.
- D. Notify Owner's Representative in writing with submittal of any deviations in submittals from Contract Document requirements.
- E. Do no fabrication or work which requires submittals until accepted by the Architect.

1.04 SUBMITTAL SCHEDULE

- A. Compile a complete and comprehensive schedule of all submittals anticipated to be made during progress of the work. Include a list of each type of item for which Contractor's drawings, shop drawings, certificates of compliance, material samples, guarantees or other types of submittals are required. Adhere to the schedule except when specifically otherwise permitted. Submittal log is for Owner's Representative and Owner to track review.
- B. Coordinate the schedule with all necessary subcontractors and materials suppliers to ensure their ability to adhere. Coordinate as required to ensure the grouping of submittals.
- C. Revise and update the schedule on a monthly basis to reflect conditions and sequences. Promptly submit revised schedules to Architect and Owner's Representative for review and comment.

1.05 SCHEDULE OF VALUES

- A. Refer to Section 01370: Schedule of Values.

1.06 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

- A. Shop Drawings:
 - 1. Present in clear and thorough manner, with details referenced to sheet, detail, schedule or room numbers shown on Contract Drawings. Provide quantity directed by Architect.

- B. Product Data:
 - 1. Preparation: Clearly mark each copy to identify pertinent products or models. Show performance characteristics and capacities, dimensions and clearances required, and wiring or piping diagrams and controls.
 - 2. Modify manufacturer's standard drawings, diagrams and literature to delete information not applicable to work and supplement information specifically applicable to the work.

- C. Samples:
 - 1. Office samples: Provide in quantity and size directed, complete with integrally related parts and attachment devices and illustrating functional characteristics of product and full range of color, texture and pattern.
 - 2. Field samples/mock-ups: Erect at project site at location acceptable to Owner's Representative in size or area specified in other specification sections. Fabricate to be complete and finished. Remove at conclusion of work or when directed.

- D. Make submittals promptly and in such sequence as to cause no delay in work.

- E. Submission Requirements:
 - 1. Quantity required:
 - a. Shop drawings: One (1) unfolded reproducible transparency and four (4) opaque reproductions.
 - b. Submit five (5) index brochures of mechanical and electrical submittals (manufacturer's literature and drawings) for final approval and distribution.
 - c. Product data: Submit five (5) copies each. Complete catalogs will not be acceptable. Manufacturer's regular catalog sheets will be acceptable if they indicate completely all specification requirements. When manufacturer's catalog sheets are submitted, material not directly connected with subject shall be completely lined out. Where drawings cover several sizes or types of construction they shall clearly indicate size or type of construction to be used including a schedule identifying each piece of equipment. Sheets of submittals containing more than five different items of equipment shall be assembled in an index brochure.
 - 2. Submittal contents:
 - a. Submission date and dates of any previous submissions.
 - b. Project title and number.
 - c. Names of Contractor, supplier and manufacturer.
 - d. Identification of product, with specification section number.

- e. Field dimensions, clearly identified as such.
 - f. Applicable standards, such as ASTM, Federal Spec numbers, etc.
 - g. Relation to adjacent or critical features of work or materials.
 - h. Identification of deviations from Contract Documents.
 - i. Identification of revisions on resubmittals.
 - j. Contractor certification of submittal review, to include product verification, field measurements, quantities, coordination with adjacent equipment structural members, or architectural features, and coordination of information within submittal with requirements of work and Contract Documents. Certification may be by stamp of approval or a letter of transmittal containing a statement to the effect that they have been reviewed. Uncertified submittals will be rejected.
- F. Resubmission Requirements:
- 1. Make corrections or changes required by Owner's Representative and resubmit until accepted.
 - 2. Shop drawings and product data: Revise and resubmit as specified for initial submittal; indicate any changes which have been made other than those requested by Owner's Representative.
 - 3. Samples: Submit new samples as required for initial submittal.
 - 4. Resubmission of structural shop drawings and product data: Resubmit finalized drawings and product data. File copy to Owner's Representative and Owner; field copy to field office. Resubmit all subsequent changes with changes and dates noted.
- G. Distribution:
- 1. Distribute reproductions of shop drawings and product data which carry Owner's Representative and Owner's stamp of approval to job site and record documents file, other affected contractors, subcontractors and supplier or fabricator.
 - 2. Distribute samples with Owner's Representative and Owner's stamp of approval as directed by Owner's Representative.

1.07 SUBSTITUTIONS AND PRODUCT OPTIONS

- A. Submit in accordance with Section 01350: Substitutions.

1.08 MANUFACTURER'S CERTIFICATES

- A. Submit certificates in accordance with requirements of each specification section.

1.09 PROJECT RECORD DOCUMENTS

- A. Submit in accordance with Section 01720 Project Record Documents.

PART 2 - PRODUCTS

Not used

PART 3 - EXECUTION

3.01 GENERAL PROCEDURES

- A. Deliver submittals to Owner's Representative.
- B. Transmit each item under Contractor's Standard Letter of Transmittal. Identify project, contractor, subcontractor, major supplier, pertinent drawing sheet and detail number and specification section number as appropriate. Identify deviations from Contract Documents.
- C. Submit initial progress and submittal schedules within 15 days after execution of Contract and schedule of values with first application for payment. Update with each Application for Payment reflecting changes since previous submittal.
- D. Comply with progress schedule for submittals related to work progress.
- E. After Owner's Representative and Owner's review of submittal, revise and resubmit as required, identifying changes made since previous submittal.
- F. Distribute copies of review submittals to concerned persons. Instruct recipients to promptly report any inability to comply with provisions.

3.02 OWNER'S REPRESENTATIVE REVIEW

- A. Owner's Representative duties:
 - 1. Review submittals with reasonable promptness.
 - 2. Affix stamp and initials or signature and indicate re-submittal requirements or approval of submittal.
 - 3. Submit to Owner for approval.
 - 4. Return submittals to Contractor for distribution or for resubmission.
- B. Review by the Owner's Representative and the Owner shall not be construed as a complete check, but only that the general method of construction and detailing is in compliance with the intent of the contract documents. Review shall not relieve the Contractor from responsibility for errors which may exist in the submittal as submitted.
- C. Authority to Proceed: The notations "Approved" or "Approved as Corrected" authorizes the Contractor to proceed with fabrication, purchase, or both, of the items so noted, subject to the revisions, required by the Owner's Representative review comments.

- D. Revisions: Make only those revisions directed or approved by the Owner's Representative and Owner.
- E. Revisions after approval: When a submittal has been reviewed by the Owner, re-submittal for substitution of materials or equipment will not be considered unless accompanied by an acceptable explanation as to why the substitution is necessary.

END OF SECTION

**SECTION 01380
PRE-CONSTRUCTION PHOTOGRAPHS**

PART 1 – GENERAL

1.01 DISTRIBUTION

- A. Work included: Provide pre-construction photographs taken at the job site prior to commencement of work.
- B. Related work:
 - 1. Documents affecting work of this Section include, but are not necessarily limit to, Proposal and Contract Documents and Sections in division 1 of these Specifications.
 - 2. Section 01510: Site Access.

1.02 QUALITY ASSURANCE

- A. Digital camera or equal.

1.03 SUBMITTALS

- A. Comply with pertinent provisions of Section 01340.
- B. Except as otherwise directed and paid for, submit one print of each photograph.

PART 2 - PRODUCTS

2.01 PRE-CONSTRUCTION PHOTOGRAPHS

- A. Provide High Resolution color images on flash drive to Landscape Architect.
- B. File should indicate:
 - 1. Job name.
 - 2. Location from which photographed.
 - 3. Date of photograph.
- C. Retain the images for at least two years following date of substantial completion.
- D. Do not allow images to be issued for any other purpose without specific written approval from the Owner.

PART 3 - EXECUTION

3.01 PRE-CONSTRUCTION PHOTOGRAPHY

- A. Except as otherwise specifically approved by the Owner's Representative make the photographs prior to the commencement of work.
- B. Any existing damage on the site to work that is scheduled to remain shall be documented or it will be the contractor's responsibility to repair the work in question.

END OF SECTION

SECTION 01500
TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work included: Provide temporary facilities and controls needed for the work including, but necessarily limited to:
 - 1. Temporary utilities such as heat, water, electricity and telephone;
 - 2. Field office for Contractor's personnel;
 - 3. Sanitary facilities;
 - 4. Enclosures such as tarpaulins, barricades and canopies;
 - 5. Temporary fencing of the construction site;
 - 6. Project sign.

- B. Related work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, Proposal and Contract Documents and Sections in Division 1 of these Specifications.
 - 2. Except that equipment furnished by Subcontractors shall comply with requirements pertinent safety regulations, such equipment normally furnished by the individual trades in execution of their own portions of the work are not part of this Section.
 - 3. Permanent installation and hookup of the various utility lines shall be in accordance with local building codes.

1.02 PRODUCT HANDLING

- A. Maintain temporary facilities and controls in proper and safe condition throughout progress of the work.

PART 2 - PRODUCTS

2.01 UTILITIES

- A. Water:
 - 1. Provide as necessary temporary piping and water supply and, upon completion of the work, remove such temporary facilities.

- B. Electricity:
 - 1. Provide necessary temporary wiring and, upon completion of the work, remove such temporary facility.
 - 2. Provide and pay for electricity used in construction.

- C. Heating: Provide and maintain heat necessary for proper conduct of operations needed in the work.

- D. Telephone and Fax:
 - 1. Contractor and superintendent to have cellular telephones accessible during normal business hours.
 - 2. Contractor to maintain telephone and fax service at the Contractor's primary office to receive job correspondence. On-site fax not required.

2.02 FIELD OFFICES AND SHEDS

- A. Contractor's facilities:
 - 1. Contractor shall provide a field office building and sheds adequate in size and accommodation for Contractor's offices, supply and storage.
 - 2. Within the Contractor's facilities, provide enclosed space, for holding project meetings. Furnish with table, chairs and utilities. This is required unless Owner agrees to have meeting in alternate location.
- B. Sanitary facilities:
 - 1. Provide temporary sanitary facilities in the quantity required for use by all personnel.
 - 2. Maintain in a sanitary condition at all times.

2.03 ENCLOSURES

- A. Provide and maintain for the duration of construction all scaffolds, tarpaulins, canopies, warning signs, steps, platforms, bridges and other temporary construction necessary for proper completion of the work in compliance with pertinent safety and other regulations.

2.04 TEMPORARY FENCING

- A. Provide and maintain for the duration of construction a temporary safety barricade of design and type needed to prevent entry onto the work by the public.

PART 3 - EXECUTION

3.01 MAINTENANCE AND REMOVAL

- A. Maintain temporary facilities and controls as long as needed for safe and proper completion of the work.
- B. Remove such temporary facilities and controls as rapidly as progress of the work will permit, or as directed by the Architect or Owner's Representative.

END OF SECTION

**SECTION 01510
SITE ACCESS**

PART 1 - GENERAL

1.01 REQUIREMENTS

- A. Work included: this information applies to situations in which a Contractor or his representatives including, but not limited to, suppliers, subcontractors, employees and field engineers enter upon The Project property.
- B. Related work:
 - Section 02000: Site Work.
 - Section 02070: Selective Demolition.
 - Section 02100: Site Preparation.
 - Section 02220: Excavating, Backfilling & Compacting.

1.02 QUALITY ASSURANCE

- A. Upon approval by Owner for access, notify all pertinent personnel regarding requirements of this information.
- B. Require that all personnel who will enter upon property certify their awareness of and familiarity with the requirements of the Owner.
- C. Tree protection in accordance with Section 02100.

1.03 SUBMITTALS

- A. Maintain an accurate record of the names and identification of all persons entering upon Park property and permit periodic review of record by Owner and/or Owner's Representative.
- B. Pre-construction photographs per Paragraph 1.07.

1.04 TRANSPORTATION FACILITIES

- A. Vehicle and equipment access:
 - 1. Provide protection for curbs, sidewalks, roads, parking, utilities and amenities over which trucks and equipment pass to reach work areas.

Contractor's vehicles:

Limit the access of vehicles belonging to employees and all other vehicles entering upon Park property to use only the access route shown on the drawings. Do not permit vehicles to park on any other area of the property except in the areas so designated at the pre-construction meeting.

1.05 NOTIFICATION BY CONTRACTOR

- A. The Contractor shall notify the Owner, in writing, two weeks in advance of any proposed construction activity on Owner's property. Said notice does not constitute authority to proceed with work in the Park. Official notice of approval will be at the discretion of the Owner.

1.06 PROTECTION AND RESTORATION OF PROPERTY AND LANDSCAPE

- A. The Contractor shall be responsible for the preservation of all property and shall protect carefully from disturbance or damage all said property witnessed or otherwise referenced their location and shall not move any item until directed.
- B. The Contractor shall be responsible for all damage or injury to property of any character, during the prosecution of the work, resulting from any act, omission, neglect, or misconduct in his manner or method of executing the work, or at any time due to defective work or materials.
- C. The Contractor shall consult with the Owner regarding his work activities and shall install any and all barriers, warning signs, fencing, property protection, access control or other devices to the satisfaction of the Owner and needed to provide for public safety and protection of Property.
- D. When or where any direct or indirect damage or injury is done to property by or on account of any act, omission, neglect, or misconduct in the execution of the work or in consequence of the non-execution thereof by the Contractor, he shall restore, at his own expense, such property to a condition similar or equal to that existing before such damage or injury was done, by repairing, rebuilding or otherwise restoring as may be directed by the Owner or he shall make good such damage or injury in an acceptable manner to the Owner.
- E. Tree protection in accordance with Section 02100.
- F. The contractor will work out a mutually acceptable plan with the Owner to provide access to the existing tennis courts and existing parking lot to accommodate league play.

1.07 PRE-CONSTRUCTION PHOTOGRAPHS OR VIDEO

- A. The Contractor shall provide digital photographs or video tapes of the specified work area one day prior to any work starting, but after appropriate construction staking and protection.

- B. Photographs shall be 3" x 5" color prints with information on the back of each print as follows: Show the job name, location of photograph, date of photograph and photographer's name, address and photograph number.
- C. Photographs shall be from a minimum of twenty-four (24) diversified overall views of the work area and of any pertinent Park property within construction limits. Additional photos may be required in unusual or extremely large sites.
- D. Each photograph shall be clear, in focus, with high resolution and sharpness and with minimum distortion.

1.08 CLEANING

- A. Progress cleaning:
 - 1. Daily, and more often if necessary, inspect the site and pick up all scrap, debris, packaging and shipping material. Remove such items from premises weekly.
 - 2. Weekly, and more often if necessary, inspect all materials stored on site, re-stack, tidy, or otherwise arrange in safe condition.
- B. Final cleaning:
 - 1. Completely remove resultant construction debris, particularly any loose rock or stone imported or uncovered during construction.
 - 2. Broom clean paved areas on site.
 - 3. Mow grass areas as directed which had not been under normal maintenance.
 - 4. Repair any areas of turfing that have been damaged by construction operations in accordance with Section 02934 Sodding.
 - 5. Alleviate compacted turf areas if access has been over turf, but no turf has to be placed. Compaction should be alleviated by a coring implement with 6" O.C. minimum coverage of 3" deep. Drag cores until leveled.
 - 6. Often when fences are erected for protection, holes are left when fence posts are pulled. Holes should be filled with appropriate top soil and settled with water to grade.

1.09 RECORD DOCUMENTS

- A. Submit to Owner a complete record drawing clearly indicating all work both concealed and visible.
- B. Information shall be tied to base line control data of the Owner and so noted on the Owner's field books.

1.10 FINAL APPROVAL

- A. Upon the completion of all work a final inspection must be made by the Owner to determine whether the work has been completed in accordance with the contract, plans and/or specifications.
- B. When the work has been so completed the Owner will provide certification of same and forward to appropriate contracting authorities.
- C. Acceptance by Owner shall not restrict or prohibit the rights provided for in regard to latent defects, frauds or such gross mistakes as may amount to fraud or as regards the rights under any warranty guarantee.

PART 2 - PRODUCTS

Not used

PART 3 - EXECUTION

Not used

END OF SECTION

**SECTION 01700
CONTRACT CLOSEOUT**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work included: Provide an orderly and efficient transfer of the completed work to the Owner.
- B. Related work:
 - 1. Proposal and contract documents.

1.02 QUALITY ASSURANCE

- A. Prior to requesting inspection by the Owner's Representative, use adequate means to assure that the work is completed in accordance with the specified requirements and is ready for the requested inspection.

1.03 PROCEDURES

- A. Substantial Completion:
 - 1. Contractor:
 - a. Submit written certification through Owner's Representative to the Owner that project is substantially complete in accordance with the construction contract.
 - b. Submit list of major items to be completed or corrected. The failure to include any items on such list does not alter the responsibility of the contractor to complete all work in accordance with the contract documents.
 - 2. Owner's Representative will make an inspection within seven (7) days after receipt of certification together with the Owner.
 - 3. Should Owner's Representative consider that work is substantially complete in accordance with the construction contract:
 - a. Contractor shall prepare a punch list of items to be completed or corrected as determined by the inspection.
 - b. The Owner or the owner's Representative will prepare a Certificate of Substantial Completion and shall submit to the Owner and the Contractor for their written acceptance of the responsibilities assigned to them in such Certificate. The Certificate of Substantial Completion shall contain the following:
 - (1) Date of Substantial Completion;
 - (2) Punch list of items to be completed or corrected.
 - (3) The time within which Contractor shall complete or correct work of listed items.

- (4) Date and time Owner will assume possession of work or designated portion thereof.
 - c. Contractor shall:
 - (1) Complete work listed for completion or correction within the designated time.
 - (2) Refer to Construction Contract for post substantial completion requirements.
 4. Should Owner's Representative consider that work is not substantially completed:
 - a. He shall immediately notify Contractor in writing stating reasons.
 - b. Contractor: Complete work and send second written notice through Owner's Representative to Owner certifying that the project is substantially complete.
 - c. Owner's Representative will re-inspect work.
- B. Final Completion:
 1. Contractor shall submit written certification that:
 - a. Contract documents have been reviewed;
 - b. Project has been inspected for compliance with contract documents.
 - c. Work has been completed in accordance with the construction contract.
 - d. Equipment and systems have been tested in presence of Owner and are operational.
 - (1) Equipment and systems shall be operated in a normal mode for a minimum period of three (3) weeks prior to final inspection.
 - e. Owner's personnel have been instructed in operation of all systems, mechanical, electrical and other equipment.
 - f. Project is completed, ready for final inspection.
 2. Owner's Representative will make final inspection within seven (7) days after receipt of certification.
 3. Should Owner's Representative consider that work is finally complete in accordance with contract documents, contractor shall submit final Application for Payment.
 4. Should Owner's Representative consider that work is not finally complete:
 - a. He shall notify contractor, in writing, stating reasons.
 - b. Contractor shall take immediate steps to remedy the stated deficiencies and send second written notice through Owner's Representative to Owner certifying that work is complete.
 - c. Owner's Representative will re-inspect work.

1.04 REINSPECTION COSTS

- A. Should Owner's Representative be required to perform more than two (2) inspections for project substantial completion and project final completion, respectively because of failure of work to comply with original certifications of contractor, the contractor will compensate Owner's Representative for additional services to include time and reimbursable expenses incurred by the Owner's Representative and his consultants. This amount will be deducted from final payment to the Contractor.

1.05 RETURN OF CONTRACT DOCUMENTS

- A. Return of Drawings: Drawings, details, sketches and specifications are property of Owner, and are issued to contractor as instruments of service only. If required, contractor shall return same to Owner.

PART 2 - PRODUCTS

Not used

PART 3 - EXECUTION

Not used

END OF SECTION

**SECTION 01720
PROJECT RECORD DOCUMENTS**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work included:
 - 1. Throughout progress of the work, maintain an accurate record of changes in the Contract Documents as described in Article 3.01 below.
 - 2. Upon completion of the work, transfer the recorded changes to a set of Record Documents, as described in Article 3.02 below.

- B. Related work:
 - 1. Proposal and contract documents.
 - 2. Other requirements affecting Project Record Documents may appear in pertinent other Sections of these Specifications.

1.02 QUALITY ASSURANCE

- A. Delegate the responsibility for maintenance of Record Documents to one person on the Contractor's staff as approved by the Owner's Representative.

- B. Accuracy of records:
 - 1. Thoroughly coordinate changes within the Record Documents, making adequate and proper entries on each page of Specifications and each sheet of Drawings and other Documents where such entry is required to show the change properly.
 - 2. Accuracy of records shall be such that future search for items shown in the Contract Documents may rely reasonably on information obtained from the approved Project Record Documents.

- C. Make entries within 24 hours after receipt of information that the change has occurred.

1.03 SUBMITTALS

- A. Comply with pertinent provisions of Section 01340.

- B. The Owner's Representative's approval of the current status of Project Record Documents may be a prerequisite to the Owner's Representative approval of requests for progress payment and request for final payment under the Contract.

- C. Prior to submitting each request for progress payment, secure the Owner's Representative's approval of the current status of the Project Record Documents.

- D. Prior to submitting request for final payment, submit the final Project Record Documents to the Owner's Representative and secure his approval.

1.04 PRODUCT HANDLING

- A. Maintain the job set of Record Documents completely protected from deterioration and from loss and damage until completion of the work and transfer all recorded data to the final Project Record Documents.
- B. In the event of loss of recorded data, use means necessary to again secure the data to the Owner's Representative's approval.
 - 1. Such means shall include, if necessary in the opinion of the Owner's Representative, removal and replacement of concealing materials.
 - 2. In such case, provide replacements to the standards originally required by the Contract Documents.

PART 2 - PRODUCTS

2.01 RECORD DOCUMENTS

- A. Job set: Promptly following receipt of the Owner Notice to Proceed, secure from the Owner's Representative at no charge to the Contractor one complete set of all Documents comprising the Contract.
- B. Final Record Documents: At the time of completion of the work, deliver all job as-built plans to the Owner's Representative clearly marked and legible.

PART 3 - EXECUTION

3.01 MAINTENANCE OF JOB SET

- A. Immediately upon receipt of the job set described in Paragraph 2.01 above, identify each of the Documents with the title, "RECORD DOCUMENTS - JOB SET."
- B. Preservation:
 - 1. Considering the Contract completion time, the probable number of occasions upon which the job set must be taken out for new entries and for examination, and the conditions under which these activities will be performed, devise a suitable method for protecting the job set to the approval of the Owner's Representative.
 - 2. Do not use the job set for any purpose except entry of new data and for review by the Owner's Representative until start of transfer of data to final Project Record Documents.
 - 3. Maintain the job set at the site of work as that site is designated by the Owner's Representative.

- C. Making entries on Drawings:
 - 1. Using an erasable colored pencil (not ink or indelible pencil), clearly describe the change by graphic line and note as required.
 - 2. Date all entries.
 - 3. Call attention to the entry by a "cloud" drawn around the area or areas affected.
 - 4. In the event of overlapping changes, use different colors for the overlapping changes.

- D. Make entries in the pertinent other Documents as approved by the Owner's Representative.

- E. Conversion of schematic layouts:
 - 1. In some cases on the Drawings, arrangements of conduits, circuits, piping, ducts and similar items is shown schematically and is not intended to portray precise physical layout.
 - a. Final physical arrangement is determined by the Contractor, subject to the Owner's Representative's approval.
 - b. However, design of future modifications of the facility may require accurate information as to the final physical layout of items which are shown only schematically on the Drawings.
 - 2. Show on the job set of Record Drawings, by dimension accurate to within one inch, the centerline of each run of items such as are described in subparagraph 3.01 E. 1. above.
 - a. Clearly identify the item by accurate note such as "cast iron drain", "galv. water" and the like.
 - b. Show, by symbol note, the vertical location of the item ("under slab", "in ceiling plenum", "exposed" and the like).
 - c. Make all identification sufficiently descriptive that it may be related reliably to the Specifications.
 - 3. The Owner's Representative may, subject to Owner approval, waive the requirements for conversion of schematic layouts where, in the Owner's Representative's judgement, conversion serves no useful purpose. However, do not rely upon waivers being issued except as specifically issued in writing by the Owner.

3.02 FINAL PROJECT RECORD DOCUMENTS

- A. The purpose of the final Project Record Documents is to provide factual information regarding all aspects of the work, both concealed and visible, to enable future modification of the work to proceed without lengthy and expensive site measurement, investigation and examination.

- B. Approval of recorded data prior to transfer:

1. Secure the Owner's Representative's approval that all recorded data is clearly marked and legible.
 2. Make required revisions requested by the Owner's Representative.
- C. Transfer of data to other Documents:
1. If the Documents other than Drawings have been kept clean during progress of the work, and if entries thereon have been orderly to the approval of the Owner's Representative, the job set of those Documents other than Drawings will be accepted as final Record Documents.
 2. If any such Document is not so approved by the Owner's Representative, secure a new copy of that Document from the Owner's Representative at the Owner's Representative's usual charge for reproduction and handling and carefully transfer the change data to the new copy to the approval of the Owner's Representative.
- D. Review and submittal:
1. Submit the completed set of Project Record Documents to the Owner's Representative.
 2. Participate in review meetings as required.
- E. Final Record Documents: At the time of completion of the work, deliver all job as-built plans to the Owner's Representative clearly marked and legible. The Owner's Representative will transfer the contractor's information electronically to the original contract documents.
1. The Contractor is responsible for the accuracy of all information contained within the Record Documents. The Owner's Representative is not responsible for the accuracy of the information and is responsible only for entering the information into the original Construction Documents.
 2. The Owner's Representative will be responsible for delivering the final Record Documents to the Owner.

END OF SECTION

**SECTION 01730
OPERATION AND MAINTENANCE DATA**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work included: To aid the continued instruction of operating and maintenance personnel and to provide a positive source of information regarding the products incorporated into the work, furnish and deliver the data described in this Section and in pertinent other Sections of these Specifications.
- B. Related work:
 - 1. Proposal and construction documents.
 - 2. Required contents of submittals also may be amplified in pertinent other Sections of these Specifications.

1.02 QUALITY ASSURANCE

- A. In preparing data required by this Section, use only personnel who are thoroughly trained and experienced in operation and maintenance of the described items, completely familiar with the requirements of this Section and skilled in technical writing to the extent needed for communicating the essential data.

1.03 SUBMITTALS

- A. Comply with pertinent provisions of Section 01340.
- B. Submit two copies of a preliminary draft of the proposed Manual or Manuals to the Owner's Representative for review and comments.
- C. Unless otherwise directed in other Sections, or in writing by the Owner's Representative, submit four copies of the final Manual to the Owner's Representative prior to indoctrination of operation and maintenance personnel.

PART 2 - PRODUCTS

2.01 INSTRUCTION MANUALS

- A. Where instruction Manuals are required to be submitted under other Sections of these Specifications, prepare in accordance with the provisions of this Section.
- B. Format:
 - 1. Size: 8-1/2" x 11".
 - 2. Paper: White bond, at least 20 lb. Wt.
 - 3. Text: Neatly written or printed.

4. Drawings: 11' in height; bind in with text; foldout acceptable, not to exceed 11x17".
 5. Flysheets: Separate each portion of the Manual with neatly prepared flysheets briefly describing contents of the ensuing portion; flysheets may be in color.
 6. Binding: Use heavy-duty plastic or fiberboard covers with binding mechanism concealed inside the Manual; 3-ring binders will be acceptable; all binding is subject to Owner's Representative's approval.
 7. Measurements: Provide all measurements in U.S. standard units such as feet and inches, lbs, and cfm.
- C. Provide front and back covers for each Manual, using durable material approved by the Owner's Representative and clearly identified on or through the cover with at least the following information:

OPERATING AND MAINTENANCE INSTRUCTIONS

Name and address of work
Name of Contractor
General Subject of this Manual

Owner's Representative

- D. Contents: Include at least the following:
1. Neatly typewritten index near the front of the Manual.
 2. For architectural products, applied materials and finishes:
 - a. Manufacturer's data, giving full information on finishes:
 - (1) Catalog number, size, composition.
 - (2) Color and texture designations.
 - (3) Information required for reordering special manufactured products.
 - b. Instructions for care and maintenance:
 - (1) Manufacturer's recommendations for types of cleaning agents and methods.
 - (2) Cautions against cleaning agents and method which are detrimental to product.
 - (3) Recommended schedule for cleaning and maintenance.
 - c. All approved submittals.
 3. For moisture protection and weather exposed products:
 - a. Manufacturer's data, giving full information on products.
 - (1) Applicable standards.
 - (2) Chemical composition.
 - (3) Details of installation.
 - b. Instructions for inspection, maintenance and repair.
 - c. All approved submittals.

4. For each electric and electronic system and mechanical system as appropriate:
 - a. Description of system and component parts. Function, normal operating characteristics and limiting conditions. Complete nomenclature and commercial number of replaceable parts.
 - b. Circuit directories of panel boards: Electrical service, controls and communications.
 - c. Operating procedures: Routine and normal operating instructions, sequences required and special operating instructions.
 - d. Maintenance procedures: Routine operations, guide to "trouble-shooting", disassembly, repair and re-assembly and adjustment and checking.
 - e. Manufacturer's printed operating and maintenance instructions.
 - f. List of original manufacturer's spare parts, manufacturer's current prices and recommended quantities to be maintained in storage.
 - g. Other data as required under pertinent sections of specifications.
 - h. All approved submittals.
5. Certificate of substantial completion.
6. Master list of extended warranty items.

PART 3 - EXECUTION

3.01 INSTRUCTION MANUALS

- A. Preliminary:
 1. Prepare a preliminary draft of each proposed Manual.
 2. Show general arrangement, nature of contents in each portion, probable number of drawings and their size, and proposed method of binding and covering.
 3. Secure the Owner's Representative's approval prior to proceeding.
- B. Final:
 1. Complete the Manuals in strict accordance with the approved preliminary drafts and the Owner's Representative's review comments.
- C. Revisions:
 1. Following the indoctrination and instruction of operation and maintenance personnel, review all proposed revisions of the Manual with the Owner's Representative.

END OF SECTION

**SECTION 02000
SITE WORK**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. These general site work requirements apply to all site work operations. Refer to Division 2 specification sections for specific general, product and execution requirements.
- B. Related work:
 - Section 01510: Site Access.
 - Section 02070: Selective Demolition.
 - Section 02100: Site Preparation.
 - Section 02220: Excavating, Backfilling and Compacting.

1.02 QUALITY ASSURANCE

- A. Comply with all applicable local, state and federal requirements regarding materials, methods of work and disposal of excess and waste materials.

1.03 PROJECT CONDITIONS

- A. Locate and identify existing underground and overhead services and utilities within contract limit work areas. Provide adequate means of protection of utilities and services designated to remain. Repair utilities damaged during site work operations at Contractor's expense.
- B. Arrange for disconnection, disconnect and seal or cap all utilities and services designated to be removed before start of site work operations. Perform all work in accordance with the requirements of the applicable utility company or agency involved.
- C. When uncharted or incorrectly charted underground piping or other utilities and services are encountered during site work operations, notify the applicable utility company immediately to obtain procedure directions. Cooperate with the applicable utility company in maintaining active services in operation. If the services are Owner maintained, notify Owner's Representative immediately.
- D. Locate, protect and maintain bench marks, monuments, control points and project engineering reference points. Re-establish disturbed or destroyed items at Contractor's expense.
- E. Perform site work operations and the removal of debris and waste materials to assure minimum interference with streets, walks and other adjacent facilities.

- F. Give the owner 24 hour advanced notice to close or obstruct street, walks and adjacent facilities. Provide alternate routes around closed or obstructed traffic ways.
- G. Control dust caused by the work. Dampen surfaces as required. Comply with pollution control regulations of governing authorities.
- H. Protect existing buildings, paving and other services or facilities on site and adjacent to the site from damage caused by site work operations. Cost of repair and restoration of damaged items at Contractor's expense.
- I. Protect and maintain street lights, utility poles and services, traffic signal control boxes, curb boxes, valves and other services, except items designated for removal. Remove or coordinate the removal of traffic signs, parking meters and postal mail boxes with the applicable governmental agency. Provide for temporary relocation when required to maintain facilities and services in operation during construction work.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Examine the areas and conditions under which site work is performed. Do not proceed with the work until unsatisfactory conditions are corrected.
- B. Consult the records and drawings of adjacent work and of existing services and utilities which may affect site work operations.

END OF SECTION

**SECTION 02070
SELECTIVE DEMOLITION**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work included: Carefully demolish and remove from the site those items scheduled to be demolished and removed.
- B. Related work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to Proposal and Contract Documents and Sections in Division 1 of these Specifications.
 - 2. Section 01510: Site Access.

1.02 QUALITY ASSURANCE

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

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. By careful study of the Contract Documents, determine the location and extent of selective demolition to be performed.
- B. Visit the site and verify the extent and location of selective demolition required.
 - 1. Carefully identify limits of selective demolition.
 - 2. Mark interface surfaces as required to enable workmen also to identify items to be removed and items to be left in place intact.
- C. Prepare and follow an organized plan for demolition and removal of items.
 - 1. Shut off, cap and otherwise protect existing public utility lines in accordance with the requirements of the public agency or utility having jurisdiction.
 - 2. Completely remove items scheduled to be so demolished and removed, leaving surfaces clean, solid and ready to receive new materials specified elsewhere.

3. In all activities, comply with pertinent regulations of governmental agencies having jurisdiction.
- D. Demolished material shall be considered to be property of the Contractor and shall be completely removed from the job site unless otherwise specified.
- E. Use means necessary to prevent dust becoming a nuisance to the public, to neighborhoods and to other work being performed on or near the site.

3.02 REPLACEMENTS

- A. In the event of demolition of items not so scheduled to be demolished, promptly replace such items to the approval of the Owner at no additional cost to the Owner.

END OF SECTION

**SECTION 02100
SITE PREPARATION**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Perform site preparation work as shown and specified. The work includes:
 - 1. Protecting existing trees to remain.
 - 2. Removing trees and other vegetation.
 - 3. Removing designated site improvements.

- B. Related work:
Section 01510: Site Access.

1.02 QUALITY ASSURANCE

- A. Comply with Section 02000 Site Work requirements.

- B. Notify all contractor employees and subcontractors of provisions of this Section.

- C. Council of Tree and Landscape Appraisers

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Materials and equipment: As selected by the contractor except as noted.

- B: Tree protection:
 - 1. Wood fencing, snow fencing.

PART 3 - EXECUTION

3.01 TREE PROTECTION

- A. Protect existing trees scheduled to remain against injury or damage, including cutting, breaking or skinning of roots, trunks or branches; smothering by stockpiled construction materials, excavated materials or vehicular traffic within branch spread.
 - 1. Protect designated trees with temporary wood or vinyl snow fence enclosure. Provide a minimum 12'-0" radius from center of tree trunk. Increase enclosure size as directed for large trees up to and including the drip line.

2. Erect temporary fencing before commencing site preparation work. Maintain fencing during full construction period. Remove temporary fencing when acceptable to Owner's Representative.
4. Repair trees scheduled to remain and damaged by construction operations in a manner acceptable to the Owner's Representative. Repair damaged trees promptly to prevent progressive deterioration caused by damage.
5. Replace trees scheduled to remain and damaged beyond repair by construction operations as determined by the Owner's Representative with trees of similar size and species of equal dollar value. Cost for tree replacement shall be determined in accordance with the "Guide for Establishing The Value of Trees and Other Plants", published by the Council of Tree and Landscape Appraisers.
6. Tree replacement as required by paragraph 5 shall be in accordance with Specification Section 02900 Trees, Plants and Ground Covers.
7. Replacement of trees scheduled to remain and damaged by construction operations during construction operations, and securing an opinion as to the tree or plant's health and its value, shall be at contractor's expense.
8. Tree loss appraisal shall be in accordance with the "Guide for Establishing the Values of Trees and Other Plants", by the Council of Tree and Landscape Appraisers.

3.02 CLEARING

- A. Locate and suitably identify trees and improvements indicated to remain.
- B. Clear and grub areas within contract limits as required for site and execution of the work.
- C. Remove trees as designated on the plans with the approval of the Owner's Representative.

3.03 STRIPPING TOPSOIL

- A. Strip topsoil to its full depth at all areas to be re-graded, resurfaced or paved within contract limit work area.
- B. Stockpile topsoil in a location acceptable to the Owner's Representative for use in finish grading and preparation of lawns and planting beds.
 1. Grade and slope stockpiles for proper drainage and to prevent erosion.
 2. No topsoil shall be removed from the site.
- C. Protect all areas which are not to be resurfaced or re-graded and adjacent areas outside of the contract limits from damage due to site preparation work.

3.04 SITE IMPROVEMENTS

- A. Existing Utilities
 - 1. Information on the drawings relating to existing utility lines and services is from the best sources presently available. All such information is furnished only for information and is not guaranteed. Excavate test pits as required to determine exact locations of existing utilities.
 - 2. Call Okie for utility staking not County owned.
 - 3. Call Owner's Representative to coordinate County maintained utility staking.

3.05 DISPOSAL OF WASTE MATERIALS

- A. Stockpile, haul from site and legally dispose of waste materials and debris. Accumulation is not permitted.
- B. Maintain disposal routes clear, clean and free of debris.
- C. On-site burning of combustible cleared materials is allowed with proper permit and burn pit.

3.06 CLEANING

- A. Upon completion of site preparation work, clean area within contract limits, remove tools and equipment. Provide site clear, clean and free of materials and debris and suitable for site work operations.

END OF SECTION

**SECTION 02211
ROUGH GRADING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Removal and stockpiling of topsoil and subsoil.
- B. Cutting, grading, filling and rough contouring the site.

1.02 RELATED SECTIONS

- A. Section 01410 - Quality Control 01410 - Testing Laboratory Services: Testing fill compaction.
- B. Section 021010 - Site Preparation.
- C. Section 02220 - Excavating, Backfilling & Compaction.
- D. Section 02265 - Finish Grading: Finish grading with topsoil to contours.

1.03 REFERENCES

- A. Relations of soils and Soil-Aggregate Mixtures, Using 5.5 lb Rammer and 12 inch Drop.
- B. ANSI/ASTM D 1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.
- C. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of soils and Soil-Aggregate Mixtures Using 10 lb. Rammer and 18 inch Drop.

1.04 QUALITY ASSURANCE

- A. Grading Contractor: A firm which has at least five (5) years of experience in work of the type and size required by this Section and which is acceptable to the Owner, Owner's Representative, and Landscape Architect.
- B. References: The Grading Contractor must supply three references for work of this type and size with their bid including names, phone numbers and email addresses of contact person(s).
- C. All grading work must be done utilizing an electronic, automatic laser grading system.

1.05 PROJECT RECORDS DOCUMENTS

- A. Submit under provisions of section 01700.
- B. Accurately record actual locations of utilities remaining, by horizontal dimensions, elevations or inverts, and slops gradients.

PART 2 PRODUCTS

2.01 SOIL MATERIALS

- A. Off-Site Fill: Off-site fill shall be material with plasticity index less than 18 and shall contain at least 15% fines (material passing #200 sieve.)

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify site conditions and all underground and above ground utilities.
- B. Verify that survey benchmark and intended elevations for the work are as indicated.

3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Identify known underground, above ground, and aerial utilities. Stake and flag locations.
- C. Notify utility company as necessary to remove and relocate utilities.
- D. Protect above and below grade utilities which are to remain.
- E. Protect plant life, lawns, rock outcropping and other features remaining as portion of final landscaping.
- F. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavation equipment and vehicular traffic.

3.03 TOPSOIL EXCAVATION

- A. Excavate topsoil from areas to be further excavated, re-landscaped, or re-graded.
- B. Stockpile in area designated on site. Remove excess topsoil not being reused, from site.
- C. Do not excavate wet topsoil.
- D. Stockpile to depth not exceeding 8 feet. Cover to protect from erosion.

3.04 SUBSOIL EXCAVATION

- A. Excavate subsoil from areas to be further excavated, re-landscaped, or re-graded.
- B. Stockpile in area designated on site. Remove excess subsoil not being reused, from site.
- C. Do not excavate wet subsoil.
- D. Stockpile subsoil to depth not exceeding 8 feet. Cover to protect from erosion.
- E. When excavation through roots is necessary, perform work by hand and cut roots with sharp axe.

3.05 FILLING

- A. Fill areas to contours and elevations with unfrozen materials
- B. Granular Fill: Place and compact materials in continuous layers not exceeding 8 inches compacted depth, compacted to 95 percent.
- C. Subsoil: Place and compact material in continuous layers not exceeding 9 inches compacted depth compacted to 95 percent.
- D. Top Soil: Place and compact material in a continuous layers not exceeding 8 inches compacted depth and do not exceed 85 percent compaction.
- D. Maintain optimum moisture content of fill materials to attain required compaction density.
- E. Slope grade away from building minimum 2 inches in 10 ft, unless noted otherwise.
- F. Make grade changes gradual. Blend slope into level areas.
- G. Remove surplus fill materials from site.

3.06 TOLERANCES

- A. Top Surface of Subgrade: Plus or minus 1/10 foot.

3.07 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 01410.
- B. Tests and analysis of fill materials will be performed in accordance with ANSI/ASTM D698 D1557 and with Section 01410.
- C. Compaction testing will be performed in accordance with ANSI/ASTM D968 and with Section 01410.
- D. If test indicate Work does not meet specified requirements, remove work, replace and retest at no cost to owner.

END OF SECTION

**SECTION 02220
EARTHWORK**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work included: 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, Proposal and Contract Documents and Sections in Division 1 of these Specifications.
 - 2. Section 01510: Site Access.

1.02 QUALITY ASSURANCE

- A. Earthwork/Grading Contractor: A firm which has at least five (5) years of experience in work of the type and size required by this Section and which is acceptable to the Owner, Owner's Representative, and Landscape Architect.
- B. References: The Earthwork/Grading Contractor must supply three references for work of this type and size with their bid including names, phone numbers and email addresses of contact person(s).
- C. All earthwork/grading work must be done utilizing an electronic, automatic laser grading system.

PART 2 - PRODUCTS

2.01 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 2-1/2" in their greatest dimension.
 - 2. Fill material is subject to the approval of the Owner's Representative and is that material 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. Where fill material is required to build up a building pad and/or under building slabs, provide select low PI material. Select fill material used

should be free of organic or other deleterious matters, have a maximum particle size of three (3) inches, and have a liquid limit less than thirty-five (35) and a plasticity index between six (6) and twelve (12) and consist of sandy clays or clayey sands.

5. Where granular base is called for under building slabs, provide aggregate complying with requirements of Section 03300 of these Specifications.

2.02 TOPSOIL

- A. Where shown on the drawings or otherwise required, provide topsoil consisting of friable fertile soil of loamy character containing a minimum of 2% decayed organic matter (humus) normal to the region, capable of sustaining healthy plant life and reasonably free from subsoil, roots, heavy or stiff clay, stones larger than 1" in greatest dimension, noxious weeds, sticks, brush, litter and other deleterious matter.
- B. Obtain topsoil from sources within the project limits or provide imported topsoil obtained from sources outside the project limits or from both sources. This is to be supplied at the contractors expense
- C. Topsoil is to installed to a depth of three (3) Inches across all areas.

2.03 OTHER MATERIALS

- A. Provide other materials not specifically described but required for complete and proper installation as selected by the Contractor subject to the approval of the Owner's Representative.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. Utilities: Refer to Section 2000 Site Work.
- 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. De-watering:
 1. Remove all water, including rain water, 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.

3.02 EXCAVATING

- A. Perform unclassified excavating of every type of material encountered within the limits of the work to the lines, grades and elevations indicated and specified herein.
- B. Excavation of rock:
 - 1. Where rocks, boulders, 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 Owner's Representative.
 - 3. The definition of "Rock Excavation" will apply as stated in the "Standard Specifications for Highway Construction", Oklahoma Department of Transportation, edition of 1988 or latest revision.
- C. Excavate and backfill in a manner and sequence that will provide proper drainage at all times.
- D. 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 Owner's Representative.
 - 2. Grade borrow areas upon completion to provide complete surface drainage and to blend with surrounding contours.
 - 3. Contractor is required to excavate sufficient material to construct contours and features as per plans. Payment of all excavation will be paid as a lump sum.
- E. Surplus material:
 - 1. Owner's Representative will direct contractor in the placement of surplus excavated material.
 - 2. Surplus material will be used on the project or stored on site at a location approved by the Owner's Representative.
- F. Swales, ditches and gutters:
 - 1. Cut accurately to the cross sections, grades and elevations shown on the grading plans.
 - 2. Maintain excavations free from detrimental quantities of leaves, sticks, trash and other debris until completion of the work.
 - 3. Swales and ditches shall be smooth in nature to accommodate standard mowing practices and equipment.

- G. Unauthorized excavation:
1. Unauthorized excavation consists of removal of materials beyond indicated sub-grade elevations or dimensions without specific instruction from the Owner's Representative.
 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 Owner's Representative, 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 Owner's Representative.
- H. Stability of excavations:
1. Slope sides of excavations to 1:1 or flatter, unless otherwise directed by the Owner's Representative.
 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.
- I. 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.
- J. Cold weather protection:
1. Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.
- K. Excavating for detention ponds:
1. The exposed sub-grade of pond areas shall be scarified to a minimum depth of 8 inches. Before compaction, the scarified soils shall be adjusted to within a moisture content range of plus or minus 2 percent of optimum moisture content.

3.03 FILLING AND BACKFILLING

- A. General:
1. For each classification listed below, place acceptable soil material in layers to required sub-grade elevations.
 2. In excavations:
 - a. Use satisfactory excavated or borrow material.
 3. Building pads and/or under building slabs:
 - a. Provide Select low PI material to build up building pad and slab to elevations called out on the drawings. If the material on site is not suitable, the select material will need to be imported from off site.
 - b. Use granular fill, if so called for on the drawings or soils report, complying with aggregate acceptable under Section 03300 of these Specifications.
- B. 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.
- C. 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. Compact per paragraph 3.05 A., B. and C. this Section.
 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 structure’s 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.

3.04 GRADING

- A. General:
1. Uniformly grade the areas within limits of grading under this Section, including adjacent transition areas.
 2. Smooth the finished surface 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.
 4. 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 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 sub-grade 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 sub-grade elevation.

3.05 COMPACTING

- A. Control soil compaction during construction to provide the minimum percentage of density specified for each area as determined according to ASTM D1557. All areas are to achieve a 95% proctor density minimum, and an 85% proctor density for the final lift in sod and planting areas only.
- 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/or as specified by the Soil Engineer's report.
1. Structures:
 - a. Compact the top 8" of sub-grade and each layer of fill material or backfill material at 98% of maximum density unless otherwise called out in the plans or soils report.
 2. Lawn and unpaved areas:
 - a. Compact the top 8" of sub-grade at 85% of maximum density, all other layers of fill material or backfill material are to be 95% of maximum density. The top 8" of sub-grade in lawn areas is not to exceed 85% of maximum density.
 3. Walks
 - a. Compact the top 8" of sub-grade and each layer of fill material or backfill material at 95% of maximum density unless otherwise called out in the plans or soils report.
 4. Pavements:
 - a. Compact the top 8" of sub-grade and each layer of fill material or backfill material at 95% of maximum density unless otherwise called out in the plans or soils report.

- C. Moisture control:
 - 1. 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 Owner's Representative.

3.06 TREATED SUBGRADE

- A. All parking lot pavement sub-grade shall be treated in accordance the plans and Engineers Soils Report.

3.07 FIELD QUALITY CONTROL

- A. Secure Owner's Representative's inspection and approval of sub-grades and fill layers before subsequent construction is permitted thereon.
- B. Provide at least the following tests to the approval of the Owner's Representative.
 - 1. At paved areas, a minimum of one field density test for every 7,500 square feet, but a minimum of three tests for all areas or as requested by the Owner's Representative. Testing to be paid for by the City.
 - 2. At lawn and unpaved areas, at least one field density test for every 20,000 square feet, but a minimum of three test for all areas or as requested by the Owner's Representative. Testing to be paid for by the City.
 - 3. Sub-grade shall be checked for stability even though it may meet the compaction requirements. The check for stability shall be proof rolling with a large roller or loaded dump truck and visual observation to insure that there is no pumping of the sub-grade.
- D. If, in the Owner's Representative's opinion based on reports of the testing laboratory, sub-grade or fills which have been placed are below specified density, provide additional compacting and testing under the provisions of Section 01410 of these Specifications. Re-testing of areas that failed and have to be re-tested to be paid for by the contractor.

3.08 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 reestablish 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.

3.09 CERTIFICATION

- A. Upon completion of this portion of the work and as a condition of its acceptance, deliver to the Owner's Representative a written report certifying that the compaction requirements have been obtained. State in the report the area or fill or embankment, the compaction density obtained and the type or classification of fill material placed.

END OF SECTION

**SECTION 02265
FINISH GRADING**

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Finish grade subsoil.
- B. Place, level, and compact topsoil.

1.02 RELATED WORK

- A. Section 02211 - Rough grading subsoil to site contours.
- B. Section 02220 - Earthwork

1.03 PROTECTION

- A. Protect landscaping and other features remaining as final work.
- B. Protect existing structures, fences, sidewalks, paving and curbs.

1.02 QUALITY ASSURANCE

- A. Finish Grading Contractor: A firm which has at least five (5) years of experience in work of the type and size required by this Section and which is acceptable to the Owner, Owner's Representative, and Landscape Architect.
- B. References: The Finish Grading Contractor must supply three references for work of this type and size with their bid including names, phone numbers and email addresses of contact person(s).
- C. All finish grading work must be done utilizing an electronic, automatic laser grading system.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Topsoil: Imported, see Section 02220, Excavating, Backfilling and Compaction; Section 02939, Sprigging and 02934, Sodding.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify site conditions and note irregularities affecting work of this Section.
- B. Beginning work of this Section means acceptance of existing conditions.

3.02 SUBSOIL PREPARATION

- A. Eliminate uneven areas and low spots. Remove debris, roots, branches, and stones, in excess of ½ inch in size. Remove subsoil contaminated with petroleum products.

3.03 PLACING TOPSOIL

- A. Place topsoil in areas where earth or no other building or paving is scheduled on the drawings.
- B. Use topsoil in relatively dry state. Place during dry weather.
- C. Fine grade topsoil eliminating rough or low areas. Maintain levels, profiles, and contours of subgrade.
- D. Remove stone, roots, grass, weeds, debris, and foreign material while spreading.
- E. Manually spread topsoil around trees, plants, building, and concrete curbs to prevent damage.
- F. Remove surplus subsoil and topsoil from site.
- G. Leave stockpile area and site clean and raked, ready to receive landscaping.

3.04 SOIL AMENDMENTS

- A. The contractor is to supply the sand and compost material as specified on the construction drawings. Materials will be submitted during the submittal process and approved by Owner and Landscape Architect.
- B. The is to spread ½” of compost and 1” of sand material over all areas to receive sprigs or sod.
- C. Contractor is to till sand and compost into the top six (6) inches of soil utilizing proper equipment for this application. Owner and Landscape Architect to provide approval before proceeding with additional construction operations.
- D. Field is to be laser graded and rolled to achieve Finish Grade.
- E. Once Irrigation system has been installed, the contractor is to flood the field by running the system for 2-3 days in order to water settle the field. Once the field has been flooded, all parties will walk the site in order to get final approval of the grade and work performed.

3.05 TOLERANCES

- A. Top of Topsoil: Plus or minus $\frac{1}{4}$ " to $\frac{1}{2}$ " in 20 feet.

END OF SECTION

**SECTION 02400
SITE DRAINAGE**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Provide site drainage as shown and specified. The work includes:
 - 1. Drainage structures and piping.
 - 2. Excavating and backfilling site drainage work.

- B. Related work:
 - Section 01510: Site Access.
 - Section 02200: Earthwork

1.02 QUALITY ASSURANCE

- A. Comply with Section 02000 Site Work requirements.

- B. Materials and methods of construction shall comply with the following:
 - 1. Oklahoma Department of Transportation Standards and Specifications.
 - 2. American Society for Testing and Materials ASTM).
 - 3. American Association of State Highway and Transportation Officials (AASHTO).
 - 4. American Concrete Pipe Association (ACPA).

- C. Excavating, backfilling and compacting operations: Comply with Section 02220 requirements and as specified.

- D. Obtain acceptance of Owner's Representative of installed and tested site drainage system prior to installing backfill materials.

- E. Identify all existing underground utilities and their location.

1.03 SUBMITTALS

- A. Comply with Provisions of Section 01340.

- B. Provide site drainage record drawings:
 - 1. Legibly mark drawings to record actual construction.
 - 2. Indicate horizontal and vertical locations, referenced to permanent surface improvements.
 - 3. Identify field changes of dimension and detail and changes made by Change Order.

- C. Provide manufacturer's product data for each type of pipe material.

1.04 PROJECT CONDITIONS

- A. Known underground and surface utility lines are indicated on the drawings.
- B. Protect existing trees, plants, lawns and other features designated to remain as part of the landscape work.
- C. Protect excavations by shoring, bracing, sheeting, underpinning or other methods as required to prevent cave-ins or loose dirt from entering excavations. Barricade open excavations and post warning lights at work adjacent to public streets and walks in accordance with OSHA requirements.
- D. Underpin adjacent structure(s) including utility service lines which may be damaged by excavation operations.
- E. Promptly repair damage to adjacent facilities caused by site drainage earthwork operations. Cost of repair at Contractor's expense.
- F. Promptly notify the Owner's Representative of unexpected subsurface conditions.

PART 2 - PRODUCT

2.01 MATERIALS

- A. Site drainage piping: Provide types and sizes indicated. Provide matching couplings, fittings and accessory components to ensure continuity of the site drainage system.
 - 1. Reinforced concrete pipe fittings: ASTM C76, Class IV pipe or of equal strength sufficient to attain D-load, 0.01" of 2,000 lbs. with ASTM C443 "O" ring seals or compression type rubber gasket joints. Sizes to 10" diameter may be non-reinforced with equivalent strength.
 - 2. Corrugated Polyethylene Tubing: ASTM F405 and F667. A product which meets this specification is ADS N-12 perforated corrugated polyethylene tubing by Advanced Drainage Systems, Inc., Columbus, Ohio or conform to AASHTO M252.
- B. Trench drains, manholes, catch basins, inlets: Provide type and sizes indicated.
 - 1. Frames, grates and covers: ASTM A48 grey cast iron, asphalt coated.
 - 2. Concrete masonry units: ASTM C139.
 - 3. Brick: ASTM C32, grade MS.
 - 4. Precast concrete manhole barrels and cones: ASTM C478, 5" wall thickness with ASTM C443 "O" ring gasket joints.
 - 5. Mortar:

- a. Mortar for jointing concrete pipe and for laying and parging concrete masonry:
1 part Portland cement and 2 parts sand.
 - b. Mortar for brickwork: 1 part Portland Cement, 1/2 part hydrated lime and 4-1/2 parts sand.
- C. Fine granular fill: Clean natural sand.
- D. Course granular fill: ¾” crushed limestone.
- E. Concrete: 3,000 psi air entrained concrete complying with requirements of Section 03300 Cast-In-Place Concrete.
- F. Earth fill: Natural sandy-clay subsoil, soil-rock mixtures, or approved excavated materials, free of foreign matter, organic material and debris.
- 1. Excavated materials removed in site drainage trenching operation may be used as backfill when acceptable to the Owner's Representative.
- G. Soil separator: Rot resistant polypropylene filter fabric, permeable and unaffected by freezing and thawing.

PART 3 - EXECUTION

3.01 DESCRIPTION

- A. Lay out site drainage work and establish extent of excavation by area and elevation. Designate and identify datum elevation and project engineering reference points. Set required lines, levels and elevations.
- B. Do not cover or enclose work of this Section before obtaining required inspections, tests, approvals and location recording.
- C. Remove existing paving, including base material, as required to accommodate site drainage work. Saw cut existing paving to provide uniform straight transition at intersection of new to existing paving.

3.02 EXISTING UTILITIES

- A. Conform to Section 02000 Site Work.

3.03 INSTALLATION

- A. Perform excavating and backfilling as required to install site drainage work.

- B. Provide trench wall support and pumping of surface and ground water as required to provide suitable conditions.
- C. Excavate trenches to accommodate indicated bedding conditions and material. Trim and shape trench bottoms to proper line and grade, free of irregularities. Remove unstable material and replace with compacted fill.
- D. Install site drainage system true to grade and alignment indicated.
 - 1. Provide necessary equipment for lowering pipe safely into trenches. Handle pipe and accessories to prevent damage. Damaged materials replaced at Contractor's expense.
 - 2. Do not place pipe in water, nor when trench or weather is unsuitable for site drainage.
 - 3. Remove all dirt and foreign material from pipe before installation. Provide bulkheads as required to prevent entrance of dirt or water after installation.
 - 4. Lay and fit pipe sections to provide a smooth, uniform invert, with sealed joints and full bearing in bedding material. Provide continuous fall in flow direction.
 - 5. Excavate bell holes under each bell to ensure uniform bedding for all types of bell and spigot piping.
 - 6. Install pipe joint gaskets in accordance with manufacturer's instructions. Install concrete pipe in accordance with ACPA "Concrete Pipe Field Manual".
 - 7. Cut pipe ends entering structures flush with inner face of structures.
 - 8. Provide soil separator over granular backfill at perforated site drainage piping.
 - 9. Extend site drainage system to outfall indicated and make required connection.
 - 10. Obtain required inspections and perform testing prior to backfilling. Remove obstructions, replace damaged components and retest as required. Provide a satisfactory free flowing drainage system.
 - 11. Sub-drain pipe installation: Conform to AASHTO M252-851.
- E. Backfill trenches with an approved backfill material, free from large clods, stones and debris.
 - 1. Backfill trenches in 8" compacted layers until there is a cover of not less than 24" over piping. Place remaining backfill material in 12" compacted layers.
 - 2. Backfill evenly on both sides of piping for full depth. Provide thorough compaction of fill under pipe haunches.
 - 3. Provide granular backfill at all paved areas.
 - 4. Provide concrete encasement where indicated.
- F. Mechanically compact backfill. Water settling, puddling and jetting as a compaction method are not acceptable.

- G. Fill, compact and restore to original level and condition all settlement.
- H. Replace paving, lawns and finished surfaces removed to accommodate the site drainage system, except where new surfaces are provided as part of the work.
- I. Construct trench drains, catch basins, manholes, inlets and other drainage structures as indicated.
 - 1. Install drainage structures on a sound cast-in-place or pre-cast segmented concrete base.
 - 2. Lay radial and batter concrete masonry with full mortar joints completely filled with Portland cement mortar. Strike joints flush with surface of concrete masonry.
 - 3. Horizontal joints shall not exceed 1/2". Vertical joints shall not exceed 1/4" on their interior surface.
 - 4. Provide headers where required to adjust frames to grade, breaking joints between courses.
 - 5. Parge inside and outside face of masonry structure walls with 1/4" mortar.
 - 6. Construct flow channels with concrete or brick conforming to the inside diameter of connecting lines. Make changes in grade gradually and make changes in line with true curves.
 - 7. Set frames and covers to required grade and bed in place with mortar.
 - 8. Cold weather protection: Provide all necessary means for heating concrete, masonry materials and mortar to protect concrete and masonry work during and after installation from damaged by frost and freezing.
 - 9. Perform no work when the temperature is below 25 degrees F. (ambient).

3.04 DISPOSAL OF WASTE MATERIALS

- A. Transport excess excavated materials, including rock, to designated disposal area on Owner's property. Stockpile or spread as directed. Remove from site and legally dispose of trash and debris.

3.05 CLEANING

- A. Maintain site drainage piping and structures in workable condition during construction operations.
- B. Flush site drainage system with water in sufficient volume to obtain free flow through each line. Remove all silt, trash and debris just prior to acceptance of work.
- C. Upon completion of site drainage work, remove tools and equipment. Provide site clear, clean, free of debris and suitable for site work operations.

END OF SECTION

SECTION 02445
VINYL COATED CHAIN LINK FENCING

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Work included: Provide Vinyl coated chain link fence system where shown on the drawings and as needed for a complete and proper installation.

1.02 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. ASTM A-120: Zinc Coating.
- C. ASTM A-123: Zinc Coated Forged Steel.
- D. ASTM F-567: Fence Installation.
- E. ASTM A-392: Class I PVC Coated Fabric.
- F. Polyester Powder:
 - 1. ASTM D-1734 - Flexibility Mandrel Test.
 - 2. ASTM D-2794 - Impact Resistance Test.
 - 3. ASTM B-117 - Salt Spray Resistance Test.
 - 4. ASTM D-2247 - Humidity Resistance Test.
 - 5. ASTM D-822 - Weatherability Test.
 - 6. ASTM D-3363 - Pencil Hardness Test.
 - 7. ASTM D-2454 - Overbake Resistance Test.
 - 8. ASTM D-3359B - Adhesion Crosshatching Test.
 - 9. Epoxy or hybrid paints are not acceptable due to poor weatherability characteristics.

1.03 SUBMITTALS

- A. Comply with pertinent provision of Section 01340 Submittals.
- B. Product data: 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 to 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 by the Owner's Representative, will become the basis for accepting or rejecting

- actual installation procedures used on the work.
5. Sample of fabric, end, line, gate, frame posts (6' lengths marked as to size); fittings; hardware and accessories; one each.

1.04 PRODUCT HANDLING

- A. Comply with pertinent provisions of Section 01640 Product Handling.

1.05 WARRANTY

- A. Record manufacturer's 10 year warranty against rust or corrosion for fabric.

PART 2 – PRODUCTS

2.01 DIMENSIONAL DATA

- A. General:
 1. Pipe sizes indicated are commercial pipe sizes.
 2. Roll-formed section sizes indicated are the nominal outside dimensions.

2.02 GALVANIZING

- A. On steel framework and appurtenances, provide galvanized finish with not less than the following weight of zinc per sq. ft.:
 1. Pipe: 1.8 oz., complying with ASTM A120.
 2. H-Sections and square tubing: 2.0 oz. complying with ASTM A123.
 3. Hardware and accessories: Comply with Table I of ASTM A153.
 4. Fabric: 1.2 oz. complying with Class I of ASTM A392.

2.03 FABRIC

- A. Provide number 6 gage (9 gage wire 0.148" O.D. with Vinyl equals 6 gage) wires, vinyl clad, in accordance with ASTM F668, Type 28, in 2" mesh where noted on drawings with top and bottom salvages knuckled.
- B. Provide fabric in one piece widths. Full height up to 12'-0".

2.04 POSTS, RAILS AND ASSOCIATED ITEMS

- A. End, corner, slope and pull posts: Provide at least the following minimum sizes and weights with powder coated finish:
 1. Up to and including 6'-0" fabric height: 2.375" (2-1/2") OD, Schedule 40 Type I round pipe, 3.65 lbs. per lineal foot.
 2. Above 6'-0" to 10'-0" fabric height: 2.875" (3") OD, Schedule 40 Type I round pipe, 5.79 lbs per lineal foot.
 3. Above 10'-0" fabric height: 4.000" (4") OD, Schedule 40 Type I round pipe, 9.10 lbs per lineal foot.

- B. Line posts: Provide minimum sizes and weights as follows:
1. Up to and including 6'-0" fabric height: 1.900" (2") OD, Schedule 40 Type I round pipe, 2.72 lbs. per lineal foot.
 2. Above 6'-0" to 10'-0" fabric height: 2.375" (2-1/2") OD, Schedule 40 Type I round pipe, 3.65 lbs per lineal foot.
 3. Above 10'-0" fabric height: 2.875" (3") OD, Schedule 40 Type I round pipe, 5.79 lbs. per lineal foot.
- C. Gate Posts: Provide gate posts for supporting single gate leaf, or one leaf of a double gate installation, for nominal gate widths as follows:
1. For 6' wide or less: Use 2.875" (3") OD, Schedule 40 Type I round pipe, 5.79 lbs. per lineal foot.
 2. Over 6 feet wide and up to 13 feet wide: Use 4.000" (4") OD, Schedule 40 Type I round pipe, 9.10 lbs. per lineal foot.
 3. Over 13 feet wide and up to 18 feet wide: Use 6.625" OD, Schedule 40 Type I round pipe, 8.92 lbs per lineal foot.
 4. Over 18 feet wide: Use 8.625" OD, Schedule 40 Type I round pipe, 28.55 lbs per lineal foot.
- D. Top Rails:
1. Use 1.660" OD, Schedule 40 Type I round pipe, 2.27 lbs. per lineal foot.
 2. Provide in manufacturer's longest lengths, with expansion type couplings approximately 6" long for each joint.
 3. Provide means for attaching top rail securely to each gate, pull, slope, line and endpost.
- E. Post Brace Assemblies:
1. Provide at end and gate posts, and at both sides of corner, slope and pull posts with the horizontal brace located at mid-height of the fabric.
 2. Use 1.660" OD pipe 2.27 lbs. per lineal ft. for horizontal brace.
 3. Use 3/8" diameter rod with turnbuckle for diagonal truss.
- F. Tension wire: Provide number 7 gage coiled spring wire at bottom of fabric.
- G. Post Tops:
1. Provide steel, wrought iron or malleable iron designed as weathertight closurecap.
 2. Provide one cap for each post.
 3. Provide caps with openings to permit through passage of top rail.
- H. Stretcher Bars:
1. Provide one-piece lengths equal to full height of fabric, with a minimum cross-section of 3/16" x 3/4".
 2. Provide one stretcher bar for each gate and end post and two for each corner, slope and pull post except where fabric is woven integrally into the post.
- I. Stretcher Bar Bands:
1. Provide steel, wrought iron or malleable iron, spaced not over 15" on centers, to secure stretcher bars to end, corner, pull, slope and gate posts.
 2. Bands may be used also with special fittings for secure end, corner, pull, slope and gate posts.

2.05 GATES

A. General:

1. Fabricate gate perimeter frames of tubular or pipe members.
2. Provide additional horizontal and vertical members to assure proper operation of the gate, and for attachment of fabric, hardware and accessories.
3. Space so frame members are not more than 8 feet apart.
4. Fabricate gate frames from:
 - a. 6' to 10' H x 8' W or less, 1.90" (2") OD, Schedule 40 Type I round pipe, 2.72 lbs. per linear foot.
5. All materials shall have powder coated finish.

B. Fabrication:

1. Assemble gate frames by welding with special malleable or pressed steel fittings and rivets for rigid connections.
2. Use same fabric as used in the fence.
3. Install fabric with stretcher bars at vertical edges as a minimum.
4. Attach stretchers to gate frame at not more than 15" on centers.
5. Attach hardware with rivets or by other means which will provide security against removal and breakage.
6. Provide diagonal cross-bracing consisting of 3/8" diameter adjustable length truss rods on gates where required to provide frame rigidity without sag or twist.

C. Gate Hardware:

1. Hinges:
 - a. Pressed or forged steel or malleable iron to suite the gate size; non-lift-off type, offset to permit 180 degree opening.
 - b. Provide 1-1/2 pair of hinges for each leaf over 6 feet in nominal height.
2. Latches:
 - a. Provide heavy duty commercial grade forked type or plunger-bar type to permit operation from either side of the gate.
 - b. Provide padlock eye as integral part of latch.
3. Keeper:
 - a. Provide keeper for vehicle gates, which automatically engages the gate leaf and holds it in the open position until manually released.
4. Double Gates:
 - a. Provide gate stops for double gates consisting of mushroom or flushplate, with anchors.
 - b. Set in concrete to engage the center drop rod or plunger bar.
 - c. Provide heavy duty commercial grade locking device and padlock eyes as an integral part of the latch, requiring one padlock for locking both gate leaves.

5. Rollers and Tracks:
 - a. Roller and assembly shall have a 250 lb. rating per assembly.
 - b. Three assemblies for overhead sliding gate.

2.06 MISCELLANEOUS MATERIALS

- A. Wire Ties:
 1. For tying fabric to line posts, use number 9 gage wire ties spaced 12” on centers.
 2. For tying fabric to rails and braces, use number 9 gage wire ties spaced 24” on centers.
 3. For tying fabric to tension wire, use number I I gage hog rings spaced 24” on centers.
 4. Manufacturer’s standard wire ties will be acceptable if of equal strength and durability.
- B. Concrete: Comply with provisions of Section 03300 for 3000 psi concrete footings.

2.07 ACCESSORIES

- A. Tubular post tops: Weather tight closure caps, I top for each post. Provide tops with openings to accommodate top rails. Finish matching framework finish.
- B. Sleeves, stretcher bars, stretcher bar bands, clips, ties, rail ends, fasteners, fittings and accessories: Provide manufacturer’s standard complying with CLMI specifications. Finish matching framework finish.

2.08 WIRE COATING

- A. Thermally fused and bonded plasticized polyvinyl chloride (PVC) with low temperature plasticizers. No filters, extenders or extraneous matter, other than the necessary stabilizers and pigments.

2.09 POWDER COATING

- A. All polyesters equal to topcoat PE50000 series by Armstrong Products Company.
 1. Coating electrostatically sprayed with a film thickness of one to five mils with average of two mils.
 2. All coated parts to be cured at a temperature of 400 degrees F for ten minutes.
 3. Owner shall approve coating company and inspect parts before shipping.

PART 3 - EXECUTION

3.01 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.

3.02 INSTALLATION

- A. General:
 - 1. Install posts at a maximum spacing of 10 feet on centers.
 - 2. Install corner or slope posts where changes in line or grade exceed a 30 degree deflection.
- B. Excavating:
 - 1. Drill holes for post footings in firm, undisturbed or compacted soil, strictly adhering to the dimensions and spacing shown.
 - 2. Post hole dimensions:
 - a. Provide 30" deep by 8" diameter foundations for line posts for 6 foot fabric height and less.
 - b. Provide 36" deep by 8" diameter foundations for line posts for fabric heights exceeding 6 feet.
 - c. Provide 36" deep by 12" diameter foundations for all other posts.
 - 3. Spread soil from excavations uniformly adjacent to the fence line, or on adjacent areas of the site if so directed.
 - 4. When solid rock is encountered near the surface, drill into rock at least 12" for line posts and at least 18" for end, pull, gate and corner posts. Drill hole at least 1" greater diameter than the largest dimension of the post to be placed.
 - 5. If solid rock is below soil overburden, drill to full depth required, except penetration into rock need not exceed minimum depths specified above.
- C. Setting Posts:
 - 1. Remove loose and foreign materials from sides and bottoms of holes and moisten soil prior to placing concrete.
 - 2. Center and align posts in holes.
 - 3. Place concrete around posts in a continuous pour and vibrate or tamp for consolidation.
 - 4. Check each post for vertical and top alignment and hold in position during placement and finishing operations.
 - 5. Trowel tops of footings and slope or dome to direct water away from posts.
 - 6. Extend footings for gate posts to the underside or bottom hinge.
 - 7. Set keeps, stops, sleeves and other accessories into concrete as required.
 - 8. Keep exposed concrete surfaces moist for at least seven days after placement, or cure with membrane curing material or other curing method approved by the Owner's Representative.
 - 9. Grout-in those posts which are set into sleeved holes, concrete constructions, or rock excavations, using non cement grout or other grouting material approved by the Owner's Representative.

- D. Concrete Strength:
1. Allow concrete to attain at least 75% of its minimum 28-day strength before rails, tension wires and/or fabric is installed.
 2. Do not, in any case, install such items in less than seven days after placement of concrete.
 3. Do not stretch and tension fabric and wire, and do not hang gates, until concrete has attained its full design strength.
- E. Rails and Bracing:
1. Install fence with a top rail and bottom tension wire.
 2. Install fence with a top rail and bottom on fence as specified on drawings.
 3. Install top rails continuously through post caps or extending to radius for curved runs.
 4. Provide expansion couplings as recommended by the fencing manufacturer.
 5. Provide bracing to the midpoint of the nearest line post or posts at all end, corner, slope, pull and gate posts.
 6. Install tension wires parallel to the line of fabric by weaving through the fabric, and tying to each post with not less than number 7 gage galvanized wire, or by securing the wire to the fabric.
 7. Weld all posts, rails and braces at heights over 10'-0".
- F. Installing Fabric:
1. Leave approximately 1/2" between finish grade and bottom selvage.
 2. Excavate high points in the ground to clear the bottom of the fence.
 3. Place and compact fill to within 1" of the bottom of the fabric in depressions.
 4. Pull fabric taut and tie to posts, rails and tension wires.
 5. Install fabric on the activity (court) side of fence and anchor to framework so that the fabric remains in tension after pulling force is removed.
 6. Install stretcher bars by threading through or clamping to fabric on 4" centers and secure to post with metal bands spaced 15" on centers.
 7. Note: All sports fields or courts fabric shall be installed on the activity side.
- G. Installing Gates:
1. Install gates plumb, level and secure for full opening without interference.
 2. Install ground-set items in concrete for anchorage in accordance with the fence manufacturer's recommendations as approved by the Owner's Representative.
 3. Lubricate and adjust the hardware for smooth operation.
 4. Provide stops for overhead track type gates.
 5. Maximum gate height of 7' in 10' and higher fencing.
- H. Miscellaneous:
1. Use U-shaped tie wires, conforming to diameter of pipe to which attached, clasping pipe and fabric firmly with ends twisted at least two full turns.
 2. Bend ends of wire to minimize hazards to persons and clothing.
 3. Fasteners:

- a. Install nuts for tension band and hardware bolts on side of fence opposite fabric side.
 - b. Peen the ends of bolts to prevent removal of nuts.
4. Repair coatings damaged in the shop or field erection, using a hot-applied repair compound applied in accordance with its manufacturer's recommendations as approved by Owner's Representative.

END OF SECTION

LANDSCAPE IRRIGATION

PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications, apply to this Section.
- B. Coordinate work of this Section with other underground utilities and with trades responsible for their installation. Refer to respective Drawings pertaining to other work.
- C. All references in this Section to “Contractor” and/or “Irrigation Contractor” shall mean “Landscape Contractor or Irrigation Contractor”.
- D. Carefully examine all of the Contract Documents for requirements that affect the Work of this Section.

1.2 WORK DESCRIPTION

- A. The work under this Section consists of furnishing adequate numbers of skilled workmen who are thoroughly trained and experienced and installing all materials, equipment and services required to complete and provide a fully operational, automatic landscape irrigation system for the turf and landscape areas depicted on the final approved landscape plans.
- B. The system shall automatically irrigate, using spray or rotary sprinklers as needed, on all turf areas as indicated on the landscape plan and as directed by the Owner. The system shall automatically irrigate, using spray sprinklers and/or drip irrigation, all landscape areas as indicated on the landscape plan and as directed by the Owner.
 - 1. The primary source of irrigation water is an adjacent lake with a submersible turbine pump station.
 - 2. The control system at a location determined by the Owner. Training, programming and start-up of control system shall be by a trained professional.
 - 3. Trench excavation, back filling and bedding materials, together with the testing and proper scheduling of the completed installation shall be included as part of this scope of work.
 - 4. The work shall be constructed and finished in every respect in a good, workmanlike and substantial manner, to the full intent and meaning of the Specifications. All parts necessary for the proper and complete execution of the work, whether the same may have been specifically mentioned or not, shall be done or furnished in a manner corresponding with the rest of the work as if the same were specifically herein described.

5. Record Drawing (As-built) as well as generation of the Operating & Maintenance Manual in accordance to these specifications shall also be included in this work.
- C. At the completion of work, contractor shall perform and successfully complete the tests as outlined in Section 3.13 "SYSTEM TESTING, START-UP AND ADJUSTMENT"

1.3 PERMITS AND INSPECTIONS

- A. The work under this Section shall comply with all ordinances and regulations of authorities having jurisdiction.
- B. Obtain and pay for all permits to any agency having jurisdiction over the work required for the execution of this Section.
- C. Furnish copies of Permits and Approval Notices to the Owner's Representative before requesting final payment.
- D. The Contractor shall include in their bid any charges by the Water Department, Utility Company, or other authorities for work done by them and charged to the Contractor.

1.4 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division Specification Sections.
- B. The Contractor shall provide copies of product specification sheets on all proposed equipment to be installed to the Owner's Representative for approval prior to the start of work, in accordance with the parameters of Division-1. Work on the irrigation system may not commence until product sheets are submitted and approved. Submittals shall be highlighted to show proper model, nozzles, sizes, flows, etc. Submittals not properly highlighted or marked up will be rejected. As a minimum, the following equipment shall be included in the submittal:
 1. Main Line Pipe
 2. Lateral Line Pipe
 3. Schedule 40 and Schedule 80 Fittings and Nipples
 4. Swing Joints Assemblies
 5. Ductile Iron Fittings
 6. Manual Valves: Main Line Isolation and Control Valve Isolation and Manual Control Valves
 7. Automatic Electric Control Valves

8. Freeze-less Yard Hydrant and Keys
9. Valve Boxes and Enclosures Including Extensions and Extension Material
10. Control Wire and Waterproof Connectors
11. Sprinkler Heads and Nozzles
12. Irrigation Controller and Enclosures
13. Electrical Conduit – Metal and PVC
14. Round River Rock for Valve Sumps in the Enclosures
15. Solvent Cements and Cleaner/Primers
16. Miscellaneous Materials

1.5 QUALITY ASSURANCE

- A. Irrigation Contractor: A firm which has at least five (5) years of experience in work of the type and size required by this Section and which is acceptable to the Owner's Representative.
- B. References: The Installation Contractor must supply three references for work of this type and size with their bid including names, phone numbers and email addresses of contact person(s).
- C. Applicable requirements of accepted Standards and Codes shall apply to the Work of this Section and shall be so labeled or listed:
 1. American Society for Testing & Materials (ASTM)
 2. National Plumbing Code (NPC)
 3. National Electric Code (NEC)
 4. National Sanitary Foundation (NSF)
 5. American Society of Agricultural Engineers (ASAE)
 6. Underwriters Laboratories, Inc. (UL)
 7. Occupational Safety and Health Regulations (OSHA)
 8. American Society of Irrigation Consultants (ASIC)

1.6 DELIVERY, STORAGE AND HANDLING

- A. Store and handle all materials in compliance with manufacturer instructions and recommendations. Protect from all possible damage. Minimize on-site storage. Contractor is responsible for the security of all stored materials on site.

1.7 GUARANTEE

- A. The Contractor shall obtain in the Owner's name the standard written manufacturer's guarantee of all materials furnished under this Section where such guarantees are offered in the manufacturer's published product data. All these guarantees shall be in addition to, and not in lieu of, other liabilities that the Contractor may have by law.
- B. In addition to the manufacturers guarantees the Contractor shall warrant the entire irrigation system, both parts and labor for a period of one (1) year from the date of acceptance by the Owner.
- C. As part of the one-year warranty the Contractor shall perform the first year-end winterization and spring start-up for the irrigation system.
- D. Should any problems develop within the warranty period because of inferior or faulty materials or workmanship, they shall be corrected to the satisfaction of the Owner's Representative at no additional expense to the Owner.
- E. A written warranty showing date of completion and period of warranty shall be supplied upon completion of each segment of the project.

1.8 COORDINATION

- A. The Contractor shall at all times coordinate his work closely with the Owner's Representative to avoid misunderstandings and to efficiently bring the project to completion. The Irrigation Contractor shall also coordinate their work with that of the electrical contractor, general contractor, plumbing contractor and landscape contractor. The Owner's Representative shall be notified as to the start of work, progression and completion, as well as any changes to the drawings before the change is made. The Contractor shall also coordinate his work with that of his sub-contractors.
- B. The Contractor shall be held responsible for and shall pay for all damage to other work caused by his work, workmen or sub-contractors. Repairing of such damage shall be done by the Contractor who installed the work as directed by the Owner's Representative.

1.9 MAINTENANCE AND OPERATING INSTRUCTIONS

- A. Contractor shall include in their Bid an allowance for two (2) hours of instruction of Owner and/or Owner's personnel upon completion of check/test/start-up/adjust operations by a competent operator (The Owner's Representative office shall be notified at least one (1) week in advance of system testing, start-up and adjustment.

- B. Upon completion of work and prior to application for acceptance and final payment, a three ring, hard cover binders titled MAINTENANCE AND OPERATING INSTRUCTIONS FOR THE GRIFFIN PARK SOCCER COMPLEX PHASE 6 SOCCER FIELDS IRRIGATION SYSTEM, shall be submitted to the Owner's Representative office. After review and approval, the copies will be forwarded to the Owner. Included in the Maintenance and Operating binder shall be:
1. Table of Contents
 2. Written description of Irrigation System.
 3. System drawings:
 - a. One (1) copy of the approved irrigation plan;
 - b. One (1) reproducible copy of the Record Drawing (As-Built); Measurements on record drawings shall be surveyed or triangulated from permanent objects and recorded on Autocad compatible digital format;
 - c. An Autocad compatible digital file (USB Flash Drive) of the record drawing;
 4. A complete set of "APPROVED" submittals of all irrigation equipment;
 5. A copy of the suggested "System Operating Schedule" which shall call out the controller program required (zone run time in minutes per day and days per week) in order to provide the desired amount of water to each area under "no-rain" conditions.
 6. One (1) copy of the controller/valve/rain/moisture/flow sensor system wiring diagram.

1.10 EXAMINATION OF CONDITIONS

- A. The Contractor shall fully inform himself of existing conditions on the site before submitting his bid, and shall be fully responsible for carrying out all work required to fully and properly execute the work of the Contract, regardless of the conditions encountered in the actual work. No claim for extra compensation or extension of time will be allowed on account of actual conditions inconsistent with those assumed, except those conditions described in the GENERAL CONDITIONS.

1.11 PROCEDURE

- A. Notify all city departments and/or public utility owners concerned, of the time and location of any work that may affect them. Cooperate and coordinate with them in the protection and/or repairs of any utilities.
- B. Provide and install temporary support, adequate protection and maintenance of all structures, drains, sewers, and other obstructions encountered. Where grade or

alignment is obstructed, the obstruction shall be permanently supported, relocated, removed or reconstructed as directed by the Architect.

PART 2 – PRODUCTS

2.1 GENERAL

- A. All materials to be incorporated in this system shall be new and without flaws or defects and of quality and performance as specified and meeting the requirements of the system. All material overages at the completion of the installation are the property of the Contractor and shall be removed from the site.
- B. No material substitutions from the irrigation products described in these specifications and shown on the drawings shall be made without prior approval and written acceptance from the Owner's Representative.

2.2 PVC IRRIGATION PIPE AND FITTINGS

- A. All pipe shall bear the following markings: Manufacturer's name, nominal pipe size, schedule or class, pressure rating in psi, and date of extrusion.
- B. All main line pipe, two and one-half inch (2-1/2") and larger, shall be PVC, Class 200, Type 1120, SDR 21, Gasket-Joint PVC, conforming to ASTM D1784 and ASTM D2241. Rubber gasket shall conform to ASTM D3139. Pipe shall be as manufactured by PipeLife Jet Stream or approved equal.
- C. All main line pipe, two inches (2") and smaller shall be PVC Type 1120-1220 Schedule 40, belled end solvent weld and conforming to ASTM D1784, cell class 12454 and ASTM 1785.
- D. All lateral pipe 3/4" and larger shall be PVC, Class 200 Type 1120, SDR 21, solvent-weld PVC. Lateral pipe shall conform to ASTM No. D2241 as manufactured by PipeLife Jet Stream or approved equal. All 1/2" lateral pipe shall be PVC Class 315 Type 1120, SDR 13.5, solvent-weld PVC joints.
- E. Fittings for gasket-joint PVC pipe, for all directional changes, pipe reductions and plugs shall be, ductile iron fittings with mechanical joints meeting ANSI/AWWA C153/A21.53. Fittings shall include transition gaskets for PVC Class 200 pipe. All connections of main line piping to control valve shall be mechanical joint ductile iron tees with 2" threaded taps. Fittings shall be manufactured of ductile iron in accordance with ASTM A536 and gaskets shall meet ANSI/AWWA C111/A21.4. Fittings shall be as manufactured by SIP Industries or approved equal.
- F. Bolted sleeve couplings shall be Model 040R manufactured by Skinner Brothers Company, Inc. or approved equal.
- G. Fittings for solvent weld PVC lateral line pipe shall be Schedule 40 solvent weld PVC fittings as manufactured by Spears or approved equal.

- H. Fittings shall bear manufacturer's name or trademark, material designation, size, and applicable I.P.S. schedule.
- I. PVC Schedule 80 fittings and nipples shall be used on all fittings required between the main line tap and the electric control valve as well as the threaded connection between the electric control valve and the lateral piping. Schedule 80 fittings shall be Spears Manufacturing or approved equal. Contractor shall use teflon tape or other sealing method according to valve, sprinkler and fitting manufacturer's recommended practice for the specific application. All Schedule 80 PVC nipples shall be supplied with machined threads.
- J. PVC solvent shall be NSF approved, for Type I and Type II PVC pipe, and Schedule 40 and 80 fittings. Cement is to meet ASTM D2564 and FF493 for potable water pipes. PVC solvent cement shall be Rectorseal Gold, IPS Weld-ON 711, Oatey Medium Cement or equal, and shall be used in conjunction with the appropriate primer. Primer shall be NSF approved, and formulated for PVC and CPVC pipe applications. Primer is to meet ASTM F 656. Primer shall be Rectorseal Jim PR-2, IPS Weld-ON P-68 Clear, Oatey Purple Primer for PVC and CPVC, or equal.

2.3 PIPE SLEEVES

- A. All pipe sleeves beneath non-soil areas (with the exception of City of Norman streets) shall be PVC, Schedule 40 water pipe as manufactured by PipeLife Jet Stream or equal. Sleeves shall be the larger of the minimum size stated in these specifications, shown on the contract drawings or two (2) times larger than the total outside diameter of all the piping contained within the sleeve. All irrigation control wire shall be routed in a separate 2" minimum diameter sleeve.
- B. All sleeving to protect pipe or control wires under city streets and roads or below grade crossings shall be ductile iron or steel and shall meet the standards and specifications of the City of Norman Water and Sewer Department. Sleeves shall be two (2) times larger than the total outside diameter of all the piping contained within the sleeve. All irrigation control wires shall be routed in a separate 2" minimum diameter sleeve.
- C. Minimum pipe sleeve size shall be 4" diameter.

2.4 WIRE CONDUIT

- A. Conduit for wiring beneath non-soil areas shall be PVC, SCH-40 conduit with solvent-weld joints, as manufactured by Certainteed, Cresline or equal.
- B. Sweep ells shall be standard electrical type PVC schedule 40 long sweep elbows. Cap sweep ell with tri-plug with the ring for securing nylon pull rope.
- C. Conduit for above ground wiring to environmental sensors, weather stations or controllers shall be galvanized, rigid metallic conduit.

2.5 ROTARY SPRINKLERS

- A. Rotor Heads (1" Inlet): 4" Pop-up, top screwdriver adjust, rubber cover, water lubricated gear drive with radius reduction adjustment of at least 25 percent. Rotor shall incorporate nozzles with advanced water distribution assuring near-head water placement and uniformity ("Rain Curtain"). A check valve shall be provided to prevent low head drainage. Rotor shall have a 1" inlet, a pressure activated wiper seal and tapered riser to protect internal assembly from debris and ensure positive pop-up and retraction. Rotor shall have at least a 5 year trade warranty. Rotor shall be Rain Bird model 6504-PC (part circle) or 6504-FC (full circle) or approved equal.
- B. Small/medium rotary sprinklers shall be gear-driven, rotary type heads, designed for in-ground installation with integral check valves and in-riser flow shut-off capability. Sprinkler shall be capable of covering a 25-47 foot radius and flow range of 0.9-7.0 gpm at 45 pounds per square inch of pressure. Sprinklers shall have a one hundred percent warranty for five years minimum against defects in workmanship. The nozzle assembly shall elevate a minimum of twelve inches when in operation and retraction shall be achieved by a stainless-steel spring. Riser assembly shall be plastic and shall incorporate a pressure regulator set at 45 psi. A nozzle wiper seal shall be included in the sprinkler for continuous operation under the presence of sand and other foreign material. All sprinkler parts shall be removable through the top of the unit through the removal of a heavy-duty threaded cap. Sprinklers shall be manufactured by Rain Bird model 5004-PL-SAM-R.

2.6 ELECTRIC CONTROL VALVES

- A. Electric control valves shall be remote control diaphragm type glass-filled nylon body valves with flow control and 200-psi pressure rating. Valve shall have globe configuration, 24 volt electric. Valve shall have a self-cleaning stainless steel screen designed for use in dirty water applications.
- B. Valves shall be manufactured by Rain Bird model PESB or approved equal.

2.7 ISOLATION VALVES

- A. Main line isolation valves 2 inches and smaller in size shall be gate type, of bronze construction, US Manufacture with a 200 WOG. The valve shall meet Federal Specifications MSS SP-80 equal to Hammond Model IB645 or approved equal.
- B. Main line isolation valves 2-1/2 inches and larger in size shall be cast iron epoxy coated inside and outside, with mechanical joint end connections, 350 psi rated, ductile iron gland flange, bronze stem-seal box, triple o-ring stem seal replaceable under pressure, stainless steel stem, 2 inch operating nut and replaceable disc conforming to AWWA C-509 as manufactured by Mueller, Model A-2361 or approved equal.
- C. Electric Control Valve Isolation Valves: 2" and smaller shall be of the ball type, plastic construction, tru-union threaded ends and have a maximum pressure rating of 235 psi at 73 degrees F. The valves shall be equal to Spears Model 3629-XX

size the same as the control valve.

2.8 FREEZELESS YARD HYDRANTS AND KEYS

- A. The freezeless bury hydrant shall be equal to WOODFORD model Y95 with bury depth as required for site conditions. Refer to details for proper application.
- B. Contractor to supply two (2) keys for every bury hydrant.

2.9 VALVE BOXES

- A. All valve boxes and covers shall be injection molded of structural foam polyethylene with a melt index between 10 and 12 and shall be UV stabilized. All covers shall be green in color.
- B. Valve box extensions shall be provided and installed as required for proper box depth. Valve box extensions shall be made by the same manufacturer.
- C. Valve boxes for isolation valves, quick coupling valves and isolation valves and in-line check valve locations shall be 10-inch round valve boxes with bolt down covers equal to Rain Bird model VB10RNDH. Provide manufacturer's stainless steel locking bolts and associated clips for each valve box supplied. Valve box extensions shall be constructed with 8" or 10" I.D. model N-12 corrugated polyethylene pipe, as manufactured by Advanced Drainage Systems, Inc. (ADS), cut to length as required to achieve proper coverage over pipe and valves.
- D. Valve boxes for automatic electric control valves (non-drip zones), air/vacuum release valves and master control valves shall be 14"x19" ("standard") valve boxes with bolt down covers equal to Rain Bird VBSTDH with model VBSTD6EXTB 6" extension. Provide manufacturer's stainless steel locking bolts and associated clips for each valve box supplied.
- E. Valve boxes for wire splices shall be 10-inch round valve boxes with bolt down covers equal to Rain Bird model VB10RNDH. Provide manufacturer's stainless steel locking bolts and associated clips for each valve box supplied. Valve box extensions shall be constructed with 8" or 10" I.D. model N-12 corrugated polyethylene pipe, as manufactured by Advanced Drainage Systems, Inc. (ADS), cut to length as required to achieve proper coverage over pipe and valves. All splices shall be in separate valve boxes and not included with isolation valves.

2.10 CONTROL SYSTEM

- A. The controller shall be housed in a wall-mountable, weather-resistant plastic cabinet with a key-locking cabinet door suitable for either indoor or outdoor installation. The controller shall have a base station capacity of 12 stations as well as 3 expansion slots capable of receiving station modules of 8 or 12 stations to create a controller capacity of up to 48 stations. All stations shall have the capability of independently obeying or ignoring the weather sensor as well as using or not using the master valve. Station timing shall be from 0 minutes to 12 hours. The controller shall have a Seasonal Adjustment by program which adjusts the station run time from 0 to 300% in 1% increments. The controller shall also have a Monthly

Seasonal Adjustment of 0 to 300% by month. Station timing with Seasonal Adjustment shall be from 1 second to 16 hours. The controller shall have 40 separate and independent programs which can have different start times, start day cycles, and station run times. Each program shall have up to 10 start times per day for a total of 400 possible start times per day. The 40 programs shall be allowed to overlap operation based on user defined settings which control the number of simultaneous stations per program and total for the controller. The controller shall allow up to 5 valves to operate simultaneously per program and total for the controller including the master valve/pump start circuit. The controller shall have an electronic, diagnostic circuit breaker that shall sense a station with an electrical overload or short circuit and shall bypass that station and continue to operate all other stations. The controller shall have a 365-day calendar with Permanent Day Off feature that allows a day(s) of the week to be turned off on any user selected program day cycle. (Custom, Even, Odd, Odd31, & Cyclical). Days set to Permanent Day Off shall override the normal repeating schedule and not water on the specified day(s) of the week. The controller shall also have a Calendar Day Off feature allowing the user to select up to 5 dates up to 365-days in the future when the controller shall not start programs. The controller shall incorporate a Rain Delay feature allowing the user to set the number of days the controller should remain off before automatically returning to the auto mode. The controller shall have Cycle+Soak water management software which is capable of operating each station for a maximum cycle time and a minimum soak time to reduce water run-off. The maximum cycle time shall not be extended by Seasonal Adjustment. The controller shall incorporate a FloManager feature providing real-time flow, power, and station management. FloManager shall manage the number of stations operating at any point in time based on water source capacity, station flow rate, number of valves per station; user-defined simultaneous stations per program and for the controller. FloManager shall incorporate the ability to provide station priorities to determine the order in which stations shall operate. The controller shall ignore the station number and instead operate the highest priority stations first and the lower priority stations last when FloManager is enabled. FloManager shall be an option that is disabled by default and the controller shall operate zones in order of station number, started with the lowest numbered zone set to irrigate and ending with the highest number zone. The controller shall offer Water Windows for each program. This function sets the allowed start and stop time where watering is allowed. If the watering cannot be completed by the time the Water Window closes, the stations with remaining run time are paused and watering automatically resumes when the Water Window opens the next time. The controller shall offer a Pro Smart Module option which adds flow sensing functionality and second master valve/booster pump functionality. The controller shall have an alarm indicator light on the front panel visible through the outer door with the door closed and locked. The alarm light shall prompt the user to select the alarm softkey to review the alarm condition(s). A port for an external alarm is also available. The controller shall be Model ESP-LXME2 as manufactured by Rain Bird Corporation.

- B. Controller shall be installed in a stainless-steel enclosure equal to Rain Bird LXMMSS or approved equal.

2.11 WIRE AND COMMUNICATION CABLE

- A. All control wiring to be used for connecting the remote control valves to the controller shall be 14 gauge and all common wire shall be 14 gauge. The wire shall be Type UF, 600 Volt, single conductor solid copper wire with PVC insulation and shall bear UL approval for direct underground burial feeder cable. Insulation shall be 4/64" thick minimum covering ICC-100 compound for positive waterproofing protection.
- B. Splicing Materials - All electrical connections shall be waterproof so that there is no chance for leakage of water and corrosion build-up in the joint. The type of connection to be used shall have a silicone sealant system and shall be rated for 600 Volts. The connector shall be equivalent to Rain Bird WC20 or approved equal suitable for the size and number of wire conductors being joined.
- C. All wire connections shall be made in specified valve boxes.
- D. Wire type and method of installation shall be in accordance with local codes for NEC Class II circuits of 30-volt A.C. or less.

2.12 SWING JOINTS

- A. Swing Joints: All 1" inlet sprinkler heads shall be installed on prefabricated, manufactured swing joint assembly rated for 315 psi with prelubricated buttress threads and O'ring seals equal to Spears Manufacturing Co. Series 5807-01012 or Rain Bird Model TSJ-12.
- B. All bury hydrants shall be installed on prefabricated, manufactured swing joint assembly rated for 315 psi with prelubricated buttress threads and double O'ring seals equal to Rain Bird Model TSJ-12075.

2.13 GROUNDING EQUIPMENT

- A. Each electronic component of the control system shall be grounded to the manufacturer's recommended resistance to ground.
- B. Proper grounding practices shall include both the installation of ground rods and grounding plates. Ground rods shall be copper clad, 5/8-inch diameter x 10 foot long grounding rods and connected to the electrical equipment and grounding plate with minimum #6 AWG, solid, bare copper wire. Grounding plates shall be 4-inch x 96-inch x 0.0625-inch copper as outlined below. Minimum 20-foot separation between rod and plate. Minimum 12-foot separation between controller and ground rod. All connections to rods shall be with Cadweld connectors as specified. All connections to plates shall be performed by the plate manufacturer with 25-feet of bare copper wire already attached. Each grounding rod is to be covered by a 4-inch round, grated top, plastic valve cover and six inches of 4-inch SDR35 PVC. Plates shall be installed in ground enhancement material. Plates shall be covered with 4-inch plastic grated cover with detection and minimum 36 inches of 4 inch ADS drainage pipe. Ground rods and plates shall be UL listed.

2.14 SAND

- A. Sand used for backfilling of trenches; under, around and over PVC lines shall be as specified in SECTION: EARTHWORK.

2.15 CONCRETE BASES AND THRUST BLOCKS

- A. Standard concrete mix shall be in accordance with ASTM C150, ASTM C-33, and ASTM C-94 with a compressive strength (28 days) of 3,500 psi.
- B. All bell and gasket mainline pipe and fittings shall have thrust blocks sized and placed in accordance with pipe manufacturer's recommendations for standard concrete mix. Thrust blocks shall be installed at all tees, elbows, crosses, reducers, plugs, caps and valves. Contractor shall be responsible to insure the stability of all thrust blocks. A minimum 4 mil "visqueen" plastic poly sheeting shall be used to protect fitting and pipe from concrete during thrust block installation.
- C. All concrete bases shall be standard concrete mix. Sizes shall be as indicated on the Drawings and sited in the Specifications.

2.16 SPARE PARTS

- A. Contractor shall supply the following tools and equipment to the Owner's Representative before final observation:
 - 1. Two (2) tools for disassembling and adjusting each type of sprinkler head provided.
 - 2. Two (2) of each type sprinkler head and pattern (PC & FC) used in the project.
 - 3. Two (2) of each type nozzle used in the project.
 - 4. Two (2) diaphragms and solenoids for each type and size of control valve used in the project.
- B. Before final observation can occur, written evidence that the Owner's Representative has received the tools and equipment must be shown to the Owner.

PART 3 – EXECUTION

3.1 GENERAL

- A. Before work is commenced, hold a conference with the Owner's Representative to discuss general details of the work.
- B. Examine all contract documents applying to this Section noting any discrepancies and bringing the same to the attention of the Owner's Representative for timely resolution.

- C. Verify dimensions and grades at job site before work is commenced. Do not proceed with installation of the landscape irrigation system when it is apparent that obstructions or grade differences exist or if conflicts in construction details, irrigation equipment legend or specific notes are discovered. All such obstructions, conflicts, or discrepancies shall be brought to the attention of the Owner's Representative.
- D. Make all field measurements necessary for the work noting the relationship of the irrigation work to the other trades. Coordinate with other trades (landscaping and other site work trades). Project shall be laid out essentially as indicated on the Irrigation Plans, making minor adjustments for variations in the planting arrangement. Major changes shall be reviewed with the Owner's Representative prior to proceeding.
- E. Coordinate installation of all sprinkler materials, including pipe, to avoid conflict with the trees, shrubs, or other plantings. Special attention shall be made to avoid damage to the root system of existing trees. Contractor shall contact Owner's Representative for guidance on trenching in this area.
- F. During progress of work, a competent superintendent and all assistants necessary shall be on site. All shall be satisfactory to the Owner's Representative. The superintendent shall not be changed, except with the consent of the Owner's Representative, unless that person proves unsatisfactory and ceases to be employed. The superintendent shall represent the Contractor in his absence and all directions given to the superintendent shall be as binding as if given to the Contractor.
- G. At all times, protect existing irrigation, landscaping, paving, structures, walls, footings, etc. from damage. Any inadvertent damage to the work of another trade shall be reported at once.
- H. Replace, or repair to the satisfaction of the Owner, all existing paving disturbed during course of work. New paving shall be the same type, strength, texture, finish, and be equal in every way to removed paving.

3.2 PIPE AND FITTINGS INSTALLATION

- A. Using proper width trencher chain, excavate trenches to a depth of minimum pipe coverage plus six inches. Trenches shall have sides as nearly vertical as possible. Remove all lumber, rubbish and rocks larger than 1 inch from the trenches. Provide a uniform bearing for the entire length of each pipe line to prevent uneven settlement. Wedging or blocking of pipe will not be permitted. Make the width of the trench a minimum of 1 1/2 times the diameter of the piping but not less than 4 inches.
- B. Loam or topsoil encountered within the limits of trench excavation for irrigation mains and branch lines shall be carefully removed to the lines and depths as shown on the Drawings and stockpiled for subsequent replacement in the upper 6 inches of the trench from which it is excavated. Such removal and replacement of the quantities of loam shall be considered incidental to the irrigation system and

no additional compensation will be allowed therefore.

- C. Back filling shall be accomplished as follows: the first 10-inch of backfill material shall contain no foreign matter and no rock larger than 1-inch in diameter. Carefully place material around pipe and wire and tamp in place. Remainder of backfill shall be laid-up in 6-inch (maximum) lifts and tamped to compaction with mechanical equipment. Compaction in paved areas shall be to 98% standard proctor. Compact backfill in trenches to dry density equal to the adjacent undisturbed soil, and conform to adjacent grades without dips, sunken area, humps, or other irregularities. Frozen material shall not be used for backfill.
- D. Do backfilling when pipe is cool. During hot weather keep pipe cool by backfilling in the early part of the morning before the heat of the day.
- E. Do not, under any circumstances, use truck wheels or flooding for compacting soil.
- F. Restore grades and repair damage where settling occurs.
- G. All solvent-weld joints shall be made in strict accordance with manufacturer's recommendations and ASTM D2855 Standard Practice. Make solvent welds with a non-synthetic bristle brush in the following sequence: Apply an even coat of solvent to the outside of the pipe. Then apply solvent to the inside of the fittings and then re-apply a light coat of solvent to the outside of the pipe, making sure that coated area on the pipe is equal to the depth of the fitting socket. Insert pipe quickly into the fitting and turn the pipe approximately 1/4 turn to distribute the solvent and remove air bubbles. Check all tees and ells for correct position, then hold joint for approximately 15 seconds so that pipe does not push out from the fitting. Wipe off any excess of primer or solvent from each connection. Allow at least 15 minute drying time for each weld joint before moving. When the temperature is above 80° F, allow connections to set minimum 24 hours before pulling or pressure is applied to the system. When temperature is below 80° F, follow manufacturer's recommendations. Provide and install for expansion and contraction as recommended. Wire shall be laid in same trench as mainline and at pipe invert (see WIRING INSTALLATION).
- H. The minimum cover over the pipe shall be as follows:
 - 1. Main line pipe - 20 inches of cover over pipe
 - 2. Lateral pipe – 15 inches of cover over pipe
- I. Cut plastic pipe with handsaw or pipe-cutting tool, removing all burrs at cut ends. All pipe cuts are to be square and true. Bevel cut end as required to conform to Manufacturer's Specifications.
- J. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the trench. At times, when installation of the piping is not in progress, the open end(s) of the pipe shall be closed by a watertight plug or other means. All piping, which cannot temporarily be joined, shall be sealed to make as watertight as possible. This provision shall apply during the lunch hour as well as overnight. Pipe not to be installed that day shall not be laid out. Should water enter the trench during or after installation of the piping, no additional piping

may be installed or back filled until all water is removed from the trench. Pipe shall not be installed when water is in the trench, when precipitation is occurring, or when the ambient temperature is at 40° F or below. Pipe installed at temperatures below 40° F shall be removed and replaced at no cost to the Owner. PVC pipe shall be snaked in the trench to accommodate for expansion and contraction due to changes in temperature.

- K. Carefully install system in areas of existing vegetation designated to remain to provide minimal disturbance feasible. When trenching under the drip-line of existing trees, extreme care must be given to avoid root damage. If at all possible avoid trenching inside the drip-line by going around the tree rather than under it. If trenching must occur under the drip-line, use either tunneling or hand-digging methods rather than a mechanical trencher. Minimize the impact of root severing by avoiding construction during hot, dry weather, keeping trees well watered before and after digging and covering roots with soil or mulch as soon as possible. Contractor shall contact Owner's Representative for guidance on trenching in this area. Where excavation must occur near trees, the Contractor shall provide proper root pruning and sealing methods shown in the landscape plans and specifications and approved by Owner's Representative.
- L. Maintain 6-inch minimum clearance between sprinkler lines and lines of other trades. Do not install sprinkler lines directly above another line of any kind.
- M. Maintain 1-inch minimum clearance between lines which cross at angles of 45 to 90 degrees.
- N. Exercise care when excavating, trenching and working near existing utilities.
- O. Throughout the guarantee period it will be the responsibility of the Contractor to refill any trenches that have settled due to incomplete compaction.
- P. Pulling of pipe will be allowed provided soil is suitable and specified depth of bury can be maintained.

3.3 THRUST BLOCKING

- A. All gasket joint bell-end and mechanical joint fittings shall be blocked with an adequately sized thrust block as per ASAE Standard S376.1 and as depicted in the details. Blocking shall be in accordance with pipe and fitting manufacturer's recommendations. Thrust blocks shall be required at all changes in size and direction of bends, reducers, plugs and tees. Thrust blocks shall be installed against undisturbed soil in all cases. Concrete thrust blocks shall utilize 3,500-psi standard concrete mixture. Bricks, stones, boulders, etc. will not be accepted as thrust blocks or thrust block material. Premixed cement, sand and gravel packages "Sackcrete" will not be permitted as a thrust blocking material. Contractor to supply all material needed for thrust blocking.
- B. Size of thrust block shall be determined by working pressure, size and type of fitting, and soil conditions. Calculate area required for concrete thrust block in contact with soil. Refer to ASAE 376.2 for thrust block sizing information to determine size of thrust block for each condition.

- C. A minimum 4 mil "visqueen" plastic poly sheeting shall be used to protect fitting and pipe from concrete during thrust block installation.
- D. Under no circumstances will concrete block be approved for thrust blocks.

3.4 ELECTRICAL WIRE CONDUIT INSTALLATION

- A. Electrical conduit shall be installed in all non-soil areas, as well as for all above ground wiring where wire passes under or through walls, walks and paving to controllers and other sensors.
- B. Conduit shall extend 18 inches beyond edges of walls and pavement.

3.5 PIPE SLEEVING INSTALLATION

- A. Contractor is responsible for the supply and installation of sleeves whether shown on the drawings or not. Install sleeves under paving and other improvements prior to construction. Install where required to accommodate piping at proper depth to prevent damage by other construction activities and to provide specified burial depth for irrigation pipe. Location of sleeves to be recorded and marked.
- B. Sleeving shall be installed wherever piping is going under a non-soil area, generally where indicated on the Drawings. Cover over all sleeving pipe shall be appropriate for the specified depth of the pipe passing through the sleeve. Minimum coverage shall be 20 inches.
- C. Sleeving shall extend 24 inches beyond edges of walls and pavement.
- D. If finished pavement is in place, the Contractor shall bore under the pavement for sleeving installation using personnel experienced in the procedure. Contractor shall be responsible for all damage to finished paving due to improper boring.

3.6 VALVE AND VALVE BOX INSTALLATION

- A. Furnish and install a valve access box for each electric valve, quick coupling valve, isolation valve, wire splice, flushing valve, air/vacuum relief valve, in-line check valves, etc.
- B. Valves and valve boxes shall be installed where shown or directed, and shall be set plumb. Valve boxes shall be centered on the valves. Where feasible, valves shall be located outside the area of natural walkways, playing areas or paths. Earth fill shall be carefully tamped around each valve box. Valve boxes should be supported by concrete blocks to ensure that any surface loads on the valve boxes will not be transmitted below to the pipe or valves and to minimize box settlement. All boxes shall have at least 6" depth of clean washed round river rock under the valve boxes for drainage.
- C. Electric control valves shall be connected to the main line in a plumb position with adjusting handle and all bolts, screws and wiring accessible through the valve box opening. Sufficient clearance shall be provided for service and operation. Valve

manifolds shall be installed in such a manner that it will not be necessary to remove more than one valve when a valve is removed or replaced. The valves shall be adjusted for proper operation as required by the manufacturer for the specified performance. Adjust zone valve operation after installation using flow control device on valve.

3.7 WIRING INSTALLATION

- A. Wiring shall be installed along with the main distribution line. Multiple wire bundles shall be cinched together at maximum 12-foot centers using plastic cable cinches and shall be laid beside, and at the same invert as, the irrigation lines. Sufficient slack for expansion and contraction shall be maintained and wiring shall at no point be installed tightly. Provide and install an additional 8 inches to 12 inches slack at all changes of direction. Wiring in valve and splice boxes shall be coiled a minimum of 3 feet (36") sufficient length to allow decoder, valve solenoid, splice, and all connections to be brought above grade for servicing. This additional slack shall be coiled for neatness in the valve box.
- B. All wire shall be laid in trenches and shall be carefully back-filled to avoid any damage to the wire insulation or wire conductors themselves. In areas of unsuitable material, the trench shall have a 3 inch layer of sand or stone dust on the bottom before the wires are laid into the trench and back-filled. The wires shall have a minimum of 15 inches of cover. Wire not to be installed that day shall not be laid out.
- C. Service wiring in connection with Drawings and local codes for 24-volt service. All in-ground wire connections shall be waterproofed with materials specified in PART 2 - PRODUCTS. All splices shall be made in valve boxes (wire runs requiring splices between valve locations shall be provided and installed in splice box-valve box shall be used). Splice locations shall be shown on the Record Drawings.
- D. Contractor shall provide a complete wiring diagram showing wire routing for the connections between the controllers, control valves and environmental sensors and flow sensor. See PART 1 - GENERAL for the inclusion of wiring diagram in operation and maintenance manuals.

3.8 SPRINKLER INSTALLATION

- A. Spray sprinklers and rotary sprinklers shall be installed on flexible connections or swing joints as specified in PART 2 - PRODUCTS and shall be set plumb and level with the final grade and in accordance with manufacturer's recommendations. Locate part circle sprinklers to maintain a minimum of 4 inches from walls and 2 inches from other boundaries and borders.
- B. In turf areas where grass has not yet been established, sprinklers shall be initially installed on risers above grade level. When grass is established, the contractor shall lower sprinkler heads to their permanent position flush with the finish grade. This elevation is critical and care shall be taken to set them exactly at or slightly above finished grade, never below grade except as recommended by the manufacturer.

3.9 IRRIGATION CONTROL SYSTEM

- A. Contractor to install all controller components, including required surge protection and grounding at the owner approved location.
- B. Contractor is referred to the detail drawings and current information on controller installation and programming found in Rain Bird publication "ESP-LXME Control System Installation & Troubleshooting Guide".
- C. Contractor shall program the controller with initial irrigation program and verify data transmission and proper valve operation.
- D. Controller shall be installed inside of specified stainless-steel enclosure.
- E. All 120-volt electrical supply requirements shall be provided and installed using a licensed electrician.

3.10 FREEZELESS YARD HYDRANT INSTALLATION

- A. Install yard hydrant on specified pre-manufactured swing joint assembly at a maximum angle of 30 degrees as detailed in the detail drawings.
- B. Install a 8" deep sump around the drain opening of the hydrant consisting of 1-1/2" washed round river rock. Refer to drawings.

3.11 SYSTEM TESTING, START-UP AND ADJUSTMENT

- A. Flushing:
 - 1. After all piping, valves, sprinkler bodies, pipe lines and risers are in place and connected, but prior to installation of sprinkler internals, open the control valves and flush out the system under a full head of water.
 - 2. INITIAL FLUSHING OF LINES SHALL NEVER BE THROUGH SPRINKLER HEADS OR DRIP ZONES. Sprinkler internals, flush caps and riser nozzles shall be installed only after flushing of the system has been accomplished to the full satisfaction of the Owner's Representative.
 - 3. Contractor shall be responsible for flushing the entire system after installation is complete and will be responsible for any clogged nozzles during the warranty period.
- B. Testing:
 - 1. Leakage test: With zone valves closed, pressure test mainlines by supplying and maintaining full static pressure continuously for one full hour. Observe for evidence of leakage by monitoring flow meter and by visual inspection of the exposed lines. Repair all leaks and retest until no water flow is observed. Owner's Representative must be contacted to inspect and witness the leak testing procedures.

2. Coverage test: perform a coverage test in the presence of the Owner's Representative (notify Landscape Architect at least three (3) days in advance of scheduled coverage test). Owner's representative will determine if the water coverage and dispersion is complete and adequate. Readjust heads and/or head locations as necessary or directed to achieve proper coverage. After landscape finish grading is accomplished, install heads to finished grade in lawn and shrub areas and backfill with clean topsoil so head is stabilized and no lateral motion is exhibited during operation. Heads shall be set so the tip of the heads are 1/2" above the top of the mulch in planting beds. Heads in the turf areas shall be set flush with the finished grade and not a hazard to pedestrians and/or maintenance machinery. Set sprinkler heads to plumb within 1/16" and a minimum of 4 inches and a maximum of 6 inches from walls, walks and curbs.
3. Sprinkler heads to be spaced so as not to throw water on the buildings, walks or driveways. Heads shall be adjusted as required so that foliage of plants will not obstruct the spray and that the system has 100% coverage.
4. Contractor shall conduct a performance test of the complete system to ensure that all components are functioning properly. Performance test shall consist of operating the system through a complete irrigation cycle per day for two (2) consecutive days. Contractor shall be at the site to monitor the performance test and make any adjustments and corrections as needed during the testing period.
5. All testing shall be at the expense of the Contractor.

3.12 CLEANING AND ADJUSTING

- A. At the completion of the work, all parts of the installation shall be thoroughly cleaned. All equipment, pipe, valves and fittings shall be cleaned of grease, metal cuttings and sludge which may have accumulated by the operation of the system for testing.
- B. Adjust sprinkler heads, valve boxes, and quick coupling valves to grade as required, so that they will not be damaged by mowing operations.
- C. Continue sprinkler coverage adjustment as required by settlement, etc., throughout the guarantee period.
- D. Each control zone shall be operated for a minimum of 5 minutes and all heads checked for consistency of delivering water. Adjustments shall be made to sprinklers that are not consistent to the point that they match the manufacturer's standards. All sprinklers, valves, timing devices or other mechanical or electrical components, which fail to meet these standards, shall be rejected, replaced and tested until they meet the manufacturer's standards.

3.13 ACCEPTANCE AND OPERATION BY OWNER

- A. Upon completion of the work and acceptance by the Owner, the Contractor shall be responsible for the training of the Owner's Representative in the operation of

the system (provide minimum 72 hours written notice in advance of test). The Contractor shall furnish, in addition to the Record Drawings and operational manuals, copies of all available specification sheets and catalog sheets to the Owner's personnel responsible for the operation of the irrigation system. The Contractor shall guarantee all parts and labor for a minimum period of one (1) year from date of acceptance.

- B. Conditions for acceptability of work for start of maintenance by Owner issued by Owner or Owner's Representative shall include but not be limited to:
 - 1. Punch list items complete and approved by Owner or Owner's Representative.
 - 2. Landscape irrigation system complete and in place.
 - 3. Record drawings complete.
 - 4. Maintain installation and watering schedules until all conditions noted above have been completed.

3.14 CLEAN UP

- A. Upon completion of all installation work, Contractor shall remove all leftover materials and equipment from the site in a safe and legal manner.
- B. Contractor shall remove all debris resulting from work of this section.
- C. Contractor shall regrade, lightly compact, and replant around sprinkler heads where necessary to maintain proper vertical positioning in relation to established grade.
- D. Contractor shall fill all depressions and eroded channels with sufficient soil mix to adjust grade to ensure proper drainage. Compact lightly, and replant filled areas in accord with Owner's Representative's requirements.

END OF SECTION

**SECTION 02934
SODDING**

PART 1 - GENERAL

1.01 SCOPE:

- A. Provide and install sodded lawns as indicated on drawings and specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE:

- A. General Requirements

1.03 QUALITY ASSURANCE:

- A. Comply with American Sod Producers Association (ASPA) guideline specifications to sodding.
- B. Sodding Contractor: A firm which has at least five (5) years of experience in work of the type and size required by this Section and which is acceptable to the Owner, Owner's Representative, and Landscape Architect.
- C. References: The Sodding Contractor must supply three references for work of this type and size with their bid including names, phone numbers and email addresses of contact person(s).
- D. All finish grading work must be done utilizing an electronic, automatic laser grading system.

1.04 DELIVERY, STORAGE AND HANDLING:

- A. Deliver sod on pallets and protect from sun, wind and dehydration prior to installation.
- B. Do not cut or deliver more sod than can be laid within 24 hours.

1.05 SUBMITTALS:

- A. Submit name, address and phone number of sod supplier.
- B. Manufacturer's label with analysis data on lawn fertilizer.

PART 2 - PRODUCTS

2.01 MATERIAL:

- A. Sod shall be Astro Sod or of type as indicated on drawings and shall be well rooted, healthy, free of weeds, disease, nematodes, and soil borne insects. Sod shall also be uniform in color, leaf texture, and density.
- B. Fertilizer shall be granular or pellet as determined by soil testing.
- C. Water shall be free of substances harmful to sod growth.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Examine finish surfaces, grades, topsoil quality and depth. Do not start sodding work until unsatisfactory conditions are corrected. Beginning of installation indicates acceptance of existing site conditions.

3.02 PREPARATION:

- A. Loosen topsoil of lawn areas to be planted. Remove existing vegetation, sticks, roots, rubbish, foreign matter and stones over one inch (1") in any dimension from the top two inches (2") of the sod bed. Areas where the finish grade has sat for extended periods of time will need to be tilled or disked to remove vegetation and to loosen compacted soil to 85% maximum density.
- B. Fine grade lawn areas to smooth, even surface with a loose, uniformly fine texture. Float smooth to remove ridges and fill depressions as required to drain.
- C. Finish grade shall be smooth and approximately one inch (1") below curbs, walks and other paved surfaces.
- D. Apply fertilizer on finish grade prior to sod installation at a rate of one (1) pound of actual nitrogen per 1000 square feet.
- E. Restore prepared areas to specified condition if eroded, settled, or otherwise disturbed after fine grading and prior to sodding.

3.03 SOD INSTALLATION:

- A. Work within seasonal limitations of the sod type specified. Install sod between April 15 and August 30. Deviation from these dates shall be submitted by the contractor for approval by the owner or the owner's representative before installation.
- B. Large roll sod will be allowed. All netting is to be removed during the installation of the sod.
- C. Lay sod to form a solid mass tightly-fitted joints. Do not overlay edges. Stagger strips to offset joints in adjacent courses.
- D. Sod shall be placed so that top of sod is flush with adjoining grass areas if any, curbs, walks, and other paved surfaces.
- E. Do not install sod on saturated or frozen soil.
- F. Water sod lightly then roll with a water filled commercial lawn roller to ensure contact with subgrade and to insure a smooth surface free of lumps and depressions.

- G. Immediately following rolling, water sod thoroughly and continue to water after installation to achieve a well rooted and vigorous growing lawn or until final acceptance, whichever is longer. Contractor to provide watering equipment as required for areas not covered by an irrigation system.
- H. Repeat sod rolling as needed after one week to achieve a smooth level surface.
- I. On 3:1 slopes or greater sod shall be secured with sod staples as needed to prevent sod from sloughing off slopes.
- J. If there are areas that were sodded that were thin or not growing, the contractor is responsible for replacing those areas, and top dressing with the same sod variety and top dressing material. This applies to all areas that are 12"x12" or larger.
- J. Replace dead sod as required prior to final acceptance.

3.04 CLEANING:

- A. During the work, the premises are to be kept neat and orderly at all times. Storage areas for materials shall be organized so that they are neat and orderly. All trash, including debris from removing weeds or rocks from sodded areas, shall be removed from the site daily as the work progresses. All walk and driveway areas shall be kept clean by sweeping or hosing.

3.05 MAINTENANCE:

- A. The contractor is to maintain the newly sodded areas for a period of 6 weeks from the date of completion of sprigging and sodding operations.
- B. The contractor is to fertilize the area (1) time per week for six (6) weeks at a rate of one (1) pound of Nitrogen per 1,000 sq. ft.
- C. The contractor must monitor sodded areas to ensure adequate irrigation occurs during the first month of grow-in.
- D. Once the turf is established, the contractor is to top dress the entire area per sprigging maintenance

END OF SECTION

**SECTION 02939
SPRIGGING**

PART I - GENERAL

1.01 SCOPE

- A. Provide and install sprigs as indicated on drawings and specified herein.

1.02 RELATED WORK: SPECIFIED ELSEWHERE

- A. Earthwork - Section 02200
- B. Sodding - Section 02938

1.03 QUALITY ASSURANCE

- A. Comply with American Sod Producers Association (ASPA) guideline specifications for sprigging.
- B. Sodding Contractor: A firm which has at least five (5) years of experience in work of the type and size required by this Section and which is acceptable to the Owner, Owner's Representative, and Landscape Architect.
- C. References: The Sodding Contractor must supply three references for work of this type and size with their bid including names, phone numbers and email addresses of contact person(s).

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver stolons to the site in bags or containers and protect from sun, wind and dehydration prior to installation.
- B. Do not cut or deliver more stolons than can be installed within 24 hours. Stolons cut and not planted within twenty-four hours will not be installed unless approved by the Owner and/or Architect.

1.05 SUBMITTALS

- A. Submit name, address and phone number of stolon supplier and/or installer.

PART II - PRODUCTS

2.01 MATERIAL

- A. Stolons shall be certified material of type as indicated on drawings and shall be well rooted, healthy, free of weeds, disease, nematodes, and soil borne insects. Stolons whose bushel weight includes more than ten (10) percent dirt or foreign matter shall be rejected.

- B. Stolons shall be measured by the bushel. A bushel shall be defined by eight (8) pounds of plant material per bushel and harvested from a minimum area of one square yard of mature turf.
- C. Water shall be free of substance harmful to grass growth.

PART III - EXECUTION

3.01 INSPECTION

- A. The Owner and Landscape Architect will examine finish surfaces, grades, topsoil quality and depth. Do not start sprigging work until unsatisfactory conditions are corrected and approved by Owner and Landscape Architect.

3.02 PREPARATION

- A. Loosen topsoil of grassed areas to be planted to a depth of six (6) inches by disking or tilling. Remove sticks, roots, rubbish, foreign matter and stones over one inch (1") in any dimension from the top two inches (2") of the sprig bed area.
- B. Fine grade sprigged and sodded areas to smooth, even surface with a loose, uniformly fine texture. Float smooth to remove ridges and fill depressions as required to drain.
- C. Finish grade shall be smooth and approximately one inch (1") below adjacent paved surfaces.
- D. Contractor is to place solid sod at a minimum width of 18" around all adjacent paved surfaces, valve boxes, electrical boxes, manholes, light poles, and all other in-grade or above grade structures within the limits of sprigging.
- E. Restore prepared areas to specified condition if eroded, settled, or otherwise disturbed after fine grading and prior to acceptance of completed work.

3.03 STOLON INSTALLATION

- A. All planting operations shall commence immediately after site preparation and start no earlier than May 15th, and be completed no later than June 15th, unless approved by the Landscape Architect.
- B. Planting operations shall stop for reasons of high winds, excessive moisture, irrigation system problems, or other factors, that satisfactory results are not likely to be obtained. All work stoppage should be documented in writing with date and reason that work was stopped.
- C. Stolons shall be installed using approved sprigging equipment as per industry standards. This equipment is to have turf tires.

- D. Stolons shall be installed at a rate of 600 hundred (600) bushels per acre and verified by delivery tickets.
- E. The contractor is to till the sprigs into the topsoil to a depth not to exceed three (3) inches within two (2) hours of application.
- F. The contractor is to apply 41-0-0 Polyon Coated Fertilizer with 1% Ronstar G at a rate of 100 pounds per acre (product).
- G. Upon Completion of sprigging, the contractor will roll each field using a vibratory roller.
- H. Immediately after completion of rolling, the Contractor shall start the initial watering program.
- I. Erosion damage or any other damage to the planted surfaces subsequent to completion of grow-in/maintenance period will be repaired by the Contractor.
- J. The base bid shall be U-3 Bermudagrass Sprigs.

3.04 CLEANING

- A. During the work, the premises are to be kept neat and orderly at all times. Storage areas for materials shall be organized so that they are neat and orderly. All trash, including debris from removing weeds or rocks from sodded areas, shall be removed from the site daily as the work progresses. All walk and driveway areas shall be kept clean by sweeping or hosing.

3.05 SPRIGGING MAINTENANCE

- A. The contractor is to maintain the newly sprigged and sodded areas for a period of 60 Days from the date of completion of sprigging operations.
- B. The contractor must monitor sprigged fields to ensure sprig growth and that the area has adequate irrigation during the grow-in period. This includes having staff visit the site a minimum of 3 days a week minimum, or as deemed necessary by all parties.
- C. The contractor is to fertilize the area (1) time per week for 60 Days at a rate of one (1) pound of Nitrogen per 1,000 sq. ft.
- D. The contractor is to mow and trim the sprigged area once the sprigs are established.
- E. Once the turf is established, the contractor is to top dress the entire area.
 - a. Top Dressing material is to consist of 75% masonry or top dressing sand and 25% dark forest compost (+/- 5%), as was utilized in the top soil mixture prior to sprigging. These materials should be blended evenly to create the top dressing material.

- b. The contractor is to apply the top dressing material utilizing industry standard top dressing equipment with turf tires.
- c. The contractor is to smooth out top dressing material with equipment having turf tires, using a smooth and fill method.
- d. The contractor is to roll the entire surface with a vibratory roller.
- e. The contractor is to spread approved fertilizer to finish the top dressing process.
- f. If there are areas that were sprigged that are not growing, the contractor is responsible for plugging, and top dressing these areas with the same sod variety and top dressing material. This applies to all areas that are 24"x24" or larger.

END OF SECTION

**SECTION 03100
CONCRETE FORMWORK**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work included: Provide formwork in accordance with provisions of this Section for cast-in-place concrete shown on the drawings or required by other Sections of these Specifications.
- B. Related work:
 - Section 03210: Steel Reinforcement
 - Section 03300: Cast-in-place Concrete

1.02 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Design of formwork is the Contractor's responsibility.
- C. Standards: in addition to complying with pertinent regulations of governmental agencies having jurisdiction, comply with pertinent provisions of ACI 347.

1.03 SUBMITTALS

- A. Comply with pertinent provisions of Section 01340.
- B. Product data: After the Contractor has received the Owner's Notice to Proceed, submit manufacturer's data and installation instructions for proprietary materials including form coatings, ties, and accessories, and manufactured form systems if used.

PART 2 PRODUCTS

2.01 FORM MATERIALS

- A. Except for metal forms, use new materials. Materials may be reused during progress of the work, provided they are completely cleaned and reconditioned, re-coated for each use, and capable of producing formwork of the required quality.
- B. For footings and foundations, use boards or planks secured to wood or steel stakes, substantially constructed to shapes indicated and to support the required loads.

2.02 FORM TIES

- A. Hold inner and outer forms for vertical concrete together with combination steel ties and spreaders approved by the Owner's Representative:
 - 1. Space ties symmetrically in tiers and rows, each tier plumb from top to bottom and each row level.
 - 2. At horizontal pour lines, locate ties not more than 6" below the pour lines. Tighten after concrete has set and before the next pour is made.
 - 3. For exposed concrete surfaces, provide form ties of removable type with the bolts equipped with permanent plugs and a system approved by the Owner's Representative for fixing the plugs in place.

2.03 DESIGN OF FORMWORK

- A. General:
 - 1. Design, erect, support, brace, and maintain formwork so it will safely support vertical and lateral loads that might be applied, until such loads can be supported by the concrete structure.
 - 2. Carry vertical and lateral loads to ground by formwork system and in-place construction that has attained adequate strength for that purpose.
 - 3. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position.
 - 4. Design forms and formwork to include assumed values of live load, dead load, weight of moving equipment operated on the formwork, concrete mix, height of concrete drop, vibrator frequency, ambient temperature, foundation pressures, stresses, lateral stability, and other factors pertinent to safety of the structure during construction.
 - 5. Provide trussed supports when adequate foundations for shores and struts cannot be secured.
 - 6. Support form materials by structural members spaced sufficiently close to prevent objectionable deflection.
 - 7. Fit forms placed in successive units for continuous surfaces to accurate alignment, free from irregularities, and within the allowable tolerances.
 - 8. Provide formwork sufficiently tight to prevent leakage of cement paste during concrete placement. Solidly butt joints, and provide backup material at joints as required to prevent leakage and prevent fins.
 - 9. Provide camber in formwork as required for anticipated deflections due to weight and pressure of fresh concrete and construction loads.

2.04 EARTH FORMS

- A. Side forms for footings may be omitted, and concrete may be placed directly against excavation only when requested by the Contractor and approved by the Owner's Representative.
- B. When omission of forms is accepted, provide additional concrete 1" on each side of the minimum design profiles and dimensions shown on the drawings.

PART 3 - EXECUTION

3.01 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.

3.02 FORM CONSTRUCTION

- A. General:
 - 1. Construct forms complying with ACI 347 to the exact sizes, shapes, lines and dimensions shown, and as required to obtain accurate alignment, location, grades and level and plumb work in the finished structure.
 - 2. Provide for openings, offsets, keyways, recesses, moldings, reglets, chambers, blocking, screens, bulkheads, anchorages, inserts, and other features as required.
- B. Fabrication:
 - 1. Fabricate forms for easy removal without hammering or prying against concrete surfaces.
 - 2. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces.
 - 3. Kerf wood inserts for forming keyways, reglets, recesses, and the like to prevent swelling and assure ease of removal.
 - 4. Provide top forms for inclined surfaces where so directed by the Owner's Representative.
- C. Forms for exposed concrete:
 - 1. Drill forms to suit ties being used, and to prevent leakage of cement paste around tie holes. Do not splinter forms by driving ties through improperly prepared holes.
 - 2. Provide sharp, clean corners at intersection planes, without visible edges or offsets. Back the joints with extra studs or girts to maintain true, square intersections.
 - 3. Use extra studs, walls and bracing to prevent objectionable bowing of forms between studs, and to avoid bowed appearance in concrete. Do not use narrow strips of form material which will produce bow.
- D. Corner treatments:
 - 1. Unless shown otherwise, form chamfers with 3/4" x 3/4" strips, accurately formed and surfaced to produce uniformly straight lines and tight edges.
 - 2. Extend terminal edges to required limit, and miter the chamfer strips at changes in direction.
- E. Locate control joints as indicated on the drawings and as approved by the Owner's Representative.
- F. Provisions for other trades:
 - 1. Provide openings in concrete formwork to accommodate work of other trades.
 - 2. Verify size and location of openings, recesses, and chases with the trade

requiring such items.

3. Accurately place and securely support items to be built into the concrete.

3.03 REMOVAL OF FORMS

A. General:

1. Do not disturb or remove forms until the concrete has hardened sufficiently to permit form removal with complete safety.
2. Do not remove shoring until the member has acquired sufficient strength to support its own weight, the load upon it, and the added load of construction.
3. Do not strip floor slabs in less than two days.
4. Do not strip vertical concrete in less than seven days.

B. Finished surfaces:

1. Exercise care in removing forms from finished concrete surfaces so that surfaces are not marred or gouged, and that corners are true, sharp, and unbroken.
2. Release sleeve nuts or clamps, and pull the form ties neatly.
3. Do not permit steel spreaders, form ties, or other metal to project from, or be visible on, any concrete surface except where so shown on the drawings.
4. Solidly pack form tie holes, rod holes, and similar holes in the concrete. For packing, use the cement grout specified in Section 03300, flushing the holes with water before packing, screeding off flush, and grinding to match adjacent surfaces.

END OF SECTION

**SECTION 03210
STEEL REINFORCEMENT**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work included: Provide concrete reinforcement where shown on the drawings specified herein, and as needed for a complete and proper installation.
- B. Related Work:
 - Section 03100: Concrete Formwork.
 - Section 03210: Steel Reinforcement.
 - Section 03300: Cast-in-place Concrete.
 - Section 03345: Concrete Finishing.

1.02 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Comply with pertinent provisions of the following, except as may be modified herein:
 - 1. ACI 318.
 - 2. CRSI "Manual of Standard Practice."

1.03 SUBMITTALS

- A. Comply with pertinent provisions of Section 01340.
- B. Product data: 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 showing details of bars, anchors, and other items, if any, provided under this Section.

1.04 PRODUCT HANDLING

- A. Delivery and Storage:
 - 1. Use necessary precautions to maintain identification.
 - 2. Store in a manner to prevent excessive rusting and fouling with dirt, grease, and other bond-breaking coatings.

PART 2 - PRODUCTS

2.01 REINFORCEMENT MATERIALS AND ACCESSORIES

- A. Bars:
 - 1. Provide deformed billet steel bars complying with ASTM A615. Using grades shown on the Drawings.

- B. Steel Wire:
 - 1. Comply with ASTM A82.
 - 2. For tie wire, comply with Fed Spec QQ-W-461, annealed steel, black, 16 gage minimum.

- C. Welded Wire Fabric:
 - 1. Provide welded steel, complying with ASTM A185, 6" x 6" x 10" x 10".

- D. Bolsters, chairs, spacers, and other devices for spacing, supporting and fastening reinforcement in place:
 - 1. Use wire bar type supports complying with CRSI recommendations, unless otherwise shown on the Drawings.
 - 2. Do not use wood, brick, or other non-complying material.
 - 3. For slabs on grade, use supports with sand plates or horizontal runners where base material will not support chair legs.

2.02 FABRICATION

- A. General:
 - 1. Fabricate reinforcing bars to conform to the required shapes and dimensions, with fabrication tolerances complying with the CRSI Manual.
 - 2. In case of fabricating errors, do not straighten or re-bend reinforcement in a manner that will weaken or injure the material.
 - 3. Reinforcement with any of the following defects will not be acceptable:
 - a. Bar lengths, depths, and/or bends exceeding the specified fabrication tolerances.
 - b. Bends and/or kinks not shown on the Drawings.
 - c. Bars with reduced cross-section due to excessive rusting or other cause.

PART 3 - EXECUTION

3.01 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.

3.02 INSTALLATION

- A. General:
1. Comply with the specified standards for detail and method of placing reinforcement and supports, except as may be modified herein.
 2. Clean reinforcement to remove loose rust and mill scale, earth, and other materials which reduce or destroy bond with concrete.
 3. Position, support, and secure reinforcement against displacement by formwork, construction, and concrete placing operations.
 4. Locate and support reinforcement by metal chairs, runners, bolsters, spacers, and hangers, as required.
 5. Place reinforcement to obtain minimum coverage's for concrete protection.
 6. Arrange, space, and securely tie bars and bar supports together with the specified tie wire.
 7. Set wire ties so twisted ends are directed away from exposed concrete surfaces.
- B. Install welded wire fabric in as long lengths as practicable, lapping adjoining pieces at least one full mesh.
- C. Provide sufficient numbers of supports, and of strength to carry the reinforcement.
- D. Do not place reinforcing bars more than 2" beyond last leg of any continuous bar support.
- E. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.

3.03 SPLICES

- A. Lap Splices:
1. Tie securely with the specified wire to prevent displacement of splices during placement of concrete.
- B. Splice Devices:
1. Obtain the Owner's Representative approval prior to using splice devices.
 2. Install in accordance with manufacturer's written instructions.
 3. Splice in a manner developing at least 125% of the yielding strength of the bar.
- C. Welding:
1. Perform in accordance with AWS D1.4-79.
- D. Do not splice bars except at locations shown on the drawings, or as otherwise specifically approved by the Owner's Representative.

3.04 TESTING

- A. Samples:
1. Materials to be sampled at the building site shall have been delivered thereto at least 72 hours before it is needed.

END OF SECTION

**SECTION 03300
CAST-IN-PLACE CONCRETE**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The extent of cast-in-place concrete is shown on drawings.
- B. Related work specified elsewhere:
 - Section 03100: Concrete Formwork.
 - Section 03210: Steel Reinforcement.
 - Section 03345: Concrete Finishing.

1.02 TESTING

- A. Owner to employ and pay for an independent testing laboratory, to perform specified testing.
- B. Tests required for aggregate:
 - 1. Test for conformance to ASTM C-33.
 - 2. Make one test for each 100 cubic yards of fine aggregate.
 - 3. Make one test for each 250 cubic yards of coarse aggregate.
- C. Tests required for concrete:
 - 1. Make and store test specimens in conformance with ASTM C-31.
 - 2. Compressive strength tests: ASTM C-39:
 - a. Make four (4) cylinders for each test.
 - b. Break two cylinders at seven days and two at 28 days unless otherwise directed by Owner's Representative.
 - 3. Make one compressive strength test for each day's placement or each 50 cubic yards of concrete of each specified strength.
 - 4. If test strength of concrete does not comply with strength requirements of these specifications and is sufficiently low that, in opinion of Owner's Representative, performance of structure is jeopardized, the Owner's Representative may require that drilled core test specimens be cut from structure at location at which the questionable concrete was placed. Cores shall be secured and tested in accordance with ASTM C-42. If results of these tests show that actual strength of concrete is sufficiently low as to jeopardize performance of structure, the Owner's Representative may require that concrete be removed from structure, and replaced at no additional cost to Owner.
 - 5. Perform slump test at point of placement immediately prior to placing concrete. Test in accordance with ASTM C-143.
 - 6. Test for percentage of entrained air in accordance with ASTM C-231 at time of slump testing.
- D. Inspection of batch plant:

1. Batch plant operation will be inspected as required to insure that concrete delivered to the job complies with specifications. Testing laboratory engaged by Contractor will provide this service as directed by Owner's Representative.
2. Plant inspection reports shall include:
 - a. Location of plant.
 - b. Job location.
 - c. Concrete design mix number and strength.
 - d. Concrete design proportion, source, type and amount of cement, aggregates and admixtures used, surface water added and total water used.
 - e. Slump.
 - f. Air content.
 - g. Temperature of heated concrete.
 - h. Capacity and condition of mixing truck.
 - i. Percent of capacity loaded.
 - j. Condition of batching installation.
 - k. Condition of heating installation.
 - l. Period of inspection.
 - m. Number and sizes of batches delivered.

1.04 REFERENCE STANDARDS

- A. The following codes and manuals form a part of this specification:
 1. Standard Specifications for Structural Concrete for Buildings (ACI 301-72; Rev 81).
 2. Recommended Practice for Selecting Proportions for Concrete (ACI 211-77).
 3. Concrete production facilities shall have a current "National Ready Mixed Concrete Association Certificate of Conformance for Concrete Production Facilities".
 4. Building Code Requirements for Reinforced Concrete (ACI 318-77).

1.05 SUBMITTALS

- A. Submit proposed mix design to Owner's Representative for review. Include certification required in admixture specification.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Cement: Portland Cement (ASTM C-150, Type I). Use high early strength Portland Cement (Serial designation C-150, Type III) where specified and elsewhere at Contractor's option and at no additional cost to Owner.
- B. Fine aggregate: Sand particles shall be coarse, sharp, clean and conforming to ASTM C-33.
- C. Coarse aggregate:

1. Crushed limestone conforming to ASTM C-33 for normal weight concrete.
 2. Light weight conforming to ASTM C-330 for semi-light weight concrete. Minimum Fsp (splitting ratio) of 6.0.
- D. Water: Clean and free from injurious amounts of oil, acids, alkalines, organic materials or other deleterious substances.
- E. Admixtures:
1. Water reducing admixture: ASTM C-494, Type A, containing no more chloride ions than are present in municipal drinking water.
 - a. Acceptable products:
 - (1) Eucone WR-75; The Euclid Chemical Co.
 - (2) Pozzolith ZOOM: Master Builders.
 - (3) Plastocrete 160; Sika Chemical Corp.
 2. Water reducing, retarding admixture: ASTM C 494, Type D, containing no more chloride ions than are present in municipal drinking water.
 - a. Acceptable products:
 - (1) Eucone Retarder-75: Euclid Chemical Co.
 - (2) Pozzolith 100XR: Master Builders.
 - (3) Plastiment: Sika Chemical Co.
 3. High range water reducing admixture (Superplasticizer): ASTM C-494, Type F or G, containing no more chloride ions than are present in municipal drinking water.
 - a. Acceptable products:
 - (1) Eucon 37; The Euclid Chemical Co.
 - (2) Sikament; Sika Chemical Corp.
 4. Non-chloride accelerator: ASTM C-494, Type C or E, containing no more chloride ions than are present in municipal drinking water.
 - a. Acceptable products:
 - (1) Accelguard 80; The Euclid Chemical Co.
 - (2) Darex Set Accelerator; W. R. Grace.
 5. Air entraining admixture: ASTM C-260.
 6. No calcium chloride or admixtures containing more than 0.1% chloride ions will be permitted.
 7. Written certification of conformance to specified requirements and the chloride ion content will be required from admixture manufacturer prior to mix design review.
- F. Curing compound: ASTM C-309 for cast-in-place slabs, except those receiving concrete staining products cementitious topping, or tennis court surfacing. No concrete treatment shall be used without Owner's Representative's approval.
1. Acceptable products:
 - a. West Concrete Floor Treatment.
 - b. Guardian Clear Bond.
 - c. TRI-KOTE Concrete Treatment.
 - d. Horn Clear Seal.
 - e. Master Builders Master Seal.
 - f. Conspec No. 1" by Conspec Marketing & Mfg. Co.

- G. Furnish concrete in accordance with ASTM C-94, Alternate No. 3, Specification for Ready Mixed Concrete. Design concrete in accordance with ACI Standard Recommended Practice for the Design of Concrete Mixes (ACI 211-77) to produce strength of concrete with slumps and maximum sizes of coarse aggregate specified. Design concrete so the concrete materials will not segregate and excessive bleeding will not occur.
- H. Reinforcing: As specified in Division 3.
- I. Floor underlayment: Ardex K-15; Ardex, Inc., 630 Stoops Ferry Road, Corapolis, Pa. 15108, (412) 264-4240.

Note: Curing agents or hardeners are not allowed for tennis courts, sport courts, playground or spraygrounds surfaces to receive color finish.

2.02 CONCRETE MIX REQUIREMENTS

- A. Meet City of Broken Arrow Standard Construction Specifications – Section 601 – Concrete dated 08/19/1999, mix design 601.02-a & 601.02-b-1, Class BA-1.
- B. Use a testing laboratory acceptable to Owner's Representative for preparing and reporting proposed mix designs. Submit written reports to Owner's Representative of each proposed mix at least 28 days prior to start of work. Do not place concrete until mixes have been reviewed and approved by Owner's Representative.

2.03 WATER STOP

- A. Acceptable manufacturers: Williams Products, Inc.
- B. Flat, natural rubber, dumbbell type, 5" wide, 1/4" minimum center thickness, 3500 psi minimum tensile strength, 525% minimum elongation to break.

2.04 COLORING

- A. NOT USED

PART 3 - EXECUTION

3.01 PLACING

- A. Notify Owner's Representative of intent to pour at least twenty-four (24) hours prior to placing concrete.
- B. Before placing concrete, clean equipment for mixing and transporting concrete. Remove debris and ice from spaces to be occupied by concrete. Forms to be removed shall be thoroughly wetted or oiled. Sprinkle sub-grade sufficiently to

prevent suction, where waterproof membrane is not required. Remove excess water from place of deposit. Reinforcement, forms, membrane, fillers and ground with which concrete is to come in contact shall be free from frost. Do not deposit concrete during rain unless it is adequately protected. In that case, be prepared to protect newly placed concrete from rain until it has hardened sufficiently so that it will not be damaged. Minimum of 2 hours between placing columns and floors.

- C. Before placing concrete, verify installation of all reinforcements, sleeves, waterproof membrane, forms for openings, fill materials, anchors and items related to mechanical, plumbing and electrical trades.
- D. Convey from mixer to place of final deposit by methods which will prevent separation or loss of materials. Do not permit concrete to drop freely any distance greater than 4 feet. Where longer drops are necessary, use a chute, tremie or other approved conveyance to assist concrete into place without separation. Chutes shall be metal and have maximum slope of 1 vertical to 2 horizontal; minimum of 1 vertical to 3 horizontal. Chutes greater than 20 feet long will not be permitted.
- E. Place concrete at a rate to keep concrete plastic and flowing readily into spaces between bars. Concrete temperature shall be 60-80°F. No concrete that is partially hardened or has been contaminated by foreign materials shall be deposited, nor shall re-tempered concrete be used.
- F. Thoroughly compact concrete by suitable means during placing and work around reinforcement and into corners and recesses of forms. Use vibrators under competent supervision to aid in placement of concrete. Insert vibrators and withdraw vertically at 18" to 30" spacing for 5 to 15 seconds duration.

3.02 HOT WEATHER CONCRETING

- A. Conform to ACI 305 when concreting during hot weather.

3.03 COLD WEATHER CONCRETING

- A. Conform to ACI 306 when concreting during cold weather.

3.04 FINISH FOR FORMED CONCRETE

- A. After removal of forms, if any honeycomb places or rock pockets exist, notify Owner's Representative and repair in accordance with his instructions. In general, remove all loose material, wet surface thoroughly, and fill all voids with a stiff mixture of one part cement to two parts sand. In exposed construction, mix white Portland Cement with standard to blend patch with surrounding surface.
- B. On exposed concrete, smooth off joint marks and fins and leave surface smooth, dense and free from honeycomb, prominent grain markings and bulges or depressions more than 3/16" in 4'.

- C. Cork floated finish (on exposed concrete, except omit at round columns):
 - 1. Remove forms at an early stage, within 2 to 3 days of placement where possible. Remove ties. Remove all burrs and fins.
 - 2. Mix one part Portland Cement and one part fine sand with sufficient water to produce a stiff mortar. Dampen wall surface. Apply mortar with firm rubber float or with trowel, filling all surface voids. Compress mortar into voids using a slow-speed grinder or stone. If the mortar surface dries too rapidly to permit proper compaction and finishing, apply a small amount of water with a fog-sprayer. Produce the final texture with a cork float.

3.05 FINISH FOR SLABS

- A. After suitable bulkheads, screens and, if specified, jointing materials have been positioned, concrete shall be placed continuously between construction joints, beginning at a bulkhead edge form or corner. Place each batch into the edge of previously placed concrete to avoid stone pockets and segregations. If there is a delay in casting, thoroughly spade concrete placed after the delay and consolidate at edge of that previously placed to avoid cold joints. Distribute concrete by shovels and consolidate by other suitable means. Bring concrete to correct level with a wood straightedge and strike off. Do not use wood bullfloats or darbies to smooth the surface.
- B. Roughen slabs to receive toppings with stiff brushes or rakes before the final set.
- C. After concrete has been properly placed, struck off and darbied or bullfloated, it shall not be worked until ready for floating. The off time between darbying and power floating may vary from 2 to 8 hours or more depending on the weather conditions, concrete temperature and concrete mixture. Begin power floating when water sheen has disappeared and mix has stiffened sufficiently that weight of a man standing on it leaves only a slight imprint on surface. If two power floating operations are necessary to bring surface to desired state, allow concrete to stiffen or become harder before beginning second floating operation.
- D. Float finish: After power floating is complete, use wood float by hand to tighten the surface and achieve a medium coarse finish. Hand wood float in a circular motion. Float sufficiently to remove cement paste from surface.
- E. Trowel finish: Both power and hand troweling shall be required. Begin power troweling as soon as little or no cement paste clings to blades. Continue troweling until surface is dense, smooth and free of all minor blemishes, such as trowel marks.
 - 1. Final hand troweling shall be required to remove slight imperfections left by troweling machines and to bring surface to a dense, smooth polished finish. Final hand troweling shall be continued until a ringing sound is heard as trowel passes over surface.

- F. Give platforms and steps a light broom finish following sufficient troweling to seal the surface and remove all minor blemishes such as trowel marks.
- G. Pitch all slabs to drain as indicated on drawings; finish exposed slab edges; stair nosings with 1/2" round radius.
- H. Finishes shall be true to planes to match requirements of Section 02514-3.01-C. If variations greater than this exist, the Owner's Representative may direct contractor to grind floor to bring surface within the requirements. Grind as soon as possible, preferably within three (3) days, but not without Owner's Representative's direction and not until concrete is sufficiently strong to prevent dislodging coarse aggregate particles. Grinding will be considered only where slabs will be covered by finish materials. Patching of low spots will not be permitted.
 - 1. Sprinkling of dry cement or a mixture of dry cement and sand on the surface of fresh concrete to absorb water or to stiffen the mix will not be permitted during any stage of floor construction. If bleeding is excessive, remove by dragging hose just ahead of floating operation.

3.06 CURING

- A. Protect freshly deposited concrete from premature drying and excessively hot or cold temperatures. Maintain without drying at a relatively constant temperature for the period of time necessary for hydration of cement and proper hardening of concrete.
- B. Initial curing shall immediately follow finishing operation. Keep concrete continuously moist at least overnight.
 - 1. On slabs, use one of the following:
 - a. Ponding or continuous sprinkling.
 - b. Absorptive mat or fabric kept continuously wet.
 - c. Sand or other covering kept continuously wet.
- C. Immediately following initial curing and before concrete has dried, additional curing shall be accomplished by one of the following materials or methods:
 - 1. Continuing the method used in initial curing.
 - 2. Waterproof paper conforming to "Specifications for Waterproof Paper for Curing Concrete" (ASTM C-171).
 - 3. Other moisture-retaining coverings approved.
- D. Continue final curing until the cumulative number of days or fractions thereof, not necessarily consecutive, during which temperature of air in contact with concrete is above 50°F has totaled seven (7) days. Prevent rapid drying at end of curing period.
- E. Excessive temperature changes: Changes in temperature of concrete shall be as uniform as possible and shall not exceed 5 Deg. F in any one (1) hour or 50 Deg. F in any twenty-four (24) hour period.

- F. Steel forms heated by sun and all wood forms in contact with concrete during final curing period shall be kept wet. If forms are to be removed during curing period, immediately employ one of above curing materials or methods. Continue such curing for remainder of curing period.
- G. On completion of construction, clean all exposed slabs and apply a coat of curing compound at rate of 600 sq. ft. per gallon.

3.07 LEVELING EXISTING SLABS

- A. Mix floor underlayment with water and apply to existing slab in accordance with manufacturer's instructions. Level floor to a tolerance of 1/8" in ten feet in any direction.

END OF SECTION

**SECTION 03345
CONCRETE FINISHING**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work included: provide finishes on cast-in-place concrete as called for on the drawings, specified herein, and needed for a complete and proper installation.
- B. Related work:
Section 03300: Cast-in-place Concrete

1.02 QUALITY ASSURANCE

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

1.03 SUBMITTALS

- A. Comply with pertinent provisions of Section 01340.
- B. Product data: 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 recommended installation procedures which, when approved by the Owner's Representative, will become the basis for accepting or rejecting actual installation procedures used on the work.

PART 2 PRODUCTS

2.01 MATERIALS

- A. General:
 - 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 conditions are correct.

PART 3 - EXECUTION

3.01 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 conditions are correct.

3.02 FINISHING SLABS

- A. Definition of Finishing Tolerances:
 - 1. Class “B”: True plane within tolerances described in Section 02514-3.01-C as determined by a ten foot straightedge placed anywhere on the slab in any direction.
 - 2. Unless otherwise directed by the Owner's Representative, provide the texturing in one direction only.
 - 3. Provide “medium” texturing as directed by the Owner's Representative or otherwise called for on the drawings.

3.03 CURING AND PROTECTION

- A. Beginning immediately after placement, protect concrete from premature drying, excessively hot and cold temperatures, and mechanical injury.
- B. Temperature, Wind, and Humidity:
 - 1. Cold Weather:
 - a. When the mean daily temperature outdoors is less than 40 degrees F, maintain the temperature of the concrete between 50 degrees F and 70 degrees F for the required curing period.
 - b. When necessary, provide proper and adequate heating system capable of maintaining the required heat without injury due to concentration of heat.
 - c. Do not use combustion heaters during the first 24 hours unless precautions are taken to prevent exposure of the concrete to exhaust gases which contain carbon dioxide.
 - 2. Hot Weather: When necessary, provide wind breaks, fog spraying, shading, sprinkling, ponding, or wet covering with a light colored material, applying as quickly as concrete hardening and finishing operations will allow.
 - 3. Rate of temperature change: Keep the temperature of the air immediately adjacent to the concrete during and immediately following the curing period as uniform as possible and not exceeding a change of 5 degrees F in any one hour period, or 50 degrees F in any 24 hour period.
- C. Protection From Mechanical Injury:
 - 1. During the curing period, protect the concrete from damaging mechanical disturbances such as heavy shock, load stresses, and excessive vibration.
 - 2. Protect finished concrete surfaces from damage from construction equipment, materials, and methods, by application of curing procedures, and by rain and running water.
 - 3. Do not load self-supporting structures in such a way as to over stress the concrete.

END OF SECTION

**SECTION 07900
SEALANTS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. The general provisions of the Contract, including Standard Requirements for Contract Work, Special Provisions and General Requirements, apply to the work specified in this Section.

1.02 SCOPE

- A. Work under this Section consists of furnishing everything necessary for and incidental to the execution and completion of all sealant work, as indicated on the Drawings and specified herein.

1.03 DESCRIPTION OF WORK

- A. The extent of sealant work is indicated on the Drawings.
- B. The required applications of sealants includes, but are not necessarily limited to the following general locations:
 - 1. New Sidewalk Expansion Joints.
 - 2. Between Courts and Fence Bands.

1.04 QUALITY ASSURANCE

- A. Obtain sealant materials only from manufacturers who will, if required, send a qualified technical representative to the project site, for the purpose of advising the installer of proper procedures and precautions for the use of the materials.
- B. Installer: A firm with a minimum of five (5) years successful experience in the application of the types of materials required.

1.05 SUBMITTALS

- A. Comply with Section 01340.
- B. Samples, Sealants and Caulking: Submit three (3), 12" long samples of each color required (except black) for each type of sealant or caulking compound exposed to view. Install sample between 2 strips of material similar to or representative of typical surfaces where sealant or compound will be used, held apart to represent typical joint widths. Samples will be reviewed by Owner's Representative for color and texture only. Compliance with all other requirements is the exclusive responsibility of the Contractor.

- C. Guarantee, Sealants: Submit four (4) copies of written guarantee agreeing to repair or replace sealants which fail to perform as air-tight and water-tight joints; or fail in joint adhesion, cohesion, abrasion resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, or general durability; or appear to deteriorate in any other manner not clearly specified by submitted manufacturer's data, as an inherent quality of the material for the exposure indicated. Provide guarantee signed by the Installer and Contractor.
 - 1. Guarantee period of one (1) year from and after acceptance of the project by the Owner.

1.06 JOB CONDITIONS

- A. Pre-Installation Meeting: At the Contractor's direction, the Installer, Owner and/or the Owner's Representative, sealant manufacturer's technical representative, and other trades involved in coordination with sealant work shall meet with the Contractor at the project site to review the procedures and time schedule proposed for installation of sealants in coordination with other work. Review each major sealant application required on the project.
- B. Condition of Other Work: The Installer must examine the joint surfaces, backing, and anchorage of units forming sealant rabbet, and the conditions under which the sealant work is to be performed, and notify the Contractor and the Owner's Representative in writing of conditions detrimental to the proper and timely completion of the work and performance of the sealants. Do not proceed with the sealant work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.
- C. Weather Conditions: Do not proceed with installation of sealants under adverse weather conditions, or when temperatures are below or above manufacturer's recommended limitation for installation. Proceed with the work only when forecasted weather conditions are favorable for proper cure and development of high early bond strength. Wherever joint width is affected by ambient temperature variations, install elastomeric sealants only when temperatures are in the lower third of manufacturer's recommended installation temperature so that sealant will not be subjected to excessive elongation and bond stress at subsequent low temperatures. Coordinate time schedule with Contractor to avoid delay of project.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

- A. Colors: Provide manufacturer's standard colors plus thirty (30) additional Fastpak, as selected by Owner's Representative.
- B. Compatibility: Before purchase of each specified sealant, investigate it's compatibility with the joint surfaces, joint fillers, sealers and other materials in the system. Provide only materials (manufacturer's recommended variation of the specified materials) which are known to be fully compatible with the actual installation condition, as shown by

manufacturer's published data or certification.

- C. Provide size and shape of preformed sealant units as shown or, if not shown, as recommended by the manufacturer, either in the published data or upon consultation with technical representative.

2.02 SELF-LEVELING JOINT SEALANT

- A. Materials shall be Tremco THC-900 multi-component, chemically curing, self-leveling polyurethane joint sealant as manufactured by Tremco, 10701 Shaker Blvd., Cleveland, Ohio 44104, or approved equal.

2.03 GENERAL PURPOSE SEALANT

- A. Materials shall be Tremco Dymeric, epoxidized polyurethane terpolymer general purpose sealant as manufactured by Tremco, 10701 Shaker Blvd., Cleveland, Ohio 44104, or approved equal.

2.04 MISCELLANEOUS MATERIALS

- A. Joint Cleaner: Provide the type of joint cleaning compound recommended by the sealant or caulking compound manufacturer, for the joint surfaces to be cleaned.
- B. Joint Primer/Sealer: Provide the type of joint primer/sealer recommended by the sealant manufacturer, for the joint surfaces to be primed or sealed.
- C. Bond Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer, to be applied to sealant-contact surfaces where bond to the substrate or joint filler must be avoided for proper performance of sealant. Provide self-adhesive tape wherever applicable.
- D. Sealant Backer Rod: Compressible rod stock polyethylene foam, polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam or other flexible, permanent, durable non-absorptive material as recommended for compatibility with sealant by the sealant manufacturer. Provide size and shape of rod which will control the joint depth for sealant placement, break bond of sealant at bottom of joint, form optimum shape of sealant bead on back side, and provide a highly compressible backer to minimize the possibility of sealant extrusion when joint is compressed.

2.05 APPLICATIONS

- A. Tremco THC-900 Sealant: Provide at all exterior horizontal slab or paving joints.
- B. Tremco Dymeric Sealant: Provide at all other joints noted on the Drawings and around steel handrail base plates where handrail has been raised.

PART 3 - EXECUTION

3.01 JOINT SURFACE PREPARATION

- A. Clean joint surfaces immediately before installation of sealants. Remove dirt, insecure coatings, moisture and other substances which would interfere with bond of sealants. All joint surface preparation shall be in accordance with sealant manufacturer's printed instructions.

3.02 INSTALLATION

- A. Comply with sealant manufacturer's printed instructions except where more stringent requirements are shown or specified and except where manufacturer's technical representative directs otherwise.
- B. Prime or seal the joint surfaces wherever shown or recommended by the sealant manufacturer. Do not allow primer/sealer to spill or migrate onto adjoining surfaces.
- C. Install sealant backer rod for liquid elastomeric sealants, except where shown to be omitted or recommended to be omitted by sealant manufacturer for the application shown.
- D. Install bond breaker tape wherever required by manufacturer's recommendations to ensure that elastomeric sealants will perform properly.
- E. Employ only proven installation techniques, which will ensure that sealants will be deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of joint bond surfaces equally on opposite sides. Except as otherwise indicated, fill sealant rabbet to a slightly concave surface, slightly below adjoining surfaces. Where horizontal joints are between a horizontal surface and a vertical surface, fill joint to form a slight cove, so that joint will not trap moisture and dirt.
- F. Install sealants to depths as shown or, if not shown, as recommended by the sealant manufacturer but within the following general limitations, measured at the center (thin) section of the bead.
- G. Spillage: Do not allow sealants or compounds to overflow or spill onto adjoining surfaces, or to migrate into the voids of adjoining surfaces including rough textures such as exposed aggregate panels. Use masking tape or other precautionary devices to prevent staining of adjoining surfaces, by either the primer/sealer or the sealant/caulking compound.
- H. Remove excess and spillage of compounds promptly as the work progresses. Clean the adjoining surfaces by whatever means may be necessary to eliminate evidence of spillage, without damage to the adjoining surfaces or finishes.

3.03 CURE AND PROTECTION

- A. Cure sealants and caulking compounds in compliance with manufacturer's instructions and recommendation, to obtain high early bond strength, internal cohesive strength and surface durability.
- B. The Installer shall advise the Contractor of procedures required for the curing and protection of sealants and caulking compounds during the construction period, so that they will be without deterioration or damage (other than normal wear and weathering) at the time of Owner's acceptance.

END OF SECTION

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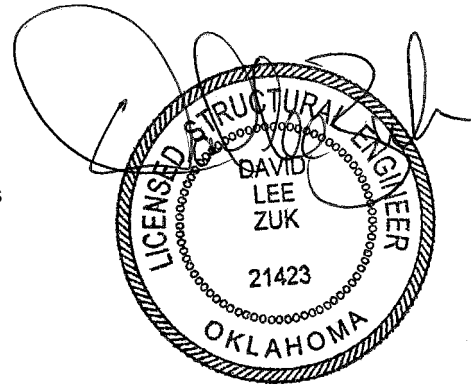
Section 42200 – Concrete Unit Masonry

DIVISION 06 – WOOD, PLASTICS, AND COMPOSITES

Section 061000 – Rough Carpentry

Section 061753 – Shop Fabricated Wood Trusses

ENGINEER'S STAMP



06-03-2022

**SECTION 04 22 00
CONCRETE UNIT MASONRY**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Concrete masonry units.
 - 2. Mortar and grout.
 - 3. Steel reinforcing bars.
 - 4. Masonry joint reinforcement.
 - 5. Miscellaneous masonry accessories.
- B. Related Sections:
 - 1. Section 033000 – Cast-in-Place Concrete
 - 2. Section 051200 – Structural Steel Framing
 - 3. Section 071900 – Water Repellents
 - 4. Section 076200 – Sheet Metal Flashing and Trim

1.03 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.04 PERFORMANCE REQUIREMENTS

- A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days as specified on Contract Drawings.
 - 1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

1.05 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Owner will engage a qualified testing and inspecting agency to perform tests and inspections as noted below along with inspection schedule items included in the Contract Drawings. Testing agency shall prepare tests and inspection reports and submit to Owner and Owner's Consultants. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.
 - 1. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C 140 for compressive strength.
 - 2. Mortar Test (Property Specification): For each mix required, according to ASTM C 109 for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
 - 3. Mortar Test (Property Specification): For each mix required, according to ASTM C 780 for compressive strength.
 - 4. Grout Test (Compressive Strength): For each mix required, according to ASTM C 1019.

1.06 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For the following:

1. Submit three bond sets of shop drawings and calculations for review by the Structural Engineer-of-Record. The Structural Engineer-of-Record will mark three sets with red and will return one set to the contractor through the Architect. The contractor shall make the number of photocopies required of the approved shop drawings for distribution to other parties, and the contractor shall be responsible for transmitting the original red-marked set to the fabricator for corrections.
 2. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 3. Submit an elevation drawing of each reinforced CMU wall that shows:
 - a. Reinforcing bar size, quantity, spacing, length and grade of steel.
 - b. Horizontal and vertical locations of all bearing plates and embed plates.
 - c. Location of each control joint.
 - d. Horizontal and vertical location of all embedded anchors.
 - e. Location and length of lap splices.
 4. Submit details showing proper location of reinforcing bars (vertical and horizontal), bearing plates, embed plates and anchor bolts.
 5. Include masonry notes that concern construction means and methods, grouting procedures, and proper alignment of reinforcing bars (vertical and horizontal), bearing plates, embed plates and anchor bolts.
 6. Prepare shop drawings in accordance with ACI 315. Do not use reproductions of Contract Drawings as shop drawings.
 7. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- C. Samples for Initial Selection:
1. Weep holes/vents.
- D. Samples for Verification: For each type and color of the following:
1. Accessories embedded in masonry.
- E. Qualification Data: For testing agency.
- F. Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. For each type and size of the following:
1. Masonry units.
 - a. Include material test reports substantiating compliance with requirements.
 - b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
 2. Cementitious materials. Include brand, type, and name of manufacturer.
 3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 4. Grout mixes. Include description of type and proportions of ingredients.
 5. Reinforcing bars.
 6. Joint reinforcement.
 7. Anchors, ties, and metal accessories.
- G. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109 for compressive strength.
 2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
- H. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
- I. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.07 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1093 for testing indicated.

- B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.
- D. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.
- E. Preinstallation Conference: Conduct conference at Project site.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.09 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches down both sides of walls and hold cover securely in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.01 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.
- B. Fire-Resistance Ratings: Where indicated on Contract Drawings, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing

according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.02 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated on Contract Drawings.
 - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 - 2. Provide square-edged units for outside corners unless otherwise indicated.
- B. CMUs: ASTM C 90.
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength as specified on Contract Drawings.
 - 2. Density Classification: Lightweight unless otherwise indicated on Contract Drawings.
 - 3. Size (Width): Manufacturer's standard units with nominal face dimensions of 16" long x 8" high.
 - a. Manufactured to dimensions 3/8 inch less than nominal dimensions.
 - 4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.

2.03 MASONRY LINTELS

- A. General: Provide one of the following:
- B. Masonry Lintels: Built-in-place masonry lintels made from bond beam CMUs with reinforcing bars placed as indicated and filled with coarse grout. Temporarily support built-in-place lintels until cured.

2.04 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated on Contract Drawings.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Masonry Cement: Not allowed.
- E. Mortar Cement: ASTM C 1329.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Lafarge North America Inc.; Lafarge Mortar Cement or Magnolia Superbond Mortar Cement.
- F. Aggregate for Mortar: ASTM C 144.
 - 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 - 2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
 - 3. White-Mortar Aggregates: Natural white sand or crushed white stone.
 - 4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- G. Aggregate for Grout: ASTM C 404.
- H. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Euclid Chemical Company (The); Accelguard 80.
 - b. Grace Construction Products, W. R. Grace & Co. - Conn.; Morset.
 - c. Sonneborn Products, BASF Aktiengesellschaft; Trimix-NCA.
- I. Water: Potable.

2.05 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615 or ASTM A 996, Grade 60.

- B. Masonry Joint Reinforcement, General: ASTM A 951.
 - 1. Interior Walls: Hot-dip galvanized, carbon steel.
 - 2. Exterior Walls: Hot-dip galvanized, carbon or stainless steel.
 - 3. Wire Size for Side Rods: 0.148-inch diameter.
 - 4. Wire Size for Cross Rods: 0.148-inch diameter.
 - 5. Wire Size for Veneer Ties: 0.148-inch diameter.
 - 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
 - 7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.
 - C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.
- 2.06 MISCELLANEOUS ANCHORS
- A. Anchor Bolts: Headed steel bolts complying with F1554, with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153, Class C; of dimensions indicated.
- 2.07 MISCELLANEOUS MASONRY ACCESSORIES
- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.
 - B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
 - C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
 - D. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated on Contract Drawings.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
 - b. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
 - c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
 - d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.
 - E. Expansion Joints
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Jeene Structural Joint Sealing System
 - F. Cleaner
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. National Chemsearch Corporation; Deox Chemical Cleaner
 - b. Process Solvent Co., Inc.; Sure Kleen 600
- 2.08 MORTAR AND GROUT MIXES
- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated on Contract Drawings.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Use portland cement-lime or mortar cement mortar unless otherwise indicated on Contract Drawings.
 - 3. For exterior masonry, use portland cement-lime or mortar cement mortar.
 - 4. For reinforced masonry, use portland cement-lime or mortar cement mortar.
 - 5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated on Contract Drawings.
 - 1. For masonry below grade or in contact with earth, use Type S.
 - 2. For reinforced masonry, use Type S.
 - 3. For mortar parge coats, use Type S.
 - 4. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type S.
 - 5. For interior non-load-bearing partitions, Type S.
- D. Grout for Unit Masonry: Comply with ASTM C 476.
 - 1. Use grout of type indicated on Contract Drawings or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
 - 2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
 - 3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143.
 - 4. Add admixtures in accordance with manufacturer's instructions; mix uniformly.
 - 5. Do not use anti-freeze compounds to lower the freezing point of grout.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
 - 2. Verify that foundations are within tolerances specified.
 - 3. Verify that reinforcing dowels are properly placed.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Coordinate and make provisions for installation of anchors, bolts, hangers, frames, insulation, dampproofing, and other items built into masonry work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

- A. Build chases and recesses to accommodate items specified in this and other Sections.
 - 1. Provide no less than 8 inches of masonry between chase or recess and jamb of openings, and between adjacent chases and recesses.
- B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- C. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.03 TOLERANCES

- A. Dimensions and Locations of Elements:
 - 1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch or minus 1/4 inch.
 - 2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.
 - 3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.
- B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
 3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
 4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
 5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
 6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
- C. Joints:
1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
 2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
 3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
 4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.04 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated on contract drawings, lay exposed masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.
- G. Provide special jamb units where required to execute window and control joint details. Maintain sealant clearances at doors, windows and other openings.
- H. Provide lintels at opening of masonry work as necessary to form opening for in-wall equipment, through-wall ducts and piping and as otherwise needed to support openings over 8 inches wide.
- I. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated on Contract Drawings.
- J. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated on Contract Drawings.
 1. Support top of wall laterally as indicated on Contract Drawings. Install compressible filler in joint between top of partition and underside of structure above.
 2. If not indicated otherwise on Contract Drawings, fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.

3. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078446 "Fire-Resistive Joint Systems."

3.05 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
 2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
 3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
 4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Set cast-stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
 1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
- D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated on Contract Drawings.
- E. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.06 MASONRY-CELL INSULATION

- A. Pour granular insulation into cavities to fill void spaces. Maintain inspection ports to show presence of insulation at extremities of each pour area. Close the ports after filling has been confirmed. Limit the fall of insulation to one story high, but not more than 20 feet.
- B. Install molded-polystyrene insulation units into masonry unit cells before laying units.

3.07 MASONRY JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
 1. Space reinforcement not more than 16 inches o.c.
 2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
 3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.08 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel or concrete to comply with the following:
 1. Provide an open space not less than 1 inch wide between masonry and structural steel or concrete unless otherwise indicated on Contract Drawings. Keep open space free of mortar and other rigid materials.
 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
 3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.09 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

- B. Form control joints in concrete masonry using one of the following methods:
 - 1. Locate 3/8 inch wide control joints as indicated on Contract Drawings. Keep vertical joints straight, true and continuous from top to bottom of masonry.
 - 2. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
 - 3. Install preformed control-joint gaskets designed to fit standard sash block.
 - 4. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
 - 5. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.
 - 6. Reinforcing and grout for bond beams at floor, roof or top of wall shall be continuous through the control joints
- C. At expansion joints, leave full width of joint free of masonry, mortar and reinforcement. Install joint filler material, recessed from face for sealant.

3.10 LINTELS

- A. Provide masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.
- B. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated on Contract Drawings.

3.11 FLASHING

- A. General: Install embedded flashing in masonry at lintels, ledges, other obstructions to downward flow of water in wall, and where indicated on Contract Drawings.
- B. Install flashing as follows unless otherwise indicated on Contract Drawings:
 - 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
 - 2. At lintels, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
 - 3. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
 - 4. Install metal drip edges and sealant stops with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
 - 5. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.
- C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.
- D. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

3.12 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
 - 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar

- and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602. Place steel reinforcement, grouted spaces and bond beams as work progresses and as follows:
1. Accurately position and secure against displacement from locations shown. Horizontal reinforcement may be placed as work progresses. All vertical reinforcing shall be in place prior to grouting and shall be held in position by means of bar positioners as shown on Contract Drawings.
 2. Make splices in bars as shown on Contract Drawings. Lapped splices for reinforcement shall be as specified on the Contract Drawings. Provide lap splices of greater lengths when indicated on Contract Drawings. Welded or mechanical splices shall develop 1.25 times the strength of the reinforcement.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 2. Unless an alternate procedure is approved by the Engineer of Record, the low-lift grouting procedure as noted in the following shall be used in the construction of reinforced unit masonry.
 - a. Units may be laid to a height not to exceed eight feet. If the height exceeds five feet, cleanouts must be used.
 - b. Place vertical steel in cells with enough steel extending to provide proper lap splice.
 - c. Grout cells in five feet high maximum lifts.
 - d. Stop grout 2" below top of masonry when grout is to be stopped for 1 hour or more. All horizontal steel shall be fully embedded in grout.
 - e. Consolidate pours exceeding 12 inches in height by mechanical vibration and reconsolidate by mechanical vibration after initial water loss and settlement has occurred.
 - f. The grouting of any section of wall shall be completed in one day with no interruptions greater than one hour.

3.13 BRACING

- A. Provide adequate temporary bracing of masonry walls until it has cured and permanent structural braces (i.e. floor and roof diaphragms, etc.) are in place. Bracing of masonry walls is means and methods of construction and is solely the responsibility of the General Contractor and his masonry sub-contractors. Reference Contract Drawings for additional bracing design requirements.
- B. Allow 16 hours to elapse after completion of masonry walls and columns before allowing uniform floor or roof loading construction.
- C. Allow an additional 48 hours before allowing construction of concentrated loads on masonry walls and columns.

3.14 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform tests and inspections as noted below along with inspection schedule items included in the Contract Drawings. Testing agency shall prepare tests and inspection reports and submit to Owner and Owner's Consultants. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.
- B. Inspections: Level 1 special inspections according to the "International Building Code."
 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 3. Place grout only after inspectors have verified proportions of site-prepared grout.

- C. Testing Prior to Construction: One set of tests.
- D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
- E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
- F. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.
- G. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

3.15 PARGING

- A. Parge exterior faces of below-grade masonry walls, where indicated on Contract Drawings, in 2 uniform coats to a total thickness of 3/4 inch. Dampen wall before applying first coat and scarify first coat to ensure full bond to subsequent coat.
- B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot. Form a wash at top of parging and a cove at bottom.
- C. Damp-cure parging for at least 24 hours and protect parging until cured.

3.16 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 5. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.17 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Excess Masonry Waste: Remove excess masonry waste, and legally dispose of off Owner's property.

END OF SECTION

**SECTION 06 10 00
ROUGH CARPENTRY**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
1. Framing with the following:
 - a. Dimension Lumber
 - b. Engineered Wood Products
 - 1) Laminated Veneer Lumber (LVL)
 - 2) Parallel Strand Lumber (PSL),
 - 3) Laminated Strand Lumber (LSL)
 - c. Wood-Based Structural-Use Panels
 - 1) Subflooring
 - 2) Underlayment
 - 3) Wall Sheathing
 - 4) Roof Sheathing
 - 5) Backing Panels
 - d. Wood-Preservative Treated Materials
 - e. Fire-Retardant-Treated Materials
 - f. Wall Sheathings
 - 1) Gypsum Wall Sheathing
 - 2) Fiberboard Wall Sheathing
 - 3) Extruded-Polystyrene-Foam Wall Sheathings
 2. Fasteners
 3. Metal Framing Anchors
 4. Wood Furring, Grounds, Nailers, and Blocking

1.2 REFERENCES

- A. [American Wood Protection Association \(AWPA\)](#) Publications:
1. C2 "Lumber, Timber, Bridge Ties and Mine Ties - Preservative Treatment by Pressure Processes"
 2. C9 "Plywood - Preservative Treatment by Pressure Process Document Number"
 3. M4 "Standard for the Care of Preservative-Treated Wood Products Document Number"
- B. [ASTM International](#) Publications:
1. A153 "Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware"
 2. A307 "Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength"
 3. A563 "Standard Specification for Carbon and Alloy Steel Nuts"
 4. A653 "Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process"
 5. B117 "Standard Practice for Operating Salt Spray (Fog) Apparatus"
 6. C27 "Standard Classification of Fireclay and High-Alumina Refractory Brick"
 7. C208 "Standard Specification for Cellulosic Fiber Insulating Board"
 8. C578 "Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation"
 9. C846 "Standard Practice for Application of Cellulosic Fiber Insulating Board for Wall Sheathing"

10. C954 "Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness"
11. C1177 "Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing"
12. D2559 "Standard Specification for Adhesives for Structural Laminated Wood Products for Use Under Exterior (Wet Use) Exposure Conditions"
13. D2898 "Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing"
14. D5055 "Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists"
15. E84 "Standard Test Method for Surface Burning Characteristics of Building Materials"
16. E699 "Standard Practice for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating of Building Components"
17. F1667 "Standard Specification for Driven Fasteners: Nails, Spikes, and Staples"

C. [The Engineered Wood Association \(APA\)](#) Publications:

1. Form No. E30, "APA Engineered Wood Construction Guide"

1.3 DEFINITIONS

- A. Rough Carpentry: Carpentry work not specified in other Sections and not exposed, unless otherwise specified.
- B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

1.4 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.
- B. Product Data: For the following products:
 1. Engineered wood products
 2. Underlayment
 3. Insulating sheathing
 4. Metal framing anchors
 5. Construction adhesives
- C. Material certificates for dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the American Lumber Standards Committee's ([ALSC](#)) Board of Review.
- D. Wood treatment data as follows, including chemical treatment manufacturer's instructions for handling, storing, installing, and finishing treated materials:
 1. For each type of preservative-treated wood product, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
 2. For waterborne-treated products, include statement that moisture content of treated materials was reduced to levels indicated before shipment to Project site.
 3. For fire-retardant-treated wood products, include certification by treating plant that treated materials comply with specified standard and other requirements as well as data relative to bending strength, stiffness, and fastener-holding capacities of treated materials.

- E. Material test reports from a qualified independent testing agency indicating and interpreting test results relative to compliance of fire-retardant-treated wood products with requirements indicated.
- F. Warranty of chemical treatment manufacturer for each type of treatment.
- G. Shop Drawings: For Engineered Wood Framing Systems provide layout drawings indicating materials, member sizes, member spacing and accessories required for proper installation. Drawings shall clearly reference construction details, loading assumptions (including location of loads transferred from other levels), and minimum live load and total load deflection criteria.
 - 1. Where installed products are indicated to comply with certain design loadings, include structural computations, materials properties, and other information needed for structural analysis that has been signed and sealed by a qualified professional engineer responsible for their preparation.
- H. Research or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence the following products' compliance with building code in effect for Project.
 - 1. Engineered wood products
 - 2. Metal framing anchors
 - 3. Power-driven fasteners
 - 4. Fire-retardant-treated wood
 - a. National Evaluation Service, Inc.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: To qualify for approval, an independent testing agency must demonstrate to Owner's Representative satisfaction, based on evaluation of agency-submitted criteria conforming to [ASTM E699](#), that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.
- B. Single-Source Responsibility for Fire-Retardant-Treated Wood: Obtain each type of fire-retardant-treated wood product from one source and by a single producer.
- C. Single-Source Responsibility for Engineered Wood Products: Obtain each type of engineered wood product from one source and by a single manufacturer.
- D. Engineering Responsibility: Engineered Wood Framing Systems shall be engineered by qualified professional engineer legally authorized to practice in jurisdiction where Project is located.
- E. Product Identification: All Engineered Wood Products System members shall be clearly marked with manufacturer's name, product series, plant identification, date of manufacture, and code compliance.
- F. Installation Review: The Engineered Wood Products System Manufacturer's Technical Representative shall be available to meet with the Contractors to review installation details prior to the beginning of framing. The Contractor shall give notification to the Technical Representative prior to enclosing the framing to provide opportunity for review of the installation.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Keep materials under cover and dry. Protect from weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings.
 - 1. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.
 - 2. Store Engineered Wood materials on dry surfaces supported on raised wood sticks located every 10 feet. Store TJI joists in an upright position.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

- A. Lumber Standards: Comply with DOC PS 20, "American Softwood Lumber Standard," and with applicable grading rules of inspection agencies certified by [ALSC](#)'s Board of Review.
- B. Inspection Agencies: Inspection agencies, and the abbreviations used to reference them, include the following:
 - 1. Northeastern Lumber Manufacturers Association ([NELMA](#))
 - 2. National Lumber Grades Authority (Canadian) ([NLGA](#))
 - 3. Southern Pine Inspection Bureau ([SPIB](#))
 - 4. West Coast Lumber Inspection Bureau ([WCLIB](#))
 - 5. Western Wood Products Association ([WWPA](#))
- C. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
 - 1. For exposed lumber, furnish pieces with grade stamps applied to ends or back of each piece, or omit grade stamps and provide grade-compliance certificates issued by inspection agency.
- D. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
 - 1. Provide dressed lumber, S4S, unless otherwise indicated.
 - 2. Provide dry lumber with 15 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.
 - 3. Provide lumber with 15 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.

2.2 DIMENSION LUMBER

- A. General: Provide dimension lumber of grades indicated according to the [ALSC](#) National Grading Rule (NGR) provisions of the inspection agency indicated.
- B. Moisture Content: 15 percent maximum for lumber items not specified to receive wood preservative treatment.
- C. Non-Load-Bearing Interior Partitions: Provide framing of the following grade and species:
 - 1. Grade: Construction.
 - 2. Species: Douglas Fir-Larch

- D. Exterior and Load-Bearing Walls: Provide framing of the following grade and species:
 - 1. Grade: No. 2 or better.
 - 2. Species: Douglas Fir-Larch
- E. Ceilings (Non-Load-Bearing): For ceiling framing that does not support a floor, roof, or attic, provide the following grade and species:
 - 1. Grade: Construction or No. 2.
 - 2. Species: Douglas Fir-Larch
- F. Other Framing Not Listed Above: Provide the following grades and species:
 - 1. Grade: No. 2.
 - 2. Species: Douglas Fir-Larch.
- G. Exposed Framing: Provide material hand-selected from lumber of species and grade indicated below for uniformity of appearance and freedom from characteristics that would impair finish appearance.
 - 1. Species and Grade: As indicated above for load-bearing construction of same type.

2.3 MISCELLANEOUS LUMBER

- A. General: Provide lumber for support or attachment of other construction, including cant strips, bucks, nailers, blocking, furring, grounds, stripping, and similar members.
- B. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.
- C. Moisture Content: 15 percent maximum for lumber items not specified to receive wood preservative treatment.
- D. Grade:
 - 1. For dimension lumber sizes, provide No. 3 or Standard grade lumber per [ALSC's](#) NGRs of any species.
 - 2. For board-size lumber, provide one of the following:
 - a. No. 3 Common grade per [NELMA](#), [NLGA](#), or [WWPA](#);
 - b. No. 2 grade per [SPIB](#)
 - c. Standard grade per [NLGA](#), [WCLIB](#) or [WWPA](#) of any species.

2.4 ENGINEERED WOOD PRODUCTS

- A. General: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that evidence compliance with building code in effect for Project.
 - 1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, which meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis, and demonstrated by comprehensive testing performed by a qualified independent testing agency.
 - 2. Source Limitations: Obtain each type of engineered wood product from single source from a single manufacturer.

- B. Laminated-Veneer Lumber (LVL): Lumber manufactured by laminating wood veneers in a continuous press, evaluated and monitored according to ASTM D 5456, using an exterior-type adhesive complying with [ASTM D2559](#) to produce members with grain of veneers parallel to their lengths.
1. Qualified Manufacturers:
 - a. [ilevel, a Weyerhaeuser Business \(Trus Joist\)](#) (800-456-4787)
 2. Construction: Continuous laminated veneer lumber free from finger or scarf joints. Stress graded veneers bonded with waterproof adhesive with face grain parallel to each adjacent layer. Provide Watershed Overlay coating and edge seal to prevent cupping and moisture damage.
 3. Comply with the following requirements:
 - a. Extreme Fiber Stress in Bending: 2600 psi for 12-inch nominal-depth members.
 - b. Modulus of Elasticity: 1,900,000 psi.
 - c. Tension Parallel to Grain: 1555 psi.
 - d. Compression Parallel to Grain: 2510 psi.
 - e. Compression Perpendicular to Grain: 750 psi perpendicular to and 480 psi and parallel to glue line.
 - f. Horizontal Shear: 285 psi perpendicular to and 190 psi parallel to glue line.
 4. Design Values:
 - a. MOE = 1.9×10^6 psi.
 - b. Fb = 2600 psi (for 12" depth).
 - c. Fc₁ = 750 psi.
 - d. Fv = 285 psi.
- C. Parallel-Strand Lumber (PSL): Lumber manufactured by laying up wood strands using an exterior-type adhesive complying with [ASTM D2559](#), and cured under pressure to produce members with grain of strands parallel to their lengths and evaluated and monitored according to ASTM D 5456.
1. Qualified Manufacturers:
 - a. [ilevel, a Weyerhaeuser Business \(Trus Joist\)](#) (800-456-4787)
 2. Construction: Continuous parallel strand lumber bonded with waterproof adhesives and formed into billets. Beams shall be of single ply construction and free from finger joints or splices for full length of span.
 3. Comply with the following requirements:
 4. Extreme Fiber Stress in Bending: 2900 psi for 12-inch nominal-depth members.
 5. Modulus of Elasticity: 2,000,000 psi.
 6. Tension Parallel to Grain: 2,025 psi.
 7. Compression Parallel to Grain: 2900 psi.
 8. Compression Perpendicular to Grain: 750 psi perpendicular to and 475 psi and parallel to wide face of strands.
 9. Horizontal Shear: 210 psi perpendicular to and 290 psi and parallel to wide face of strands.
 10. Design Values:
 - a. MOE = 2.0×10^6 psi.
 - b. Fb - 2900 psi (for 12" depth).
 - c. Fc₁ = 750 psi.
 - d. Fv = 290 psi.
- D. Prefabricated Wood I-Joists (TJI): Units manufactured by bonding stress-graded lumber flanges to wood-based structural-use panel webs with exterior-type adhesives complying with [ASTM D2559](#). Provide units complying with material requirements of and with structural capacities established and monitored according to ASTM D 5055.
1. Qualified Manufacturers:

- a. [ilevel, a Weyerhaeuser Business \(Trus Joist\)](#) (800-456-4787)

2.5 WOOD-BASED STRUCTURAL-USE PANELS, GENERAL

- A. Structural-Use Panel Standards: Provide either all-veneer, mat-formed, or composite panels complying with DOC PS 2, "Performance Standard for Wood-Based Structural-Use Panels," unless otherwise indicated. Provide plywood panels complying with DOC PS 1, "U.S. Product Standard for Construction and Industrial Plywood," where plywood is indicated.
- B. Trademark: Factory mark structural-use panels with APA trademark evidencing compliance with grade requirements.

2.6 CONCEALED, PERFORMANCE-RATED STRUCTURAL-USE PANELS

- A. General: Where structural-use panels are indicated for the following concealed types of applications, provide [APA](#)-performance-rated panels complying with requirements designated under each application for grade, span rating, exposure durability classification, and edge detail (where applicable).
 - 1. Thickness: Provide panels meeting requirements specified but not less than thickness indicated.
 - 2. Span Ratings: Provide panels with span ratings required to meet "Code Plus" provisions of [APA](#) Form No. E30, "Engineered Wood Construction Guide."
- B. Combination Subfloor-Underlayment: [APA](#)-rated Plywood.
 - 1. Exposure Durability Classification: Exposure 1.
 - 2. Span Rating: Not less than 24.
 - 3. Minimum Thickness: 23/32 inches.
 - 4. Edge Detail: Tongue and groove
 - 5. Surface Finish: Fully sanded face.
- C. Combination Subfloor-Underlayment: Oriented-Strand-Board.
 - 1. Exposure Durability Classification: Exposure 1.
 - 2. Span Rating: Not less than 24.
 - 3. Minimum Thickness: 23/32 inches.
 - 4. Edge Detail: Tongue and groove
- D. Subflooring: [APA](#)-rated plywood sheathing.
 - 1. Exposure Durability Classification: Exposure 1.
 - 2. Span Rating: Not less than 24.
 - 3. Minimum Thickness: 23/32 inches.
 - 4. Edge Detail: Tongue and groove
- E. Subflooring: Oriented-Strand-Board.
 - 1. Exposure Durability Classification: Exposure 1.
 - 2. Span Rating: Not less than 24.
 - 3. Minimum Thickness: 23/32 inches.
 - 4. Edge Detail: Tongue and groove
- F. Wall Sheathing: Where indicated on Drawings, provide [APA](#)-rated plywood sheathing.
 - 1. Exposure Durability Classification: Exposure 1.
 - 2. Span Rating: 16/0
 - 3. Minimum Thickness: As indicated on Drawings.

- G. Roof Sheathing: [APA](#)-rated plywood sheathing.
 - 1. Exposure Durability Classification: Exposure 1.
 - 2. Span Rating: Not less than 40/20.
 - 3. Minimum Thickness: As indicated on Drawings.

2.7 STRUCTURAL-USE PANELS FOR BACKING

- A. Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire-retardant-treated plywood panels with DOC PS 1, Grade, C-D Plugged Exposure 1, in thickness indicated or, if not otherwise indicated, not less than 15/32 inch thick.

2.8 STRUCTURAL-USE PANELS FOR UNDERLAYMENT

- A. General: Over smooth subfloors, provide underlayment not less than 1/4 inch thick. Over board or uneven subfloors, provide underlayment not less than 11/32 inch thick.
- B. Plywood Underlayment for Resilient Flooring: For underlayment under 19/32 inch-thick, provide plywood panels with fully sanded face and as follows:
 - 1. Grade: [APA](#) Underlayment Exposure 1.

2.9 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. General: Where lumber or plywood is indicated as preservative treated or is specified to be treated, comply with applicable requirements of [AWPA](#) C2 (lumber) and [AWPA](#) C9 (plywood). Mark each treated item with the Quality Mark Requirements of an inspection agency approved by [ALSC](#)'s Board of Review.
 - 1. Lumber that is not in contact with the ground and is not used in areas subject to water comply with [AWPA](#) C31 with inorganic boron (SBX).
 - 2. Do not use chemicals containing chromium or arsenic.
 - 3. For exposed items indicated to receive stained finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.
- B. Pressure treat above ground items with waterborne preservatives to a minimum retention of 0.25 lb/cu. ft. After treatment, kiln-dry lumber and plywood to a maximum moisture content of 19 and 15 percent, respectively. Treat indicated items and the following:
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
 - 3. Wood framing members less than 18 inches above grade.
 - 4. Wood floor plates installed over concrete slabs directly in contact with earth.
- C. Pressure treat wood members in contact with ground or freshwater with waterborne preservatives to a minimum retention of 0.40 lb/cu. ft.
- D. Complete fabrication of treated items before treatment, where possible. If cut after treatment, apply field treatment complying with [AWPA](#) M4 to cut surfaces. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

2.10 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated wood is indicated, comply with applicable requirements of [AWPA C20](#) (lumber) and [AWPA C27](#) (plywood). Identify fire-retardant-treated wood with appropriate classification marking of [UL](#); [SGS U.S. Testing](#); [Timber Products Inspection, Inc.](#); or another testing and inspecting agency acceptable to authorities having jurisdiction.
1. Provide fire treated wood in all concealed areas of construction, as shown or indicated on the drawings, and as required by code.
 2. Research or Evaluation Reports: Provide fire-retardant-treated wood acceptable to authorities having jurisdiction and for which a current model code research or evaluation report exists that evidences compliance of fire-retardant-treated wood for application indicated.
 3. For exposed items indicated to receive stained finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.
- B. Interior Type A: For interior locations, use chemical formulation that produces treated lumber and plywood with the following properties under conditions present after installation:
1. Bending strength, stiffness, and fastener-holding capacities are not reduced below values published by manufacturer of chemical formulation under elevated temperature and humidity conditions simulating installed conditions when tested by a qualified independent testing agency.
 2. No form of degradation occurs due to acid hydrolysis or other causes related to treatment.
 3. Contact with treated wood does not promote corrosion of metal fasteners.
- C. Exterior Type: Use for exterior locations and where indicated. Comply with [ASTM D2898](#).
- D. After treatment, kiln-dry lumber and plywood to a maximum moisture content of 19 and 15 percent, respectively
- E. Inspect each piece of treated lumber or plywood after drying and discard damaged or defective pieces.

2.11 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per [ASTM A153](#) or of Type 304 stainless steel.
- B. Nails, Wire, Brads, and Staples: [ASTM F1667](#).
- C. Power-Driven Fasteners: ICC NER-272.
- D. Wood Screws: [ASME B18.6.1](#).
- E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: [ASTM C954](#), except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
1. For wall and roof sheathing panels, provide screws with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to [ASTM B117](#).

- F. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to [ASTM B117](#). Attach sheathing to comply with [ASTM C954](#).
- G. Lag Bolts: [ASME B18.2.1](#).
- H. Bolts: Steel bolts complying with [ASTM A307](#), Grade A; with [ASTM A563](#) hex nuts and, where indicated, flat washers.

2.12 METAL FRAMING ANCHORS

- A. Qualified Manufacturers:
 - 1. [Simpson Strong-Tie Company, Inc.](#) (800-999-5099)
- B. General: Provide galvanized steel framing anchors of structural capacity, type, and size indicated and as follows:
 - 1. Research or Evaluation Reports: Provide products for which model code research or evaluation reports exist that are acceptable to authorities having jurisdiction and that evidence compliance of metal framing anchors for application indicated with building code in effect for Project.
 - 2. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis, and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- C. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with [ASTM A653](#), G60 coating designation; structural, commercial, or lock-forming quality, as standard with manufacturer for type of anchor indicated.
- D. Joist Hangers: As indicated in the drawings.
- E. Top Flange Hangers: As indicated in the drawings.
- F. Bridging: Rigid, V-section, nailless type, 0.064 inch thick, length to suit joist size and spacing.
- G. Post Bases: Adjustable-socket type for bolting in place with standoff plate to raise post 1 inch above base and with 2-inch minimum side cover, socket 0.064 inch thick, standoff and adjustment plates 0.108 inch thick.
- H. Joist Ties: Flat straps, with holes for fasteners, for tying joists together over supports.
 - 1. Type: As indicated in the drawings.
 - 2. Length: As indicated.
- I. Rafter Tie-Downs (Hurricane Ties): Bent strap tie for fastening rafters or roof trusses to wall studs below.
 - 1. Type: As indicated in the drawings.
- J. Floor-to-Floor Ties: Flat straps, with holes for fasteners, for tying upper floor wall studs to band joists and lower floor studs.

1. Type: As indicated in the drawings.
 2. Length: As indicated in the drawings.
- K. Hold-Downs: Brackets for bolting to wall studs and securing to foundation walls with anchor bolts or to other hold-downs with threaded rods and designed with first of 2 bolts placed 7 bolt diameters from reinforced base.
1. Type: As indicated in the drawings.
 2. Length: As indicated in the drawings
 3. Bolt Diameter: As indicated in the drawings.

2.13 MISCELLANEOUS MATERIALS

- A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch nominal thickness, compressible to 1/32 inch; selected from manufacturer's standard widths to suit width of sill members indicated.
- B. Adhesives for Field Gluing Panels to Framing: Formulation complying with [APA](#) and [ASTM C3498](#) that is approved for use with type of construction panel indicated by both adhesive and panel manufacturers.
- C. Water-Repellent Preservative: [NWWDA](#)-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbonate (IPBC) as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Discard units of material with defects that impair quality of rough carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted.
- C. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.
- D. Apply field treatment complying with [AWPA](#) M4 to cut surfaces of preservative-treated lumber and plywood.
- E. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated in the drawings, complying with the following:
1. "Table 2304.9.1 - Fastening Schedule" of the International Building Code.
- F. Use common wire nails, unless otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill as required.
- G. Use hot-dip galvanized or stainless-steel nails where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity.

- H. Countersink nail heads on exposed carpentry work and fill holes with wood filler.

3.2 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS

- A. Install wood grounds, nailers, blocking, and sleepers where shown and where required for screeding or attaching other work. Form to shapes shown and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.
- C. Install permanent grounds of dressed, preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 WOOD FURRING

- A. Install plumb and level with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
 - 1. Firestop furred spaces of walls at each floor level and at ceiling with wood blocking or noncombustible materials, accurately fitted to close furred spaces.
- B. Furring to Receive Plywood Paneling: Install 1-by-3-inch nominal-size furring at 24 inches o.c., horizontally and vertically. Select furring with no knots capable of producing bent-over nails and damage to paneling.
- C. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal-size furring at 16 inches o.c., vertically.

3.4 WOOD FRAMING, GENERAL

- A. Framing Standard: Comply with [AFPA's](#) "Manual for The Wood Frame Construction Manual (WFCM) for One- and Two-Family Dwellings," unless otherwise indicated.
- B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- C. Install framing members of size and at spacing indicated.
- D. Do not splice structural members between supports.
- E. Firestop concealed spaces of wood-framed walls and partitions at each floor level and at ceiling line of top story. Where firestopping is not inherent in framing system used, provide closely fitted wood blocks of 2-inch nominal-thickness lumber of same width as framing members.
- F. Comply with Table 2304.9.1 and Section 2304 of the International Building Code for minimum fastening requirements of wood members, and published requirements of metal fastener manufacturer, whichever is more stringent.

3.5 WALL AND PARTITION FRAMING

- A. General: Arrange studs so that wide face of stud is perpendicular to direction of wall or partition and narrow face is parallel. Provide single bottom plate and double top plates using members of 2-inch nominal thickness whose widths equal that of studs; except single top plate may be used for non-load-bearing partitions. Nail or anchor plates to supporting construction, unless otherwise indicated.
- B. Construct corners and intersections with 3 or more studs. Provide miscellaneous blocking and framing as shown and as required to support facing materials, fixtures, specialty items, and trim.
 - 1. Provide continuous horizontal blocking at midheight of single-story partitions and multistory partitions, using members of 2-inch nominal thickness and of same width as wall or partitions.
- C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Set headers on edge and support on jamb studs.
 - 1. For non-load-bearing partitions, provide double-jamb studs with headers not less than 4-inch nominal depth for openings 36 inches and less in width, and not less than 6-inch nominal depth for wider openings.
 - 2. For load-bearing walls, provide jamb studs and header as indicated in the drawings. At a minimum, provide double-jamb studs for openings 72 inches and less in width, and triple-jamb studs for wider openings. Provide headers of depth shown or, if not shown, as recommended by [AFPA's](#) "Manual for The Wood Frame Construction Manual (WFCM) for One- and Two-Family Dwellings."
- D. Provide bracing in walls, at locations indicated in the drawings, full-story height, unless otherwise indicated. Provide one of the following:
 - 1. Structural use sheathing panels, not less than 48 by 96 inches block at all edges.

3.6 FLOOR JOIST FRAMING

- A. General: Install floor joists with crown edge up and support ends of each member with not less than 1-1/2 inches of bearing on wood or metal, or 3 inches on masonry. Attach floor joists as follows:
 - 1. Where supported on wood members, by toe nailing or by using metal framing anchors.
 - 2. Where framed into wood supporting members, by using wood ledgers as shown or, if not shown, by using metal joist hangers.
- B. Fire Cuts: At joists built into masonry, bevel cut ends 3 inches and do not embed more than 4 inches.
- C. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches.
- D. Do not notch in middle third of joists; limit notches to 1/6 depth of joist, 1/3 at ends. Do not bore holes larger than 1/3 depth of joist; do not locate closer than 2 inches from top or bottom.
- E. Provide solid blocking of 2-inch nominal thickness by depth of joist at ends of joists unless nailed to header or band.
- F. Lap members framing from opposite sides of beams, girders, or partitions not less than 4 inches or securely tie opposing members together. Provide solid blocking of 2-inch nominal thickness by depth of joist over supports.

- G. Anchor members paralleling masonry with 1/4-by-1-1/4-inch metal strap anchors spaced not more than 96 inches o.c. extending over and fastening to 3 joists. Embed anchors at least 4 inches into masonry with ends bent at right angles 4 inches into grouted masonry.
- H. Under jamb studs at openings, provide solid blocking between joist.
- I. Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.
 - 1. Provide triple joists separated as above, under partitions receiving ceramic tile and similar heavy finishes or fixtures.
- J. Provide bridging of type indicated below, at intervals of 96 inches o.c., between joists.
 - 1. Diagonal wood bridging formed from bevel cut 1-by-3-inch nominal-size lumber, double-crossed and nailed both ends to joists.
 - 2. Steel bridging installed to comply with bridging manufacturer's written instructions.
 - 3. Bridging may be omitted where joist depth is 12-inch nominal size or less, and where indicated live load is 40 psf or less.
- K. Engineered Wood Beams
 - 1. Comply with manufacturer's written instructions for design, installation, and fastening.
 - 2. Design Loads: Beams shall be sized to support loads indicated on drawings.
 - 3. Allowable deflection:
 - a. Floor Beams: L/360 live load deflection; L240 total load deflection.
 - b. Roof Beams: L/180 total load deflection.
 - 4. Protect wood members from direct contact with concrete or masonry.
 - 5. Refer to manufacturers literature for connection of multiple plies of side loaded beams.

3.7 RAFTER AND CEILING JOIST FRAMING

- A. Ceiling Joists: Install ceiling joists with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.
 - 1. Where ceiling joists are at right angles to rafters, provide additional short joists perpendicular to rafters from wall plate to first joist; nail to ends of rafters and to top plate and nail to first joist or anchor with framing anchors or metal straps. Provide 1-by-8-inch nominal-size or 2-by-4-inch nominal-size stringers spaced 48 inches o.c. crosswise over main ceiling joists.
- B. Rafters: Notch to fit exterior wall plates and toe nail or use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.
 - 1. At valleys, provide double-valley rafters of size shown or, if not shown, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against valley rafters.
 - 2. At hips, provide hip rafter of size shown or, if not shown, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against hip rafter.
- C. Provide collar beams (ties) as shown or, if not shown, provide 1-by-6-inch nominal-size boards between every third pair of rafters, but not more than 48 inches o.c. Locate below ridge member, at third point of rafter span. Cut ends to fit roof slope and nail to rafters.
- D. Provide special framing as shown for eaves, overhangs, dormers, and similar conditions, if any.

- E. Engineered Wood Beams
 - 1. Comply with manufacturer's written instructions for design, installation, and fastening.
 - 2. Design Loads: Beams shall be sized to support loads indicated on drawings.
 - 3. Allowable deflection:
 - a. Floor Beams: L/360 live load deflection; L/240 total load deflection.
 - b. Roof Beams: L/180 total load deflection.
 - 4. Protect wood members from direct contact with concrete or masonry.
 - 5. Refer to manufacturers literature for connection of multiple plies of side loaded beams.

3.8 STAIR FRAMING

- A. Provide stair framing members of size, space, and configuration indicated or, if not otherwise indicated, to comply with the following requirements:
 - 1. Stringer Size:
 - a. Interior - 1.5x14 LVL members.
 - b. Exterior - 2x12 sawn lumber
 - 2. Notching: Notch stringers to receive treads, risers, and supports; leave at least 7-1/2 inches of effective depth.
 - 3. Stringer Spacing: 16" O.C. maximum
 - 4. Attachment to landing headers: Per drawings notes.
- B. Provide stair framing that does not exceed the following variations between treads and risers within each flight:
 - 1. Adjacent Treads and Risers: 3/16 inch.
 - 2. Between Largest and Smallest Treads and Risers: 3/8 inch.

3.9 INSTALLATION OF STRUCTURAL-USE PANELS

- A. General: Comply with applicable recommendations contained in [APA](#) Form No. E30, "APA Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
 - 1. Comply with "Code Plus" provisions of above-referenced guide.
- B. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. ICC NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
- C. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- D. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.
- E. Fastening Methods: Fasten panels as indicated below:
 - 1. Combination Subflooring-Underlayment: Glue and nail to framing throughout.
 - 2. Subflooring: Glue and nail to framing throughout.
 - a. Space panels 1/8 inch at edges and ends.
 - 3. Sheathing:
 - a. Nail to wood framing.

- b. Space panels 1/8 inch at edges and ends.
4. Underlayment: Nail to subflooring.
 - a. Space panels 1/32 inch at edges and ends.
 - b. Fill and sand edge joints of underlayment receiving resilient flooring just before installing flooring.
5. Plywood Backing Panels: Nail or screw to supports.
6. Lay-out panels with face grain oriented perpendicular to the supporting members.
7. Install roof sheathing with panel cups at all edges.

3.10 GYPSUM SHEATHING

- A. General: Install gypsum sheathing to comply with manufacturer's instructions, GA-253, and the following:
 1. Cut boards at penetrations, edge, and other obstructions of the work. Fit tightly against abutting construction, except provide a 3/8" setback where non-load-bearing construction abuts structural elements.
 2. Coordinate sheathing installation with flashing and joint sealant installation so that these combined materials are installed in the sequence and manner that prevents exterior moisture from passing through completed exterior wall assembly.
 3. Apply fasteners so that screw heads bear tightly against face of gypsum sheathing boards, but do not cut into face paper.
 4. Do not bridge building expansion joints with gypsum sheathing. Cut and space edges to match spacing of structural support elements.
- B. Vertical Installation: Install four-foot-wide gypsum sheathing boards vertically with vertical edges centered over flanges of studs. Abut ends and edges of each board with those of adjoining boards. Screw-attach boards at perimeter and within field of board to each steel stud a follows:
 1. Fasteners spaced approximately 8" o.c. and set-back 3/8" minimum from edges and ends of boards.

3.11 FIBERBOARD SHEATHING INSTALLATION

- A. Comply with [ASTM C846](#) and with manufacturer's written instructions.
- B. Fasten fiberboard sheathing panels to intermediate supports and then at edges and ends. Use galvanized roofing nails; comply with manufacturer's recommended spacing and referenced fastening schedule. Drive fasteners flush with surface of sheathing and locate perimeter fasteners at least 3/8 inch from edges and ends.
- C. Install sheathing vertically with long edges parallel to, and centered over, studs. Install solid wood blocking where end joints do not occur over framing. Allow 1/8-inch open space between edges and ends of adjacent units. Stagger horizontal joints if any.
- D. Cover sheathing as soon as practical after installation to prevent deterioration from wetting.

3.12 FOAM-PLASTIC SHEATHING INSTALLATION

- A. Comply with manufacturer's written instructions.
- B. Foam-Plastic Wall Sheathing: Install vapor-relief strips or equivalent for permitting escape of moisture vapor that otherwise would be trapped in stud cavity behind sheathing.

3.13 PROTECTION

- A. Protect wood that has been treated with inorganic boron from weather. If inorganic boron treated wood becomes wet, apply EPA registered borate treatment to wood surfaces in accordance with manufacturers recommendations.

- B. Protect Gypsum Sheathing from weather by covering exposed exterior surface, if required by manufacturer of gypsum sheathing.

END OF SECTION

SECTION 06 17 53
SHOP FABRICATED WOOD TRUSSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Triangular-Pitched Roof Trusses
2. Scissor Roof Trusses
3. Parallel-Chord Roof Trusses, Top-Chord Bearing
4. Parallel-Chord Roof Trusses, Bottom-Chord Bearing
5. Girder Trusses
6. Parallel-Chord Floor Trusses, Top-Chord Bearing
7. Parallel-Chord Floor Trusses, Bottom-Chord Bearing
8. Truss Accessories

1.2 REFERENCES

A. [ASTM International](#) Publications:

1. A153 "Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware"
2. A307 "Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength"
3. A563 "Standard Specification for Carbon and Alloy Steel Nuts"
4. A591 "Standard Specification for Steel Sheet, Electrolytic Zinc-Coated, for Light Coating Weight [Mass] Applications"
5. A653 "Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process"
6. A666 "Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar"
7. A780 "Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings"
8. A792 "Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process"
9. F1667 "Standard Specification for Driven Fasteners: Nails, Spikes, and Staples"

B. [The American Society of Mechanical Engineers](#) (ASME) Publications:

1. B18.2.1 "Square and Hex Bolts and Screws, Inch Series"

C. [American Wood-Preservers's Association \(AWPA\)](#) Publications:

1. C2 "Lumber, Timber, Bridge Ties and Mine Ties - Preservative Treatment by Pressure Processes"
2. C9 "Plywood - Preservative Treatment by Pressure Process Document Number"
3. M4 "Standard for the Care of Preservative-Treated Wood Products Document Number"

D. [Truss Plate Institute](#) (TPI) / [American National Standards Institute](#) (ANSI) Publications:

1. ANSI/TP1 1, "National Design Standard for Metal-Plate-Connected Wood Truss Construction."
2. TPI HIB "Commentary and Recommendations for Handling Installing & Bracing Metal Plate Connected Wood Trusses."

3. TPI DSB "Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses."

1.3 DEFINITIONS

- A. Metal-plate-connected wood trusses include planar structural units consisting of metal-plate-connected members fabricated from dimension lumber and cut and assembled before delivery to Project site.

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Engineer, fabricate, and erect metal-plate-connected wood trusses to withstand design loads within limits and under conditions required.
 1. Design Loads: As indicated.
 2. Design trusses to withstand design loads without deflections greater than the following:
 - a. Roof Trusses: Vertical deflection of 1/240 of span due to total load.
 - b. Roof Trusses: Horizontal deflection at reactions of 1-1/4 inches due to total load.
 - c. Floor Trusses: Vertical deflection of 1/480 of span due to live load.
- B. Engineering Responsibility: Engage a fabricator who uses a qualified professional engineer to prepare calculations, Shop Drawings, and other structural data for metal-plate-connected wood trusses.

1.5 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections:
 1. Product Data: For lumber, metal-plate connectors, metal framing connectors, bolts, and fasteners.
 2. Shop Drawings detailing location, pitch, span, camber, configuration, and spacing for each type of truss required; species, sizes, and stress grades of lumber to be used; splice details; type, size, material, finish, design values, and orientation and location of metal connector plates; and bearing details.
 - a. To the extent truss design considerations are indicated as fabricator's responsibility, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - b. Include truss Shop Drawings signed and sealed by the qualified professional engineer responsible for their preparation.
 3. Product certificates signed by officer of truss fabricating firm certifying that metal-plate-connected wood trusses supplied for Project comply with specified requirements and Shop Drawings.
 4. Qualification data for firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
 5. Material test reports from a qualified independent testing agency indicating and interpreting test results relative to compliance of fire-retardant-treated wood products with requirements indicated.
 6. Material certificates for dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the American Lumber Standards Committee (ALSC) Board of Review.
 7. Wood treatment data as follows, including chemical treatment manufacturer's instructions for handling, storing, installing, and finishing treated materials:

- a. For each type of preservative-treated wood product, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
 - b. For waterborne-treated products, include statement that moisture content of treated materials was reduced to levels indicated before shipment to truss fabricator.
 - c. For fire-retardant-treated wood products, include certification by treating plant that treated materials comply with specified standard and other requirements as well as data relative to bending strength, stiffness, and fastener-holding capacities of treated materials, all tested in accordance with ASTM D5664.
8. Research or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence the following products' compliance with building code in effect for Project.
- a. Fire-retardant-treated wood
 - b. Metal-plate connectors
 - c. Metal framing connectors

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer with a minimum of five years of experience, who has completed wood truss projects similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Fabricator's Qualifications: Engage a firm that complies with the following requirements for quality control and is experienced in fabricating metal-plate-connected wood trusses similar to those indicated for this Project and with a record of successful in-service performance:
 1. Fabricator participates in a recognized quality-assurance program that involves inspection by SPIB; Timber Products Inspection, Inc.; Truss Plate Institute (TPI); or other independent inspecting and testing agency acceptable to Architect and authorities having jurisdiction.
- C. Comply with applicable requirements and recommendations of the following publications:
 1. [ANSI/TP1 1](#)
 2. [TPI HIB](#)
 3. [TPI DSB](#)
- D. Metal-Plate Connector Manufacturer's Qualifications: A manufacturer that is a member of [TPI](#) and that complies with [TPI](#) quality-control procedures for manufacture of connector plates published in [ANSI/TP1 1](#).
- E. Single-Source Responsibility for Connector Plates: Provide metal connector plates from one source and by a single manufacturer.
- F. Wood Structural Design Standard: Comply with applicable requirements of [AFPA's](#) "Manual for The Wood Frame Construction Manual (WFCM) for One- and Two-Family Dwellings."
- G. Single-Source Engineering Responsibility: Provide trusses engineered by metal-plate connector manufacturer to support superimposed dead and live loads indicated, with design approved and certified by a qualified professional engineer.
- H. Professional Engineer Qualifications: A professional engineer who is legally authorized to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated that have resulted in installing metal-plate-connected wood trusses similar to those indicated for this Project and with a record of successful in-service performance.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Handle and store trusses with care and comply with manufacturer's written instructions and TPI recommendations to avoid damage and lateral bending.
- B. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

1.8 SEQUENCING AND SCHEDULING

- A. Time delivery and erection of trusses to avoid extended on-site storage and to avoid delaying progress of other trades whose work must follow erection of trusses.

PART 2 - PRODUCTS

2.1 DIMENSION LUMBER

- A. Lumber Standards: Comply with DOC PS 20, "American Softwood Lumber Standard," and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.
- B. Inspection Agencies: Inspection agencies, and the abbreviations used to reference them, include the following:
 - 1. Southern Pine Inspection Bureau ([SPIB](#))
- C. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
- D. Provide dressed lumber, S4S, manufactured to actual sizes required by DOC PS 20 for moisture content specified, to comply with requirements indicated below:
 - 1. Provide dry lumber with 19 percent maximum moisture content at time of dressing.
- E. Grade and Species: Provide dimension lumber of any species for truss chord and web members, graded visually or mechanically, and capable of supporting required loads without exceeding allowable design values according to AFPA's "National Design Specification for Wood Construction" and its "Supplement."

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. General: Where lumber is indicated as preservative treated or is specified to be treated, comply with applicable requirements of [AWPA C2](#) (lumber). Mark each treated item with the Quality Mark Requirements of an inspection agency approved by [ALSC](#)'s Board of Review.
 - 1. Lumber that is not in contact with the ground and is not used in areas subject to water comply with [AWPA C31](#) with inorganic boron (SBX).
 - 2. Do not use chemicals containing chromium or arsenic.
- B. Pressure treat aboveground items with waterborne preservatives to a minimum retention of 0.25 lb/cu. ft. After treatment, kiln-dry lumber to a maximum moisture content of 19 percent.
- C. Complete fabrication of treated items before treatment, where possible. If cut after treatment, apply field treatment complying with [AWPA M4](#) to cut surfaces. Inspect each piece of lumber after drying and discard damaged or defective pieces.

2.3 METAL CONNECTOR PLATES

- A. General: Fabricate connector plates from metal complying with requirements indicated below.
- B. Interior locations:
 - 1. Hot-Dip Galvanized Steel Sheet: Structural-quality steel sheet, zinc coated by hot-dip process complying with [ASTM A653](#), Structural Steel, (SS), high strength low alloy steel, Type A, G60 coating designation; Grade 33 and not less than 0.0359 inch thick.
 - 2. Electrolytic Zinc-Coated Steel Sheet: [ASTM A591](#), structural-(physical) quality steel sheet, zinc coated by electrodeposition; 33,000-psi minimum yield strength, coating class C, and not less than 0.0474 inch thick.

2.4 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified below for material and manufacture.
 - 1. Where truss members are exposed to weather, in ground contact or in high humidity areas (such as swimming pools), provide fasteners of stainless steel, Type 304 or 316.
- B. Nails, Wire, Brads, and Staples: [ASTM F1667](#).
- C. Power-Driven Fasteners: ICC NER-272.
- D. Wood Screws: [ASME B18.2.1](#).
- E. Lag Bolts and Screws: [ASME B18.2.1](#).
- F. Bolts: Steel bolts complying with [ASTM A307](#), Grade A; with [ASTM A563](#) hex nuts and, where indicated, flat washers.
- G. Truss Tie-Downs: As indicated in drawings.
- H. Roof Truss Clips: Angle clips for bracing bottom chord of roof trusses at non-load-bearing walls, 1-1/4 inches wide by 0.050 inch thick. Clip is fastened to truss through slotted holes to allow for truss deflection.
- I. Floor Truss Hangers: U-shaped hangers, full depth of floor truss, with 1-3/4-inch-long seat; formed from metal strap 0.062 inch thick with tabs bent to extend over and be fastened to supporting member.

2.5 METAL FRAMING ANCHORS

- A. General: Provide metal framing anchors of structural capacity, type, size, metal, and finish indicated that comply with requirements specified, including the following:
 - 1. Research or Evaluation Reports: Provide products for which model code research or evaluation reports exist that are acceptable to authorities having jurisdiction and that evidence compliance of metal framing anchors for application indicated with building code in effect for this Project.
 - 2. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis, and demonstrated by comprehensive testing performed by a qualified independent testing agency.

- B. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with [ASTM](#) A653, G60 coating designation; structural, commercial, or lock-forming quality, as standard with manufacturer for type of anchor indicated.
- C. Stainless-Steel Sheet: [ASTM](#) A666, Type 304 or 316, chromium nickel steel sheet; 33,000-psi minimum yield strength.

2.6 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.
- B. Protective Coatings: Provide one of the following coating systems:
 - 1. SSPC-Paint 22, epoxy-polyamide primer.
 - 2. SSPC-Paint 16, coal-tar epoxy-polyamide black or dark red paint.

2.7 FABRICATION

- A. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.
- B. Fabricate metal connector plates to size, configuration, thickness, and anchorage details required to withstand design loadings for types of joint designs indicated.
- C. Assemble truss members in design configuration indicated using jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances of [ANSI/TP1 1](#). Position members to produce design camber indicated.
 - 1. Fabricate wood trusses within manufacturing tolerances of [ANSI/TP1 1](#).
- D. Connect truss members by metal connector plates located and securely embedded simultaneously into both sides of wood members by air or hydraulic press.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Do not install wood trusses until supporting construction is in place and is braced and secured.
- B. Before installing, splice trusses delivered to Project site in more than one piece.
- C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.
- D. Install and brace trusses according to recommendations of [TPI](#) and as indicated.
- E. Install trusses plumb, square, and true to line and securely fasten to supporting construction.
- F. Space, adjust, and align trusses in location before permanently fastening and as indicated on Drawings.
- G. Anchor trusses securely at all bearing points using metal framing anchors. Install fasteners through each fastener hole in metal framing anchor according to manufacturer's fastening schedules and written instructions.

- H. Securely connect each truss ply required for forming built-up girder trusses.
 - 1. Anchor of trusses to girder trusses is by truss manufacturer.
- I. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.
 - 1. All truss bracing and bracing connection for permanent and erection loads are by truss manufacturer.
- J. Install wood trusses within installation tolerances of [ANSI/TP1 1](#).
- K. Do not cut or remove truss members.
- L. Return wood trusses that are damaged or do not meet requirements to fabricator and replace with trusses that do meet requirements.
 - 1. Do not alter trusses in the field.

3.2 REPAIRS AND PROTECTION

- A. Repair damaged galvanized coatings on exposed surfaces with galvanized repair paint according to [ASTM A780](#) and manufacturer's written instructions.
- B. Protective Coating: Clean and prepare exposed surfaces of embedded-metal connector plates. Brush apply primer, when part of coating system, and one coat of protective coating.
 - 1. Apply materials to provide minimum dry film thickness recommended by manufacturer of coating system.

END OF SECTION