# **PROJECT MANUAL AND SPECIFICATIONS**

# JORDAN SCHOOL DISTRICT MOUNTAIN RIDGE HIGH SCHOOL ACCESS ROADS

Bid Number: 24KP12

**Construction Documents** 



PREPARED BY



Great Basin Project #23N216

January 16, 2024

## Jordan School District

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# GENERAL CONDITIONS

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## **SECTION 1 - GENERAL PROVISIONS**

## 1.1 **DEFINITIONS**

- A. <u>Agreement:</u> The Agreement is the document entitled "Agreement Between Owner and Contractor" executed by the Owner and the Contractor for performance of the Work.
- B. <u>Architect:</u> The Architect is the entity identified as such in the Agreement.
- C. <u>Change In The Work:</u> A Change in the Work is:
  - 1. A modification to the requirements of the Contract Documents or a delay in Substantial Completion resulting from an instruction from the Owner or Architect to the Contractor;
  - 2. A modification to the requirements of the Contract Documents or a delay in Substantial Completion resulting from an event or circumstance other than an instruction from the Owner or Architect to the Contractor.
  - D. <u>Contract:</u> The Contract Documents form the Contract.
  - E. <u>Contract Documents:</u> The Contract Documents consist of the documents identified as such in the Agreement.
  - F. <u>Contractor</u>: The Contractor is the entity identified as such in the Agreement.
  - G. <u>Contract Sum</u>: The Contract Sum is the total amount stated in the Agreement as amended by Modifications payable by the Owner to the Contractor for performance of the Work.
  - H. <u>Contract Time</u>: The Contract Time is the period of time stated in the Agreement as amended by Modifications for Substantial Completion of the Work.
  - I. <u>Day:</u> The term "day" means calendar day unless otherwise specifically defined.
  - J. <u>Drawings</u>: The Drawings consist of the documents identified as such in the Agreement.
  - K. <u>Modification</u>: A Modification is a written amendment to the Contract in the form of a: 1. Change Order;
    - 2. Construction Change Directive; or
    - 3. Field Change.
  - L. <u>Owner:</u> The Owner is the entity identified as such in the Agreement.
  - M. <u>Project</u>: The Project is the total construction designed by the Architect of which the Work performed under the Contract Documents may be the whole or a part.
  - N. <u>Product Data</u>: Product Data consists of standard illustrations, schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate

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details regarding materials or equipment to be used in the Work, or the manner of installation, operation, or maintenance of such materials or equipment.

- O. <u>Project Manual</u>: The Project Manual is the volume assembled for the Work which includes the bidding requirements, sample forms, the Conditions of the Contract, the Specifications, and other information.
- P. <u>Samples And Mock-ups</u>: Samples and Mock-ups are physical examples which illustrate materials, equipment, or workmanship and establish standards by which the Work will be judged.
- Q. <u>Shop Drawings</u>: Shop Drawings are drawings, diagrams, illustrations, schedules, performance charts, fabrication and installation drawings, setting diagrams, patterns, templates, and other data which are specially prepared by the Contractor or any Subcontractor, manufacturer, supplier, or distributor. Shop drawings illustrate some portion of the Work and confirm dimensions and conformance to the Contract Documents.
- R. <u>Specifications</u>: The Specifications consist of the documents identified as such in the Agreement.
- S. <u>Subcontractor</u>: A Subcontractor is any entity supplying labor, materials, or equipment for the Work under separate contract with the Contractor or any other Subcontractor.
- T. <u>Substantial Completion</u>: Substantial Completion occurs when the contractor has obtained a certificate of occupancy for the Work from the local governmental authority having jurisdiction over the Work and the Work is sufficiently complete that Owner can use the Work for its intended purpose. The date of Substantial Completion is the substantial completion date certified by the Architect in accordance with the Contract Documents.
- U. <u>Work:</u> The Work includes all labor, materials, equipment and construction required by the Contract Documents.
- V. <u>Written Notice</u>: Written notice is notice in writing given from one party to the other. Written Notice shall be effective:
  - 1. On the date of personal delivery to the other party;
  - 2. On the date sent by facsimile transmission to the other party provided receipt of the facsimile is verified by telephone or an electronic confirmation report by the party sending the facsimile transmission;
  - 3. Three days after the date of mailing by first class mail postage prepaid to the other party's last known business address; or
  - 4. On the date of receipt by the other party as stated on the return receipt if sent by registered or certified mail, or by courier.

## 1.2 EXECUTION, CORRELATION, AND INTENT

- A. By executing the Agreement, the Contractor represents that it has visited the site, familiarized itself with the local conditions under which the Work is to be performed, and correlated its own observations with the requirements of the Contract Documents.
- B. The intent of the Contract Documents is to include all labor, materials, equipment, and other items necessary for the proper execution and completion of the Work. The Contract Documents are complementary and what is required by any one shall be as binding as if required by all. Performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the intended result.
- C. The organization of the Contract Documents is not intended to control the Contractor in dividing the Work among Subcontractors or to establish the extent of the Work to be performed by any trade.
- D. Words used in the Contract Documents which have well known technical or trade meanings are used therein in accordance with such recognized meanings.
- E. In the interest of brevity, the Contract Documents may omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

## 1.3 OWNERSHIP AND USE OF CONTRACT DOCUMENTS

The Drawings, the Project Manuals, and copies thereof are the property of the Owner. The Contractor shall not use these documents on any other project. The Contractor may retain one copy of the Drawings and the Project Manual as a Contract record set and shall dispose of all remaining copies following final completion of the Work.

## **SECTION 2 - OWNER**

## 2.1 INFORMATION AND SERVICES REQUIRED OF OWNER

- A. The Owner will be responsible for establishment of property lines and bench marks for grading.
- B. The Owner will furnish to the Contractor any information or services it is required to furnish under the Contract Documents with reasonable promptness to avoid delay in the orderly progress of the Work.
- C. The Owner will furnish to the Contractor a PDF copy of the Drawings, the Project Manual, and the Addenda. Any prints required are the responsibility of the contractor.

## 2.2 OWNER'S RIGHT TO INSPECT THE WORK

The Owner and its representatives shall have the right to inspect any portion of the Work wherever located at any time.

## 2.3 OWNER'S RIGHT TO STOP THE WORK

If the Contractor fails to carry out the Work in accordance with the Contract Documents or fails to correct Work which is not in accordance with the Contract Documents in a timely manner, the Owner may order the Contractor in writing to stop the Work, or any portion thereof, until the cause for such order has been eliminated.

## **SECTION 3 - CONTRACTOR**

#### 3.1 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

- A. The Contractor shall carefully compare the Contract Documents with each other and with other information relating to the Project prior to commencing the Work and during performance of the Work and shall immediately report to the Architect errors, inconsistencies, and omissions discovered.
- B. Should the Contractor or any of its Subcontractors become aware of any question regarding the meaning or intent of any part of the Contract Documents prior to commencing that portion of the Work about which there is a question, the Contractor shall request an interpretation or clarification from the Architect before proceeding. The Contractor proceeds at its own risk if it proceeds with the Work without first making such a request and receiving an interpretation or clarification from the Architect. If neither the Contractor nor the affected Subcontractors become aware of the question until after work on the relevant portion of the Work has commenced, then the following precedence shall govern for purposes of determining whether resolution of the question constitutes a Change in the Work:
  - 1. The Agreement takes precedence over all other documents.
  - 2. The Supplementary Conditions take precedence over the General Conditions.
  - 3. The General Conditions and Supplementary Conditions take precedence over the Drawings and the Specifications.
  - 4. An Addendum or Modification takes precedence over the document(s) modified by the Addendum or Modification.
  - 5. The Specifications take precedence over the Drawings.
  - 6. Within the Drawings, larger scale drawings take precedence over smaller scale drawings, figured dimensions over scaled dimensions, and noted materials over graphic indications.
- C. It is not the Contractor's responsibility to ascertain that the Contract Documents are in accordance with requirements of governing public authorities. However, if the Contractor observes that

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portions of the Contract Documents are at variance with those requirements, the Contractor shall immediately notify the Architect in writing. The Contractor shall not proceed unless necessary Modifications to the Contract Documents required for compliance with such laws, regulations, and ordinances have been effected. The Contractor shall be fully responsible for any work knowingly performed contrary to such laws, regulations, and ordinances and shall fully indemnify the Owner against loss and bear all costs and penalties arising therefrom.

- D. The Contractor shall take field measurements and verify field conditions and shall compare such field measurements and conditions and other information known to the Contractor with the Contract Documents before ordering any materials or commencing construction activities. The Contractor shall immediately report errors, inconsistencies, and omissions which it discovers to the Architect. If the Contractor orders materials or commences construction activities before taking field measurements and verifying field conditions, the Contractor shall not be entitled to any compensation for additional costs to the Contractor resulting from field measurements or conditions different from those anticipated by the Contractor which would have been avoided had the Contractor taken field measurements and verified field conditions prior to ordering the materials or commencing construction activities.
- E. If site conditions indicated in the Contract Documents differ materially from those the Contractor encounters in performance of the Work, the Contractor shall immediately notify the Architect in writing of such differing site conditions.

## 3.2 SUPERVISION OF CONSTRUCTION PROCEDURES

- A. The Contractor shall supervise and direct the Work using its best skill and attention. The Contractor shall be solely responsible for all construction means, methods, techniques, sequences, and procedures and for coordinating all portions of the Work.
- B. The Contractor shall be responsible for:
  - 1. The proper observance of property lines and set back requirements as shown in the Contract Documents; and
  - 2. The location and layout of the Work as shown in the Contract Documents with respect to the position of the Work on the property and the elevation of the Work in relation to grade.
- C. The Contractor shall be responsible to the Owner for the acts and omissions of the Contractor's employees, Subcontractors, and their agents and employees, and other persons performing portions of the Work under a contract with the Contractor or any Subcontractor.
- D. The Contractor shall not be relieved of its obligation to perform the Work in accordance with the Contract Documents either by the activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections, or approvals required or performed by persons other than the Contractor.
- E. The Contractor shall be responsible for inspection of portions of the Work already performed under the Contract to determine that such portions are in proper condition to receive subsequent portions of the Work.

## 3.3 LABOR AND MATERIALS

- A. Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for all labor, materials, equipment, tools, water, heat, utilities, transportation, and other facilities and services necessary for the proper execution and completion of the Work.
- B. The Contractor shall at all times enforce strict discipline and good order among those performing the Work and shall not permit employment of any unfit person or anyone not skilled in the tasks assigned to them.
- C. The Contractor is fully responsible for the Project and all materials and work connected therewith until the Owner has accepted the work in writing. The Contractor shall replace or repair at its own expense any materials or work damaged or stolen, regardless of whether it has received payment for such work or materials from the Owner.

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D. The Contractor shall remedy all damage or loss to any property caused in whole or in part by the Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable.

## 3.4 WARRANTY

The Contractor warrants to the Owner that the materials and equipment furnished under the Contract will be of specified quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects, and that the Work will conform with the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of the materials and equipment used in performing the Work.

## 3.5 TAXES

- A. The Contractor shall pay all use, consumer, payroll, workers compensation, unemployment, old age pension, surtax, and similar taxes assessed in connection with the performance of the work.
- B. The Owner will pay all taxes and assessments on the real property comprising the Project site.

## 3.6 PERMITS, FEES, AND NOTICES

- A. The Contractor will obtain and pay for all permanent easements necessary for completion of the Work.
- B. The Contractor will pay the cost of permits, fees, and improvement bonds required by local agencies necessary for the proper execution and completion of the Work. The Contractor will arrange for issuance of permits and shall be responsible for picking up the permits from the local agencies.
- C. The Contractor shall obtain and pay the cost of licenses necessary for the proper execution and completion of the Work.
- D. The Contractor shall secure any certificates of inspection and of occupancy that may be required by authorities having jurisdiction over the Work. The Contractor shall deliver these certificates to the Architect prior to execution of the Certificate of Substantial Completion.
- E. The Contractor shall comply with and give any notices required by the laws, ordinances, rules, regulations, and lawful orders of any public authorities bearing on performance of the Work.

## 3.7 CONTRACTOR'S ON-SITE REPRESENTATIVE

The Contractor shall employ a competent representative to supervise the performance of all Work. This representative shall be in attendance at the Project site during the performance of all Work. This representative shall represent the Contractor for all purposes, including communication with the Owner. All communications will be confirmed in writing.

## 3.8 CONTRACTOR'S CONSTRUCTION SCHEDULES

- A. The Contractor shall prepare and submit for the Owner's and the Architect's information the Contractor's construction schedule for the Work. The schedule shall cover the time limits stated in the Contract Documents, shall be revised at specified intervals, shall relate to all of the work, and shall provide for the expeditious and practicable execution of the Work.
- B. The Contractor shall prepare and keep current a submittal schedule which is coordinated with the Contractor's construction schedule and which allows the Architect specified times to review submittals.

## 3.9 DOCUMENTS AND SUBMITTALS AT THE SITE

The Contractor shall keep at the Project site for use by the Owner, the Architect, or their representatives, a record copy of the Project Manual, the Drawings, all Addenda, and all Modifications. These documents shall be maintained in good order and currently marked to record changes and selections made during construction. In addition, the Contractor shall keep at the Project site one copy of all Product Data, Shop Drawings, Samples, and similar submittals required by the Contract Documents.

## 3.10 PRODUCT DATA, SHOP DRAWINGS, AND SAMPLES

- A. Product Data, Shop Drawings, Samples, and similar submittals are not Contract Documents and do not alter the requirements of the Contract Documents unless incorporated into the Contract Documents by a Modification.
- B. The Contractor shall review, approve, and submit to the Architect Product Data, Shop Drawings, Samples, and similar submittals in accordance with the Contract Documents. Submittals not required by the Contract Documents may be returned without action. By approving Product Data, Shop Drawings, Samples, and similar submittals, the Contractor represents that it has determined and verified field measurements, field construction criteria, materials, catalog numbers, and similar data, and that it has checked and coordinated each submittal with the requirements of the Work and of the Contract Documents or will make such determination, verification, check, and coordination prior to commencing the relevant portion of the Work.
- C. The Contractor shall not perform any portions of the Work requiring submittals until the respective submittal has been reviewed and accepted by the Architect.
- D. The Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's acceptance of submittals unless the Contractor has specifically informed the Architect in writing of such deviations at the time of submission and the Architect has incorporated the deviation into the Contract Documents by a Modification. The Contractor shall not be relieved of responsibility for errors or omissions in submittals by the Architect's acceptance of the submittal.

#### 3.11 CUTTING AND PATCHING

The Contractor shall be responsible for any cutting, fitting, and patching that may be required to complete the Work and make its parts fit together properly.

## 3.12 ACCESS TO WORK

The Contractor shall provide the Owner and the Architect access to the Work wherever located.

#### 3.13 ROYALTIES AND PATENTS

The Contractor shall pay all royalties and license fees required by the Work or by the Contractor's chosen method of performing the Work. The Contractor shall defend and hold the Owner harmless from all suits or claims for infringement of any patent or license rights or any loss on account thereof.

## 3.14 INDEMNIFICATION

- A. The Contractor shall indemnify and hold harmless the Owner, the Architect, their consultants, and the agents and employees of any of the foregoing from and against any and all claims, damages, liability, demands, costs, judgements, awards, settlements, causes of action, losses and expenses, including but not limited to attorneys fees, arising out of or resulting from performance of the Work, attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible or real property, including loss of use resulting therefrom, but only to the extent caused in whole or in part by the negligent acts or omissions of the Contractor, any Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. In the event that any such claim, damage, loss, or expense is caused in part by a party indemnified hereunder, that party shall bear the cost of such claim, damage, loss, or expense to the extent it was the cause thereof. In the event that the claimant asserts a claim for recovery against any party indemnified hereunder, the party indemnified hereunder may tender the defense of such claim to the Contractor. If the Contractor rejects such tender of defense and it is later determined that the party indemnified hereunder did not cause any part of the claim, damage, loss, or expense, the Contractor shall reimburse the party indemnified hereunder for costs and expenses incurred by that party in defending against the claim. The Contractor shall not be liable hereunder to indemnify any party for damages resulting from the sole negligence of that party.
- B. In addition to the foregoing, the Contractor shall be liable to defend the Owner in any lawsuit filed by any Subcontractor relating to the Project. Where liens have been filed against the Owner's property, the Contractor and/or its bonding company which has issued bonds for the Project, shall obtain lien releases and record them in the appropriate county and/or local jurisdiction and provide the Owner with a title free and clear from any liens of Subcontractors. In the event that the Contractor and its bonding company are unable to obtain a lien release, the Owner in its absolute discretion may require the Contractor to provide a bond around the lien or a bond to discharge the lien at the Contractor's sole expense.
- C. In addition to the foregoing, the Contractor shall indemnify and hold the Owner harmless from any claim of any other contractor resulting from the performance, nonperformance or delay in performance of the Work by the Contractor.
- D. No subcontract shall relieve the Contractor of any of its liability or obligations to the Owner under the Contract Documents. The Contractor agrees that it is fully responsible to the Owner for acts or omissions of Subcontractors and of persons either directly or indirectly employed by them.
- E. In claims against any person or entity indemnified under this Article 3.14 by an employee of the Contractor or any Subcontractor or anyone employed directly or indirectly by them or anyone for whose acts they are liable, the indemnification obligation under Article 3.14 shall not be limited by a limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under worker's compensation acts, disability benefit acts, or other employee benefit acts.

## **SECTION 4 - ADMINISTRATION OF THE CONTRACT**

## 4.1 ARCHITECT

In case of the termination of the employment of the Architect, the Owner shall appoint in writing an Architect against whom the Contractor makes no reasonable objection, whose status under the Contract Documents shall be that of the former Architect in all respects.

## 4.2 ARCHITECT'S ADMINISTRATION OF THE CONTRACT

- A. The Architect shall be the Owner's representative during the construction period. He shall have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.
- B. The Architect will make frequent visits to the site to familiarize itself generally with the progress and quality of the Work and to determine if the Work is proceeding in accordance with the Contract Documents. Although the Architect is required to make periodic inspections, it is not required to make exhaustive or continuous onsite inspections. On the basis of its observations while at the site, the Architect will keep the Owner informed of the progress of the Work and will endeavor to guard the Owner against defects and deficiencies in the Work. The fact that the Architect has failed to observe a defect or deficiency in the Work shall not relieve the Contractor of its duty to perform the Work in accordance with the Contract Documents.
- C. Communications between the Contractor and the Owner relating to the Work shall be through the Architect. Communications between the Owner or the Contractor with the Architect's consultants relating to the Work shall be through the Architect. Communications between the Owner or the Architect and the Subcontractors relating to the Work shall be through the Contractor. Communications between the Contractor and any separate contractor shall be through the Architect, except as otherwise specified in the Contract Documents.
- D. The Architect will review the Contractor's Payment Requests and determine the amounts due the Contractor in accordance with Section 9.
- E. The Owner and/or the Architect shall have the right to condemn and require removal of the following at the Contractor's expense:
  - 1. Any portion of the Work which does not meet the requirements of the Contract Documents.
  - 2. Any portion of the Work damaged or rendered unsuitable during installation or resulting from failure to exercise proper protection.
- F. The Architect shall have authority to stop the Work, with concurrence of the Owner, whenever such stoppage may be necessary in its reasonable opinion to insure the proper performance of the Work.
- G. The Architect will review the Contractor's submittals such as Product Data, Shop Drawings, Samples, and Mock-ups and shall accept or take other appropriate action regarding the submittals. The Architect's review of the submittals shall be for the limited purpose of checking for general conformance with the Contract Documents and shall not be conducted for the purpose of determining the accuracy and completeness of details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor. The Architect's review of submittals shall not relieve the Contractor of its obligations under the Contract Documents. The Architect's review of submittals shall not constitute acceptance of safety precautions or construction means, methods, techniques, sequences or procedures. The Architect's acceptance of a specific item shall not indicate acceptance of an assembly of which the item is a component.
- H. The Architect has authority to order Construction Change Directives and Field Changes in accordance with Section 7.
- The Architect will conduct inspections to determine the dates of Substantial Completion and final completion, will receive and review written guarantees and related documents required by the Contract and assembled by the Contractor, and will review and approve or reject the Contractor's final payment request.
- J. The Architect shall be the interpreter of the performance and requirements of the Contract Documents. The Architect's interpretations shall be in writing or in the form of drawings.
- K. The Architect's decisions in matters relating to artistic effect will be final if consistent with the Contract Documents.

## SECTION 5 - SUBCONTRACTORS

## 5.1 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

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- A. The Contractor shall enter into contracts with Subcontractors to perform all portions of the Work that the Contractor does not customarily perform with its own employees.
- B. The Contractor shall not contract with any Subcontractor who has been rejected by the Owner. The Contractor will not be required to contract with any Subcontractor against whom it has a reasonable objection.
- C. If the Owner refuses to accept any Subcontractor proposed by the Contractor, the Contractor shall propose an acceptable substitute to whom the Owner has no reasonable objection.
- D. The Contractor shall not make any substitution for any Subcontractor which has been accepted by the Owner and the Architect without the prior written approval of the Owner and the Architect.

## 5.2 SUBCONTRACTUAL RELATIONS

- A. The Contractor's responsibility for the Work includes the work and materials of all Subcontractors including those recommended or approved by the Owner. The Contractor shall be responsible to the Owner for proper completion and guarantee of all workmanship and materials under any subcontracts. Any warranties required for such work shall be obtained by the Contractor in favor of the Owner and delivered to the Architect. It is expressly understood and agreed that there is no contractual relationship between the Owner and any Subcontractor, and under no circumstances shall the Owner be responsible for the non-performance or financial failure of any Subcontractor or any effects therefrom.
- B. The Contractor agrees to pay the Subcontractors promptly upon receipt of payment from the Owner for that portion of the funds received which represents the Subcontractor's portion of the Work completed to the Contractor's satisfaction for which payment was made by the Owner.
- C. The Contractor shall require each Subcontractor to:
  - 1. Be licensed by the state in which the Project is located where such licensing is required by the governing authority;
  - 2. Be bound by the terms of the Contract Documents as far as they are applicable to the Subcontractor's work;
  - 3. Assume toward the Contractor the same obligations the Contractor has assumed toward the Owner, including the prompt payment of its employees, subcontractors, and materialmen;
  - 4. Submit its applications for payment to the Contractor in time to permit the Contractor to make timely application to the Owner;
  - 5. Execute claim or lien releases or lien waivers for payments made by the Contractor; and
  - 6. Make all claims for extra work done or for extensions of time to the Contractor in the same manner as the Contractor is required to make such claims to the Owner.

## SECTION 6 - CONSTRUCTION BY OWNER OR SEPARATE CONTRACTORS

## 6.1 OWNER'S RIGHT TO PERFORM WORK OR AWARD SEPARATE CONTRACTS

- A. The Owner reserves the right to perform work itself or to award other contracts in connection with other portions of the Project.
- B. When separate contracts are awarded for different portions of the Project, "the Contractor" in the Contract Documents in each case shall mean the contractor who signs each separate contract.

## 6.2 MUTUAL RESPONSIBILITY

- A. The Contractor shall afford other contractors reasonable opportunity to place and store their materials and equipment on site and to perform their work and shall properly connect and coordinate its Work with theirs where applicable.
- B. If any part of the Contractor's Work depends upon the work of any other separate contractor for

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proper performance or results, the Contractor shall inspect and promptly report to the Architect any apparent discrepancies or defects in such work that render it unsuitable for such proper performance and results. Failure of the Contractor to so inspect and report shall constitute an acceptance of the work of the other contractor as fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

C. The Contractor shall promptly remedy damage caused by the Contractor or any Subcontractor to the completed or partially completed work of other contractors or to the property of the Owner or other contractors.

## 6.3 OWNER'S RIGHT TO CLEAN UP

If a dispute arises among the Contractor and separate contractors as to the responsibility under their separate contracts for maintaining the Project free from waste materials and rubbish, the Owner may clean up the Project and allocate the cost among those responsible as the Owner and the Architect determine to be just.

## SECTION 7 - CHANGES IN THE WORK

# 7.1 CHANGES IN THE WORK RESULTING FROM AN INSTRUCTION BY THE OWNER OR ARCHITECT TO THE CONTRACTOR

- A. If the Owner or the Architect gives the Contractor an instruction which modifies the requirements of the Contract Documents or delays Substantial Completion of the Work, the Contractor may be entitled to an adjustment in the Contract Sum and/or the Contract Time. If compliance with the instruction affects the cost to the Contractor to perform the Work, the Contract Sum shall be adjusted to reflect such increase or decrease in cost subject to the conditions set forth in Article 7.1, Paragraphs B through F. If compliance with the instruction delays Substantial Completion, the Contract Time shall be extended for a period of time commensurate with such delay subject to the conditions set forth in Article 7.3, Paragraph A and the Contractor shall be paid liquidated damages for the delay as set forth in Article 7.3, Paragraph B.
- B. If the Contractor receives an instruction from the Owner or the Architect which the Contractor considers a Change in the Work, the Contractor before complying with the instruction shall notify the Architect in writing that the Contractor considers such instruction to constitute a Change in the Work. The Contractor agrees that if it complies with the instruction without first giving such written notice to the Architect, the Contractor is not entitled to any adjustment in the Contract Sum or the Contract Time as a result of the instruction and waives any claim therefor.
- C. If the Contractor claims that it is entitled to an adjustment in the Contract Sum (except for costs related to a time extension) as a result of an instruction by the Owner or the Architect, the Contractor shall furnish a proposal for a Change Order containing a price breakdown itemized as required by the Owner. The breakdown shall be in sufficient detail to allow the Owner to determine any increase or decrease in direct costs (materials, labor, equipment, insurance, bonds, and subcontract costs) as a result of compliance with the instruction. Any amount claimed for subcontracts shall be supported by a similar price breakdown and shall itemize the Subcontractors' profit and overhead charges. Profit and overhead shall be subject to the following limitations.
  - 1. The Subcontractors' profit and overhead shall not exceed twelve (12) percent of its direct costs.
  - 2. The Contractor's profit and overhead on work performed by its own crews shall not exceed twelve (12) percent of its direct costs.
  - 3. The Contractor's profit and overhead mark up on work performed by its Subcontractors shall not exceed five (5) percent of the Subcontractor's charges for such work.
  - 4. On credit changes, profit and overhead on the originally estimated work will not be credited back to the Owner.
- D. If the Contractor claims that it is entitled to an adjustment in the Contract Time as a result of an

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instruction from the Owner or the Architect, the Contractor shall include in its proposal justification to support the Contractor's claim that compliance with the instruction will delay Substantial Completion.

- E. The Contractor's proposal for a modification, together with the price breakdown and time extension justification, shall be furnished within ten (10) days of the date the Architect gives written notice requesting the proposal.
- F. If the Contractor is required to perform work which it claims constitutes a Change in the Work but which the Owner and the Architect do not agree constitutes a Change in the Work, the Contractor may submit its claim for additional compensation, additional time, or both as a dispute pursuant to Section 13 within thirty (30) days of completion of the change in the Work. In the event that the Contractor fails to submit its claim for resolution pursuant to Section 13 within thirty (30) days of the completion of the changed work, then the Contractor shall be deemed to acknowledge that the change does not entitle it to additional compensation or time extensions and waives any claim therefor.

## 7.2 CHANGE IN THE WORK RESULTING FROM AN EVENT OR CIRCUMSTANCE

- If an event or circumstance other than an instruction from the Owner or the Architect affects the Α. cost to the Contractor of performing the Work or delays Substantial Completion of the Work, the Contractor may be entitled to an adjustment in the Contract Sum and/or the Contract Time. If the circumstance or event affects the cost to the Contractor to perform the Work and is caused by a wilful or negligent act or omission of the Owner or the Architect, the Contract Sum shall be adjusted to reflect such increase or decrease in cost subject to the conditions set forth in Article 7.2, Paragraphs B through F. If the event or circumstance delays Substantial Completion and is described in Article 7.3, Paragraph A, the Contract Time shall be extended for a period of time commensurate with such delay subject to the conditions set forth in such article. If the circumstance or event delays Substantial Completion of the Work and is caused by a wilful or negligent act or omission of the Owner or the Architect, then the Contractor shall be compensated for costs incident to the delay in accordance with Article 7.3, Paragraph B. The Contractor shall not be entitled to any adjustment to the Contract Sum or other damages from the Owner as a result of any event or circumstance unless the event or circumstance results from a wilful or negligent act or omission of the Owner or the Architect.
- B. If a Change in the Work results from any event or circumstance caused by the wilful or negligent act or omission of the Owner or the Architect, the Contractor shall give the Owner written notice of such event or circumstance within twenty-four (24) hours after commencement of the event or circumstance so that the Owner can take such action as is necessary to mitigate the effect of the event or circumstance. The Contractor shall not be entitled to any adjustment in either the Contract Time or the Contract Sum based on any damages or delays resulting from such event or circumstance during a period more than twenty-four hour prior to the Contractor giving such written notice to the Owner.
- C. The Contractor shall submit any claims for an adjustment in the Contract Time and/or the Contract Sum resulting from a Change in the Work (other than a change resulting from compliance with an instruction from the Owner or Architect) within the time limits set forth below. In the event that the Contractor fails to submit its claim within the limits set forth above, then the Contractor agrees it shall not be entitled to any adjustment in the Contract Time or the Contract Sum or to any other damages from the Owner due to the circumstance or event and waives any claim therefor.
  - 1. Claims for an adjustment in the Contract Time due to inclement weather shall be made by the tenth (10th) of the month following the month in which the delay occurred.
  - 2. Claims for an adjustment in the Contract Time and/or the Contract Sum due to any other circumstance or event shall be submitted within seven (7) days after the occurrence of the circumstance or event.
- D. If the Contractor claims that it is entitled to an adjustment in the Contract Sum (except for costs related to a time extension) because of an event or circumstance resulting from the wilful or

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negligent act or omission of the Owner or the Architect (other than an instruction), the Contractor shall furnish a proposal for a Change Order containing a price breakdown as described in Article 7.1, Paragraph C.

- E. If the Contractor claims that it is entitled to an adjustment in the Contract Time as a result of an event or circumstance, the Contractor shall include with its claim copies of daily logs, letters, shipping orders, delivery tickets, Project schedules, and other supporting information necessary to justify the Contractor's claim that the event or circumstance delayed Substantial Completion. If the Contractor is entitled to a time extension as a result of an event or circumstance caused by the wilful or negligent act or omission of the Owner or the Architect, the Contractor shall be compensated for all costs related to the delay in accordance with Article 7.3, Paragraph B.
- F. Within thirty (30) days after receipt of the Contractor's claim, the Architect shall either approve or deny the claim. If the Architect approves the claim, the adjustment in the Contract Time and/or Contract Sum shall be reflected in a Change Order pursuant to Article 7.5 or a Construction Change Directive pursuant to Article 7.6. If the Architect denies the Contractor's claim, the Contractor may submit its claim as a dispute pursuant to Section 13 within thirty (30) days of receipt of the Architect's denial of the claim. If the Contractor fails to submit its claim for resolution pursuant to Section 13 within the thirty (30) day time period, then the Contractor agrees it is not entitled to any adjustment in the Contract Time and/or Contract Sum or any other damages as a result of the event or circumstance from the Owner and waives any claim therefor.

## 7.3 EXTENSIONS OF TIME

- A. If Substantial Completion of the Project is delayed because of any of the following causes, then the Contract Time shall be extended by Change Order for a period of time equal to such delay.
  - 1. Labor strikes or lock-outs;
  - 2. Inclement weather;
  - 3. Unusual delay in transportation;
  - 4. Unforeseen governmental requests or requirements;
  - 5. A Change in the Work pursuant to Article 7.1; or
  - 6. Any other event or circumstance caused by the wilful or negligent act or omission of the Owner or the Architect.
- B. If any delay referred to in Article 7.3, Paragraph A, subparagraphs 4, 5 or 6 is caused by the wilful or negligent act or omission of the Owner or the Architect, the Contractor shall be paid liquidated damages in the amount per day set forth in the Supplementary Conditions to compensate the Contractor for all damages resulting from the delay, including but not limited to general conditions costs, additional job site costs, additional home office overhead costs, disruption costs, acceleration costs, increase in labor costs, increase in subcontract costs, increase in materials costs, and any other costs incident to the delay. The Contractor shall be entitled to no other compensation relating to the delay.

## 7.4 DOCUMENTATION OF CHANGES IN THE WORK

If the Owner, the Architect and the Contractor reach agreement regarding the adjustment in Contract Sum, if any, and the adjustment in the Contract Time, if any, resulting from a Change in the Work, then the parties shall execute a Change Order pursuant to Article 7.5. If the Owner, the Architect and the Contractor cannot reach agreement regarding the adjustment in Contract Sum or the adjustment in Contract Time resulting from a Change in the Work, then the Owner and the Architect shall issue a Construction Change Directive pursuant to Article 7.6.

## 7.5 CHANGE ORDERS

A. A Change Order is a written instrument prepared by the Architect and signed by the Owner, the Contractor, and the Architect stating their agreement upon the following:

- 1. The occurrence of a Change;
- 2. The amount of the adjustment in the Contract Sum, if any, as a result of the Change; and
- 3. The extent of the adjustment in the Contract Time, if any, as a result of the Change.
- B. The Contractor's signature upon a Change Order is the Contractor's acknowledgment that it is not entitled to any additional adjustment in the Contract Time or the Contract Sum or any other damages or compensation as a result of the Change in the Work other than that provided for in the Change Order, irrespective of whether a subsequent claim for additional compensation or time extensions relating to the Change in the Work is described as a change in the requirements of the Contract Documents, a delay, a disruption of the Work, an acceleration of the Work, an impact on the efficiency of performance of the Work, an equitable adjustment, or other claim and irrespective of whether the impact of the Change in the Work is considered singly or in conjunction with the impact of other Changes in the Work.

## 7.6 CONSTRUCTION CHANGE DIRECTIVES

- A. A Construction Change Directive is a written order, prepared by the Architect and signed by the Owner, stating a proposed basis for adjustment, if any, in the Contract Sum, the Contract Time, or both resulting from a Change in the Work. A Construction Change Directive shall be used to order a Change in the Work if the terms of a Change Order cannot be agreed upon prior to performance of a Change in the work described in Article 7.1 or after the occurrence of an event or circumstance described in Article 7.2.
- B. Upon receipt of a Construction Change Directive, the Contractor shall immediately perform the changed work with due diligence.
- C. Pending final resolution of any adjustment in the Contract Sum or Contract Time relating to a Construction Change Directive, the amounts proposed by the Owner in the Construction Change Directive may be included in the Contractor's Payment Requests once the work relating thereto is completed. Amounts due the Owner as a result of a Construction Change Directive shall be the actual net savings to the Contractor from the Change in the Work as confirmed by the Architect. If both additions and credits are involved in a single Change in the Work, overhead and profit shall be figured on the basis of net increase, if any, related to that Change in the Work.
- D. If after the changed work is completed the Owner, the Architect, and the Contractor reach agreement on adjustments in the Contract Sum, Contract Time, or both, such agreement shall be reflected in an appropriate Change Order.
- E. If the parties do not reach agreement regarding an adjustment to the Contract Sum, Contract Time, or both relating to the Construction Change Directive within thirty (30) days of the completion of the changed work, then the Contractor may submit its claim for an adjustment pursuant to Section 13 within thirty (30) days of the completion of the changed work. In the event that the Contractor fails to submit its claim for resolution pursuant to Section 13 within thirty (30) days of completion of the changed work, then the Contractor shall be deemed to acknowledge that it is not entitled to additional compensation or time extensions resulting from the Change in the Work except as set forth in the Construction Change Directive and waives any claim therefor.

## 7.7 FIELD CHANGES

- A. The Architect is authorized to order minor changes during the course of the Work which will not involve extra cost or time and which are consistent with the general intent of the Contract Documents. Further, the Architect is authorized to order on-the-spot minor Changes in the Work of a value of \$1,000 or less and resulting in no time extension in order to avoid delaying the Work. The price of such Field Change will be mutually agreed upon between the Architect and the Contractor before the Contractor proceeds with the change and shall be recorded on a Field Change form.
- B. The Contractor will proceed with the changed work forthwith. The Field Change will subsequently be reduced to a Change Order.

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## 7.8 WAIVER OF CLAIMS

The Contractor shall not be entitled to any adjustment in the contract Sum or the Contract Time or for any damages of any kind whatsoever resulting from an instruction from the Owner or the Architect, any event or circumstance, or any act or omission of the Owner or Architect and the Contractor expressly waives any and all claims therefor, except as set forth in Articles 7.1. through 7.3.

## **SECTION 8 - TIME**

## 8.1 TIME IS OF THE ESSENCE

All time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work. The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

## 8.2 COMMENCEMENT OF THE WORK

The Contractor shall not commence work on the Project site until the date set forth in the written Notice to Proceed. However, the Contractor may enter into subcontracts and secure material for the Project after receipt of the Agreement with the Owner's authorized signature. The Owner will issue the Notice to Proceed within forty-five (45) days after the Owner receives acceptable bonds and evidence of insurance pursuant to Section 11 unless the Owner earlier terminates the Agreement pursuant to Section 14.

## 8.3 DELAY IN COMPLETION OF THE WORK

- A. For each day after the expiration of the Contract Time that the Work is not substantially complete, the Contractor shall pay the Owner the amount set forth in the Supplementary Conditions as liquidated damages for the Owner's loss of use of the Project and the added administrative expense to the Owner to administer the Project during the period of delay. In addition, the Contractor shall reimburse the Owner for any additional Architect's fees and legal fees incurred by the Owner as a result of the delay. The Owner may deduct any liquidated damages or reimbursable expenses from the money due or to become due to the Contractor. If the amount of liquidated damages and reimbursable expenses exceeds any amounts due to the Contractor, the Contractor shall pay the difference to the Owner within ten (10) days after receipt of a written request from the Owner for payment.
- B. At the time, the Architect certifies the Project is substantially completed, the Architect shall identify the remaining items to be completed for final completion of the Project and shall establish with the Contractor a reasonable time for completion of those items. The items to be completed and the time established for their completion shall be set forth in a Certificate of Substantial Completion. For each day that the Contractor exceeds the time allowed for completion of the items set forth in the Certificate of Substantial Completion, the Contractor shall pay to the Owner as liquidated damages for additional administrative expenses the amount set forth in the Supplementary Conditions. In addition, the Contractor shall reimburse the Owner for any additional Architect's fees and legal fees incurred by the Owner as a result of the delay.

#### SECTION 9 - PAYMENTS AND COMPLETION

## 9.1 SCHEDULE OF VALUES

The Contractor shall submit to the Architect a schedule of values which allocates the Contract Sum to various portions of the Work. The schedule of values shall be supported by such data to substantiate its accuracy as required by the Architect. This schedule, when accepted by the Architect, shall be used as a basis for reviewing the Contractor's payment requests.

## 9.2 PAYMENT REQUESTS

- A. Once each month, the Contractor shall submit to the Architect for its approval a payment request for the estimated value of the Work completed, materials stored on the site, and for materials stored offsite as approved by the Owner as of the date of the payment request as specified in Division 01.
  - 1. The estimate shall be in accordance with the schedule of values submitted by the Contractor.
  - 2. Such payment requests may include requests for payment for Change Orders and for the Changes in the Work which have been authorized by Construction Change Directives, but not yet included in Change Orders.
  - 3. Such payment requests may not include requests for payment of amounts the Contractor does not intend to pay to a Subcontractor because of a dispute or other reason.
- B. The Contractor warrants and guarantees that upon the receipt of payment for work, materials, and equipment covered by each payment request, whether incorporated in the Project or not, title to such work, materials, and equipment shall pass to the Owner free and clear of all liens, claims, security interests, or encumbrances. The Contractor further warrants that no work, material, or equipment covered by a payment request has been acquired by the Contractor or by any other person performing the Work or furnishing material and equipment for the Work, subject to an agreement under which an interest therein or an encumbrance thereon is retained by the seller or otherwise imposed by the Contractor or such other person.

## 9.3 PAYMENT REQUEST APPROVAL

- A. The Architect will, within seven (7) days after receipt of the Contractor's payment request, forward to the Owner the payment request approved for such amount as the Architect determines is properly due, and notify the Contractor and the Owner in writing of the Architect's reasons for withholding certification of any part of the payment request.
- B. The approval of the payment request will constitute a representation by the Architect to the Owner based upon the Architect's observations at the site and the data comprising the payment request, that the Work has progressed to the point indicated and that, to the best of the Architect's knowledge, information, and belief, the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to minor deviations from the Contract Documents correctable prior to completion, and to specific qualifications expressed by the Architect. However, the approval of the payment request shall not constitute a representation that the Architect has:
  - Conducted exhaustive or continuous on-site inspections to check the quantity or quality of the Work;
  - 2. Reviewed construction means, methods, techniques, sequences, or procedures;
  - 3. Reviewed copies of requisitions received from Subcontractors or other data requested by the Owner to substantiate the Contractor's right to payment; or
  - 4. Made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

## 9.4 DECISIONS TO WITHHOLD APPROVAL AND PAYMENT

A. The Architect may disapprove a payment request in whole or in part to the extent reasonably necessary to protect the Owner if, in the opinion of the Architect, the representations to the Owner

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required by Article 9.3, Paragraph B cannot be accurately made. If the Architect is unable to certify payment in the amount of the payment request, the Architect will notify the Contractor and the Owner as provided in Article 9.3, Paragraph A. If the Contractor and the Architect cannot agree on a revised amount, the Architect will promptly approve a payment request for the amount for which the Architect is able to make such representations to the Owner. The Architect may also decide not to certify payment or, because of subsequently discovered evidence or subsequent observations, may nullify the whole or a part of a payment request previously approved, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss because of:

- 1. Defective Work not remedied;
- 2. Third-party claims filed or reasonable evidence indicating probable filing of such claims;
- 3. Failure of the Contractor to make payments properly to Subcontractors for labor, material or, equipment;
- 4. Reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- 5. Damage to the Owner or another contractor for which the Contractor is responsible;
- 6. Reasonable evidence that the Work will not be completed within the Contract Time and that the unpaid balance would not be adequate to cover the cost of completing the Work and actual or liquidated damages for the anticipated delay; or
- 7. The Contractor's persistent failure to carry out the Work in accordance with the Contract Documents.
- B. The Owner reserves the right to withhold payments to the Contractor, subsequent to the Architect's approval of any payment request, in order to protect the Owner from loss due to any condition described in Article 9.4, Paragraph A, Subparagraphs 1 through 7. Upon satisfactory removal of any such grounds for withholding, payments so withheld will be made.

## 9.5 PROGRESS PAYMENTS

- A. Subject to the Owner's right to withhold payment set forth in Article 9.4, Paragraph B, the Owner shall pay to the Contractor ninety (90) percent of the amount certified by the Architect, less previous payment thereon within fifteen (15) days after receipt of the payment request from the Architect. However, at any time after fifty (50) percent of the Work has been completed, the Owner may, at its sole discretion, make any remaining progress payments in full. The Owner shall make payments to the Contractor by placing the payments in the United States mail addressed to the Contractor.
- B. Upon receipt of any payment from the Owner, the Contractor shall pay to each Subcontractor the amount paid to the Contractor on account of such Subcontractor's portion of the Work.
- C. The Contractor shall maintain a copy of each payment request at the Project site for review by the Subcontractors.
- D. No payment made under the Contract, either in whole or in part, shall be construed to be an acceptance of defective or improper materials or workmanship.

#### 9.6 FINAL PAYMENT

- A. The Owner shall make full and final payment of the Contract Sum within thirty (30) days of the completion of all of the following requirements:
  - 1. The Architect has declared to the Owner in writing that the Work is complete;
  - 2. The Architect has received all final lien waivers and/or releases of lien from all Subcontractors;
  - 3. The Architect has received the Affidavit of Contractor and Consent of Surety on the Owner's prescribed form fully executed by the Contractor and its surety; and
  - 4. The Owner has accepted the Work in writing.
- B. Acceptance of final payment by the Contractor or any Subcontractor shall constitute a waiver of claims by that payee except those previously made in writing pursuant to Sections 7, 8, or 9 and

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identified by the Contractor on the Affidavit of Contractor and Consent of Surety as being unsettled at the time of the final payment request.

## SECTION 10 - PROTECTION OF PERSONS AND PROPERTY

## **10.1 SAFETY PRECAUTIONS AND PROGRAMS**

The Contractor shall be responsible to the Owner for initiating and supervising all safety programs in connection with the performance of the Work.

## 10.2 SAFETY OF PERSONS AND PROPERTY

- A. The Contractor shall take reasonable precautions to prevent damage, injury, or loss to:
  - 1. All persons on the site;
  - 2. The Work and materials and equipment to be incorporated into the Work; and
  - 3. Other property at the site or adjacent to it.
- B. The Contractor shall give notices and comply with applicable laws, ordinances, rules, regulations, and other lawful requirements of public authorities bearing on the safety or protection of persons and property.
- C. The Contractor shall designate a responsible member of its organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated in writing by the Contractor to the Owner and the Architect.

## **10.3 EMERGENCIES**

In case of an emergency endangering life or threatening the safety of any person or property, the Contractor may, without waiting for specific authorization from the Architect or the Owner, act at its own discretion to safeguard persons or property. The Contractor shall immediately notify the Architect of such emergency action and make a full written report to the Architect within five (5) days after the event.

## SECTION 11 - INSURANCE AND BONDS

#### 11.1 CONTRACTOR'S LIABILITY INSURANCE

- A. The Contractor shall obtain the following insurance and provide evidence thereof as described below prior to commencement of the Work or within ten (10) days after signing the Agreement, whichever is earlier:
  - 1. Workers Compensation and Employers Liability Insurance with limits and coverages as required by the law of the state in which the Project is located.
  - 2. Commercial General Liability Insurance ISO Form CG 00 01 (10/93) or equivalent Occurrence Policy, with:
    - a. Limits of not less than:
      - 1) \$2,000, 000 General Aggregate;
      - 2) \$2,000, 000 Products Comp/OPS Aggregate:
      - 3) \$1,000, 000 Personal and Advertising Injury:
      - 4) \$1,000, 000 Each Occurrence;
      - 5) \$50,000 Fire Damage (any one fire); and
      - 6) \$5,000 Medical Expense (any one person).
    - b. Endorsements attached thereto including the following or their equivalent:
      - 1) ISO Form CG 25 03 (10/93), Amendment Of Limits of Insurance (Designated Project or Premises), describing the subject Contract and specifying limits as shown above.

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- 2) ISO Form CG 20 10 (10/93), Additional Insured -- Owners, Lessees, Or Contractors (Form B), naming the Owner as an additional insured and containing the following statement: "This Endorsement Also Constitutes Primary Coverage In The Event Of Any Occurrence, Claim, Or Suit".
- c. Automobile Liability Insurance, with:
  - A minimum limit of \$1,000,000 Combined Single Limit per accident; and
     Coverage applying to "Any Auto."
- 3. All-Risk Builders Risk Insurance Policy By owner, Causes of Loss-Special, including Additional Coverage-Collapse and Additional Coverage-Extensions (or equivalent) with Limits of Insurance not less than the Contract Sum. An installation floater may be used, if approved in writing by Owner.
  - a. Policy shall cover materials stored at temporary storage locations and materials in transit.
  - b. Policy shall not cover Flood or Earthquake. Flood and Earthquake coverage will be provided by the Owner.
- c. Include the Owner and all Subcontractors as Insured's with the Contractor on the policy.
- B. The Contractor shall provide evidence of such insurance to the Owner as follows
  - Deliver to the Owner a Certificate of Insurance, on ACORD 25-S (3/93) Form, or equivalent:

     Listing the Owner as a Certificate Holder and Additional Insured on general liability and
     any excess liability policies;
    - b. Listing the endorsements set forth above. (Note: If forms other than ISO forms are used, copies of the non-ISO forms shall be attached to this certificate);
    - c. Identifying the Project;
    - d. Containing a cancellation clause of the certificate amended to read: "Should any of the above described policies be cancelled before the natural expiration date thereof, the issuing company will mail thirty (30) days' written notice to the certificate holder named to the left";
    - e. Listing the Insurance Companies Providing Coverage (All companies listed must be rated "B Class V" or better, except company providing builders risk insurance shall be rated "B+ Class VIII" or better, in the A.M. Best Company Key Rating Guide-Property-Casualty, current edition); and
    - f. Bearing the name, address and telephone number of the "Producer" and an original signature of the authorized representative of the Producer. (Facsimile or mechanically reproduced signatures will not be accepted.)
  - 2. Upon request, provide copy of All-Risk Builder's Risk Insurance Policy for Owner's approval.
- C. The Contractor shall maintain such insurance in effect from the commencement of the Work until the expiration of the time period covered by the warranty specified in Article 12.2, paragraph B. and the completion of any repairs covered by said bonds.
- D. The Owner reserves the right to reject any insurance company, policy, endorsement, or certificate of insurance with or without cause.
- E. The cost of insurance as required above shall be the obligation of the Contractor.

## 11.2 PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND

- A. Prior to commencing the Work or within ten days after signing the Agreement, whichever is earlier, the Contractor shall furnish to the Owner a performance bond and a labor and material payment bond each in an amount equal to one hundred (100) percent of the Contract Sum as security for all obligations arising under the Contract Documents. Such bonds shall:
  1. Bo written on Form AIA Document A312
  - 1. Be written on Form AIA Document A312.
  - Be issued by a surety company or companies licensed in the state in which the Project is located and holding valid certificates of authority under Sections 9304 to 9308, Title 31, of the United States Code as acceptable sureties or reinsurance companies on federal bonds.
  - 3. Have a penal sum obligation not exceeding the authorization shown in the current revision of

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- 4. Be accompanied by a certified copy of the Power of Attorney stating the authority of the Attorney-in-fact executing the bonds on behalf of the Surety.
- B. The Owner reserves the right to reject any surety company, performance bond, or labor and material payment bond with or without cause.
- C. The cost of such bonds as required above shall be the obligation of the Contractor.

## SECTION 12 - UNCOVERING AND CORRECTION OF WORK

## 12.1 UNCOVERING OF WORK

The Contractor shall notify the Architect at least twenty-four (24) hours in advance of performing work which would cover up work or otherwise make it difficult to perform inspections required by the Specifications or by applicable governing authorities. Should any such work be covered without proper notification having been given to the Architect, the Contractor shall uncover that work for inspection at its own expense.

## **12.2 CORRECTION OF WORK**

- A. The Contractor shall promptly correct any portion of the Work which is rejected by the Architect or which fails to conform to the requirements of the Contract Documents, whether observed before or after Substantial Completion and whether or not fabricated, installed, or completed. The Contractor shall bear the costs of correcting such rejected Work, including additional testing and inspection costs, compensation for the Architect's services, and any other expenses made necessary thereby.
- B. The Contractor shall remedy any defects due to faulty materials, equipment, or workmanship which appear within a period of one year from the date of Substantial Completion or within such longer period of time as may be prescribed by law or by the terms of any applicable special warranty required by the Contract Documents. The Contractor shall pay all costs of correcting faulty work, including additional Architect's fees when incurred.
- C. Nothing in the Contract Documents shall be construed to establish a period of limitation within which the Owner may enforce the obligation of the Contractor to comply with the Contract Documents. The one (1) year period specified above has no relationship to the time within which compliance with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations.

## 12.3 ACCEPTANCE OF NONCONFORMING WORK

- A. If the Owner prefers to accept work not in conformance with the Contract Documents, the Owner may do so instead of requiring removal and correction of the nonconforming Work. In that event, the Contract Sum will be reduced by an amount agreed upon by the parties which reflects the difference in value to the Owner between the Work as specified and the nonconforming work. Such adjustment may consider increased maintenance costs, early replacement costs, increased inefficiency of use, etc. and shall be effective whether or not final payment has been made. Such adjustment shall be reflected in a Change Order pursuant to Article 7.5.
- B. Temporary or trial usage by the Owner or the Architect of mechanical devices, machinery, apparatus, equipment, or other work or materials supplied under this Contract prior to written acceptance by the Architect, shall not constitute the Owner's acceptance.

## **SECTION 13 - RESOLUTION OF DISPUTES**

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- A. In the event any claim asserted under Section 7 or any dispute regarding any other provision of the Contract Documents cannot be resolved by agreement between the Owner and the Contractor, either party may submit the claim as a dispute to the Owner's Director of Facilities Management Department (the 'Director') who will review the matter and render a written decision resolving the dispute. A copy of the Director's written decision will be provided to the parties. The decision of the Director will be final and conclusive of the dispute unless within thirty (30) days after the Contractor receives the Director's written decision, the Contractor mails or otherwise delivers to the Director a written notice of appeal addressed to the Presiding Bishopric, Attention: Counselor for Physical Facilities. If a notice of appeal is filed, the Presiding Bishopric shall review the matter and render its written decision regarding the matter and provide a copy thereof to the Contractor. The decision of the Presiding Bishopric shall be final and conclusive of the dispute unless within thirty (30) days after the Contractor receives the Presiding Bishopric's written decision, the Contractor commences legal action for adjudication of the dispute. Submission of the dispute to the Director and the Presiding Bishopric as outlined above is a condition precedent to the right to commence legal action to adjudicate any dispute. In the event that the Contractor commences legal action to adjudicate any dispute without first submitting the dispute to the Director and the Presiding Bishopric, the Owner shall be entitled to obtain an order dismissing the litigation without prejudice and awarding the Owner any costs and attorneys fees incurred by the Owner in obtaining the dismissal. In the event that the Contractor commences legal action to adjudicate a dispute, the decisions of the Director and the Presiding Bishop shall be deemed to be settlement proposals to the Contractor which the Contractor rejected and are admissible as evidence only to extent that settlement negotiations are admissible, but not admissible as evidence of liability. However, the initial action or inaction by the Owner giving rise to the dispute as well as the Owner's initial response to any claim by the Contractor are not settlement proposals and shall be admissible subject to the customary objections provided by law.
- B. Pending final resolution of a dispute hereunder, the Contractor shall proceed diligently with the performance of the Contract and in accordance with the Architect's decision.

#### SECTION 14 - TERMINATION OR SUSPENSION OF THE CONTRACT

#### 14.1 TERMINATION BY THE CONTRACTOR

In the event the Owner materially breaches any term of the Contract Documents, the Contractor may give written notice of the breach to the Owner. If the Owner fails to cure the breach within ten (10) days of the written notice, the Contractor may terminate this Contract by giving written notice to the Owner and recover from the Owner the percentage of the Contract Sum represented by the Work completed as of the date of termination together with any loss other than unearned profits it has sustained with respect to materials and equipment as a result of the termination prior to completion of the Work. The Contractor shall not be entitled to any other compensation or damages as a result of the termination.

#### 14.2 TERMINATION BY THE OWNER FOR CAUSE

Should the Contractor fail to provide the Owner with the bonds and certificate of insurance required by Section 11 within the time specified in Article 11.1 and Article 11.2, make a general assignment for the benefit of its creditors, fail to apply enough properly skilled workmen or specified materials to properly prosecute the Work in accordance with the approved construction schedule, or otherwise materially breaches any provision of the Contract, then the Owner may, without any prejudice to any other right or remedy give the Contractor written notice of Owner's complaint. If the Contractor fails to satisfy the Owner's complaint within ten (10) days, the Owner may terminate the Contract by giving written notice to the Contractor and take possession of the premises and all material, tools, and appliances thereon, and finish the Work by whatever

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method the Owner deems expedient. In such case, the Contractor shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Sum exceeds the expense of finishing the Work, including compensation for additional administrative, architectural, and legal services, such excess shall be paid to the Contractor. If such expense shall exceed the unpaid balance, the Contractor shall pay the difference to the Owner.

## 14.3 TERMINATION BY THE OWNER FOR CONVENIENCE

The Owner may, without cause and in its absolute discretion, terminate the Contract at any time. In the event of such termination, the Contractor shall be entitled to recover from the Owner the percentage of the Contract Sum represented by the Work completed as of the date of termination together with any loss it has sustained other than unearned profits with respect to materials, equipment, and tools as a result of the termination prior to completion of the Work. The Contractor shall not be entitled to any other compensation as a result of the termination.

## SECTION 15 - MISCELLANEOUS PROVISIONS

## 15.1 GOVERNING LAW

The Contract shall be governed by the law of the State where the Project is located.

## 15.2 NO WAIVER

No action or failure to act by the Owner, the Architect, or the Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed in writing.

#### 15.3 AUTHORSHIP

The Owner and the Contractor agree that the Contract Documents shall be deemed to be the product of both the Owner and the Contractor and shall not be construed against either the Owner or the Contractor because of authorship.

#### 15.4 TESTS AND INSPECTIONS

- A. The Owner and the Architect have the right to have tests made when they deem it necessary. Tests conducted by the Owner or the Architect shall be paid for by the Owner. Should a test reveal a failure of the Work to meet Contract Document requirements, the cost of the test as well as subsequent tests related to the failure necessary to determine compliance with the Contract Documents will be paid for by the Owner, with the cost thereof deducted from the Contract Sum by Change Order.
- B. Where necessary, tests shall be made in accordance with recognized standards by a competent, independent testing laboratory. Materials found defective or not in conformity with Contract Document requirements shall be promptly replaced or repaired at the expense of the Contractor.
- C. The Owner and the Architect have the right to obtain samples of materials to be used in the Work and to test samples for determining whether they meet Contract Document requirements. Samples required for testing shall be furnished by the Contractor and selected as directed by the Architect. Samples may be required from the sample's source, point of manufacture, point of delivery, or point of installation at the Architect's discretion. Samples not required as a submittal in a specification section shall be paid for by the Owner. Should tests reveal a failure of the sample to meet

the Contract Document requirements, the Contractor shall provide other samples which comply with the requirements of the Contract Documents.

END OF DOCUMENT

#### ITEM 1 - GENERAL

- 1. Conditions of the Contract apply to each Division of the Specifications.
- 2. Provisions contained in Division 01 apply to Divisions 02 through 49 of the Specifications.

#### ITEM 2 - LIQUIDATED DAMAGE AMOUNTS:

- 1. The amount of liquidated damages to be deducted by Owner from final payment for delays in Substantial Completion of the Work under General Conditions is \$1000 per day.
- 2. The amount of liquidated damages to be deducted by Owner from final payment for delays in completing work itemized on the Substantial Completion Certificate under General Conditions is \$1000 per day.

#### ITEM 3 - UTAH STATE NOTICE OF COMMENCEMENT FILING:

- In compliance with Section 38-1-27 Utah Code Annotated, Contractor shall file with County Clerk of county in which Project is located a Notice of Commencement. Notice shall be filed within 30 days of date of Notice to Proceed. Notice of Commencement shall include, but not be limited to, following
  - a. Name and address of Owner.
  - b. Name and address of Contractor.
  - c. Name and address of surety providing payment bond for Project.
  - d. Project name
  - e. Legal description of Project.
- 2. The parties to the Contract agree that any breach or failure to comply with this Section by the Contractor shall constitute a breach of Contract and the Contractor shall be liable in any direct, indirect, or consequential damages to the Owner flowing from said breach.

#### ITEM 4 - UTAH STATE RETENTION REQUIREMENTS

- 1. Delete Article 9.5, Paragraph A and replace with the following:
  - A. Subject to the Owner's right to withhold payment set forth in General Conditions, the Owner shall pay to the Contractor ninety-five (90) percent of the amount certified by the Architect, less previous payment thereon within twenty (20) days after receipt of the payment request from the Architect. The Owner shall make payments to the Contractor by placing the payments in the United States mail addressed to the Contractor.

#### ITEM 5 - NUMBER OF PROJECT PLANS

1. Replace section 2.1.C number of project plans to 6 sets of project plans.

#### ITEM 6 - CONSTRUCTION WATER

- 1. Only minor amounts of water are available at the job site.
- 2. Water from fire hydrants attached to this water system is to be used for construction purposes with approval from city.

#### ITEM 7 - FIRE PROTECTION

1. Protect site from accidental fire from cutting, welding, smoking, and other sources of ignition. END OF DOCUMENT

## SECTION 011000 - SUMMARY

#### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Work covered by the Contract Documents.
  - 2. Type of the Contract.
  - 3. Work phases.
  - 4. Use of premises.
  - 5. Owner's occupancy requirements.
  - 6. Work restrictions.
  - 7. Specification formats and conventions.
- B. Related Sections include the following:
  - 1. Division 01 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

#### 1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification: Mountain Ridge High School Access Roads
   1. Great Basin Project #23N216
  - 2. Project Location: 14100 Sentinel Ridge Blvd, Herriman UT 84096
- B. Owner: Jordan School District
- C. Architect: Great Basin Engineering, Inc. PO Box 150048, Ogden, Utah
- D. Project Coordinator: Jim Zaugg, Great Basin Engineering has been appointed by Owner to serve as Project Coordinator.
- E. The Work consists of the following:
  - 1. The work includes two work areas of work, a base bid area and an alternate 1 area:
    - a. Base Bid Area South Access Drive: Demolition of south curb and gutter drive and construction of a widened access drive. Work includes grading of the widened access drive and the adjacent hillside. Construction of new partial drive approach, curb and gutter, asphalt paving, concrete sidewalk, landscape and irrigation, relocation of storm drain and fire hydrant.

- 2.
- a. Alternate #1 Area North Access Drive: Demolition of existing north access drive and construction of a new access drive along the north property line. Work includes grading of the new road and relocated detention pond, construction of new drive approach, curb and gutter, asphalt paving, concrete sidewalk, lighting, relocation of electrical switchgear, landscape and irrigation, storm drain work, and earthwork.

## 1.4 TYPE OF CONTRACT

A. Project will be constructed under a single prime contract.

## 1.5 USE OF PREMISES

- A. General: Contractor shall have full use of premises for construction operations, including use of Project site, during construction period. Contractor's use of premises is limited only by Owner's use of roads parking lots, and other adjoining areas for normal business.
- B. Use of Site: Limit use of premises to work areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
  - 1. Owner Occupancy: Allow for Owner occupancy of Project site and use by the public.
  - 2. Driveways and Entrances: Keep loading areas, and at least one entrance serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
    - a. Schedule deliveries to minimize use of driveways and entrances.
    - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Use of Existing Building: Do not use the existing building for any reason during the construction period.

#### 1.6 OWNER'S OCCUPANCY REQUIREMENTS

- A. Full Owner Occupancy: Owner will occupy site and existing building during entire construction period. Adjacent buildings will also be occupied during construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits, unless otherwise indicated.
  - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
  - 2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

#### 1.7 WORK RESTRICTIONS

A. On-Site Work Hours: Work shall be generally performed during normal business working hours of 7:00 a.m. to 7:00 p.m., Monday through Friday, except as indicated otherwise.

- B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
  - 1. Notify Architect not less than two days in advance of proposed utility interruptions.
  - 2. Do not proceed with utility interruptions without Architect's written permission.
- C. Nonsmoking Building: Smoking is not permitted on site.

#### 1.8 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 50division format and CSI/CSC's "Master Format" numbering system.
  - Section Identification: The Specifications use Section numbers and titles to help crossreferencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used.
  - 2. Division 01: Sections in Division 01 govern the execution of the Work of all Sections in the Specifications.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
  - 1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
  - 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
    - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

## SECTION 012200 - UNIT PRICES

## PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for unit prices.
- B. Related Sections include the following:
  - 1. Division 1 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
  - 2. Division 1 Section "Quality Requirements" for general testing and inspecting requirements.

#### 1.3 DEFINITIONS

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

#### 1.4 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, overhead, and profit.
- B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- D. List of Unit Prices: A list of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

## 3.1 LIST OF UNIT PRICES

1. Unit Price No. 1: Remove and replace soft or unstable soils materials and replace with 12" thick layer of structural fill overlain by geo grid and geo textile fabric. Unit cost Per Cubic yard.

END OF SECTION 012200

## SECTION 012300 - ALTERNATES

#### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

#### 1.3 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
  - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
  - 2. The cost for each alternate is the net addition to the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

#### 1.4 PROCEDURES

- A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
  - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.
- C. Execute accepted alternates under the same conditions as other work of the Contract.
- D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

## 3.1 SCHEDULE OF ALTERNATES

A. Alternate #1: All work associated with the improvements to the North entrance drive. Work includes demolition of existing north access drive and construction of a new access drive along the north property line. Work involves grading of the new road and relocated detention pond, construction of new drive approach, curb and gutter, asphalt paving, concrete sidewalk, lighting, relocation of electrical switchgear, landscape and irrigation, storm drain work, and earthwork.

END OF SECTION 012300

## SECTION 012500 - CONTRACT MODIFICATION PROCEDURES

## GENERAL

## 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

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

#### 1.3 MINOR CHANGES IN THE WORK

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

#### 1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
  - 1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
  - 2. Within 7 days after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
    - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    - c. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change.
  - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.

- 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
- 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
- 4. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- 5. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.
- C. Proposal Request Form: Use AIA Document G709 for Proposal Requests.

## 1.5 CHANGE ORDER PROCEDURES

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

## 1.6 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
  - 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
  - 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used).

END OF SECTION 012500

## SECTION 012900 - PAYMENT PROCEDURES

## PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Sections include the following:
  - 1. Division 1 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
  - 2. Division 1 Section "Construction Progress Documentation" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals Schedule.

#### 1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment. Schedule included in the RFP will serve as a Schedule of Values

#### 1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
  - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
    - a. Application for Payment forms with Continuation Sheets.
    - b. Submittals Schedule.
  - 2. Sub-schedules: Where the Work is separated into phases requiring separately phased payments, provide sub-schedules showing values correlated with each phase of payment.
  - 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
- 4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
- 5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
  - a. Differentiate between items stored on-site and items stored off-site. Include evidence of insurance or bonded warehousing if required.
- 6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
- 7. Allowances (if required): Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
- 8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
  - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
- 9. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

### 1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
  - 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
  - 1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
  - 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

- E. Transmittal: Submit 2 signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
  - 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment. AIA Form G706A or equivalent acceptable to Owner.
  - 1. Submit partial waivers on each item for amount requested, before deduction for retainage, on each item.
  - 2. When an application shows completion of an item, submit final or full waivers.
  - 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
  - 4. Waiver Delays: Submit each Application for Payment with Contractor's waiver of mechanic's lien for construction period covered by the application.
    - a. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
  - 5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
  - 1. List of subcontractors.
  - 2. Schedule of Values.
  - 3. Contractor's Construction Schedule (preliminary if not final).
  - 4. Products list.
  - 5. Schedule of unit prices (if any)
  - 6. Submittals Schedule (preliminary if not final).
  - 7. List of Contractor's staff assignments.
  - 8. Copies of building permits.
  - 9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
  - 10. Initial progress report.
  - 11. Report of preconstruction conference.
  - 12. Certificates of insurance and insurance policies if not provided to Owner at contract signing.
  - 13. Performance and payment bonds.
  - 14. Initial settlement survey and damage report if required.
- H. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
  - 1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.

- I. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
  - 1. Evidence of completion of Project closeout requirements.
  - 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
  - 3. Updated final statement, accounting for final changes to the Contract Sum.
  - 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
  - 5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
  - 6. AIA Document G707, "Consent of Surety to Final Payment."
  - 7. Evidence that claims have been settled.
  - 8. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

# SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
  - 1. General project coordination procedures.
  - 2. Conservation.
  - 3. Coordination Drawings.
  - 4. Administrative and supervisory personnel.
  - 5. Project meetings.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Division 1 Section "Summary" for a description of the work and responsibility for coordination activities not in this Section.
  - 2. Division 1 Section "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
  - 3. Division 1 Section "Closeout Procedures" for coordinating Contract closeout.

### 1.3 COORDINATION

- A. Coordination: Contractor shall coordinate its construction operations with those of other contractors in separate phases where required, and entities to ensure efficient and orderly installation of each part of the work. Each contractor shall coordinate its operations with operations of other contractors under this contract or others, included in different Sections that depend on each other for proper installation, connection, and operation.
  - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the work depends on installation of other components, before or after its own installation.
  - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
  - 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. If necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

- 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the work. Such administrative activities include, but are not limited to, the following:
  - 1. Preparation of Contractor's Construction Schedule.
  - 2. Preparation of the Schedule of Values.
  - 3. Installation and removal of temporary facilities and controls.
  - 4. Delivery and processing of submittals.
  - 5. Progress meetings.
  - 6. Pre-installation conferences.
  - 7. Project closeout activities.
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
  - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the work.

## 1.4 SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
  - 1. Indicate relationship of components shown on separate Shop Drawings.
  - 2. Indicate required installation sequences.
  - 3. Refer to Division 26 Section "Basic Electrical Materials and Methods" for specific Coordination Drawing requirements for electrical installations.
- B. Staff Names: Within 5 days of starting construction operations, submit a list of the principal staff assignments, including superintendent and other personnel in attendance at Project site. List addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
  - 1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone.

### 1.5 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

- A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the work.
  - 1. Include special personnel required for coordination of operations with sub-contractors.

### 1.6 PROJECT MEETINGS

Mountain Ridge High School Access Roads GBE Project #23N216

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
  - 1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
  - 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
  - 3. Minutes: The Architect will record significant discussions and agreements achieved and distribute the meeting minutes to everyone concerned, including Owner and Contractor, within 2 days of the meeting.
- B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 7 days after execution of the Agreement unless otherwise directed by Owner. Hold the conference at Jordan School District Auxiliary Services Building. Conduct the meeting to review responsibilities and personnel assignments.
  - 1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  - 2. Agenda: Discuss items of significance that could affect progress, including the following:
    - a. Tentative construction schedule.
    - b. Phasing.
    - c. Critical work sequencing.
    - d. Designation of responsible personnel.
    - e. Procedures for processing field decisions and Change Orders.
    - f. Procedures for processing Applications for Payment.
    - g. Distribution of the Contract Documents.
    - h. Submittal procedures.
    - i. Preparation of Record Documents.
    - j. Use of the premises.
    - k. Responsibility for temporary facilities and controls.
    - I. Parking availability.
    - m. Office, work, and storage areas.
    - n. Equipment deliveries and priorities.
    - o. First aid.
    - p. Security.
    - q. Site Upkeep.
    - r. Working hours.
- C. Pre-installation Conferences: Conduct a pre-installation conference at Project site before construction activities that requires coordination with other construction as a part of weekly progress meetings.
  - 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
  - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
    - a. Contract Documents.

- b. Options.
- c. Related Change Orders.
- d. Purchases.
- e. Deliveries.
- f. Submittals.
- g. Review of mockups.
- h. Possible conflicts.
- i. Compatibility problems.
- j. Time schedules.
- k. Weather limitations.
- I. Manufacturer's written recommendations.
- m. Warranty requirements.
- n. Compatibility of materials.
- o. Acceptability of substrates.
- p. Temporary facilities and controls.
- q. Space and access limitations.
- r. Regulations of authorities having jurisdiction.
- s. Testing and inspecting requirements.
- t. Required performance results.
- u. Protection of construction and personnel.
- 3. Record significant conference discussions, agreements, and disagreements.
- 4. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Conduct progress and coordination meetings at intervals as directed by the Contractor. Coordinate dates of meetings with preparation of payment requests.
  - 1. Attendees: In addition to representatives of Owner and Architect, each subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  - 2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
    - b. Review present and future needs of each entity present, including the following:
      - 1) Interface requirements.
      - 2) Sequence of operations.
      - 3) Status of submittals.
      - 4) Deliveries.
      - 5) Off-site fabrication.
      - 6) Access.
      - 7) Site utilization.

- 8) Temporary facilities and controls.
- 9) Work hours.
- 10) Hazards and risks.
- 11) Progress cleaning.
- 12) Quality and work standards.
- 13) Change Orders.
- 14) Documentation of information for payment requests.
- 3. Reporting: The Architect will prepare meeting minutes and distribute to each party present and to parties who should have been present.
  - a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

## SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

### PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
  - 1. Preliminary Construction Schedule.
  - 2. Contractor's Construction Schedule.
  - 3. Daily construction reports.
  - 4. Field condition reports.
  - 5. Special reports.

#### B. Related Sections include the following:

- 1. Division 1 Section "Payment Procedures" for submitting the Schedule of Values.
- 2. Division 1 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
- 3. Division 1 Section "Submittal Procedures" for submitting schedules and reports.
- 4. Division 1 Section "Quality Requirements" for submitting a schedule of tests and inspections.
- 5. Division 1 Section "Closeout Procedures" for submitting Project Record Documents at Project closeout.

#### 1.3 SUBMITTALS

- A. Preliminary Construction Schedule: Submit **two** printed copies; one a single sheet of reproducible media, and one a print.
- B. Contractor's Construction Schedule: Submitted as part of RFP Response
- C. Daily Construction Reports: Submit one copy at weekly intervals.
- D. Field Condition Reports: Submit one copy at time of discovery of differing conditions.
- E. Special Reports: Submit one copy at time of unusual event.

#### 1.4 QUALITY ASSURANCE

A. Pre-scheduling Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to the Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:

- 1. Discuss constraints, including **phasing**, **storage areas**.
- 2. Review time required for review of submittals and re-submittals.
- 3. Review requirements for tests and inspections by independent testing and inspecting agencies, If required
- 4. Review time required for completion and startup procedures.
- 5. Review and finalize list of construction activities to be included in schedule.
- 6. Review submittal requirements and procedures.
- 7. Review procedures for updating schedule.

### 1.5 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities
- B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
  - 1. Secure time commitments for performing critical elements of the Work including delivery of equipment from parties involved.
  - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

## PART 2 - PRODUCTS

- 2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL
  - A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."
  - B. Time Frame: Extend schedule from date established for commencement of the Work or the Notice to proceed to date of Substantial Completion.
  - C. Activities: Treat each separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
    - Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 30 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
    - 2. Submittal Review Time: Include review and re-submittal times indicated in Division 1 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
    - 3. Startup and Testing Time: Include days for startup and testing as required by the Electrical Consultant.
    - 4. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.

- D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
  - 1. Phasing: Arrange list of activities on schedule by phase or separate areas of the work,
  - 2. Work Restrictions: Show the effect of the following items on the schedule:
    - a. Coordination with existing construction.
    - b. Uninterruptible services.
    - c. Use of premises restrictions.
    - d. Provisions for future construction.
    - e. Seasonal variations.
    - f. Environmental control.
  - 3. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
    - a. Subcontract awards, if any.
    - b. Submittals.
    - c. Purchases.
    - d. Fabrication.
    - e. Sample testing.
    - f. Deliveries.
    - g. Installation.
    - h. Tests and inspections.
    - i. Adjusting.
    - j. Startup and placement into final use and operation.
- E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, Percentage completion milestones and Final Completion.
- F. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis to demonstrate the effect of the proposed change on the overall project schedule.

### 2.2 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
  - 1. List of subcontractors at Project site, if any.
  - 2. List of separate contractors at Project site where applicable
  - 3. Approximate count of personnel at Project site.
  - 4. High and low temperatures and general weather conditions.
  - 5. Accidents.
  - 6. Meetings and significant decisions.
  - 7. Unusual events (refer to special reports).
  - 8. Stoppages, delays, shortages, and losses.
  - 9. Emergency procedures.
  - 10. Orders and requests of authorities having jurisdiction.
  - 11. Change Orders received and implemented.
  - 12. Construction Change Directives received.
  - 13. Services connected and disconnected.

- 14. Equipment or system tests and startups.
- 15. Partial Completions.
- 16. Substantial Completions.
- B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit with a request for information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

### 2.3 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

## PART 3 - EXECUTION

## 3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At weekly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one day before each regularly scheduled progress meeting.
  - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
  - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
  - 3. As the Work progresses, indicate Actual Completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Architect, Owner, sub-contractors, testing and inspecting agencies, if applicable and other parties identified by Contractor with a need-to-know schedule responsibility.
  - 1. Post copies in Project meeting rooms and temporary field offices.
  - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

### SECTION 013300 - SUBMITTAL PROCEDURES

### PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.
- B. Related Sections include the following:
  - 1. Division 1 Section "Payment Procedures" for submitting Applications for Payment.
  - 2. Division 1 Section "Project Management and Coordination" for submitting Coordination Drawings.
  - 3. Division 1 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule and the Submittals Schedule
  - 4. Division 1 Section "Quality Requirements" for submitting test and inspection reports and Delegated-Design Submittals.
  - 5. Division 1 Section "Closeout Procedures" for submitting warranties Project Record Documents and operation and maintenance manuals.

### 1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Architect's responsive action.
- B. Informational Submittals: Written information that does not require Architect's approval. Submittals may be rejected for not complying with requirements.

### 1.4 SUBMITTAL PROCEDURES

- A. General: Electronic copies of CAD Drawings of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
  - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
  - 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

- a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow enough time for submittal review, including time for re-submittals, as follows. Time for review shall commence on **Architect's** receipt of submittal.
  - 1. Initial Review: Allow 7 business days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
  - 2. Concurrent Review: Where concurrent review of submittals by Architect's consultants, Owner, or other parties is required, allow 10 business days for initial review of each submittal.
  - 3. If intermediate submittal is necessary, process it in same manner as initial submittal.
  - 4. Allow 5 additional days for processing each re-submittal.
  - 5. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.
- D. Identification: Place a permanent label or title block on each submittal for identification.
  - 1. Indicate name of firm or entity that prepared each submittal on label or title block.
  - 2. Provide a space approximately **4 by 5 inches** on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
  - 3. Include the following information on label for processing and recording action taken:
    - a. Project name.
    - b. Date.
    - c. Name and address of Architect
    - d. Name and address of Contractor.
    - e. Name and address of subcontractor, if any
    - f. Name and address of supplier.
    - g. Name of manufacturer.
    - h. Unique identifier, including revision number.
    - i. Number and title of appropriate Specification Section.
    - j. Drawing number and detail references, as appropriate.
    - k. Other necessary identification.
- E. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.
- F. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.
  - 1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
  - 2. Additional copies submitted for maintenance manuals will **not** be marked with action taken and will be returned.
- G. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will **return submittals**, **without review**, received from sources other than Contractor.

- 1. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements of the Contract Documents, including minor variations and limitations. Include the same label information as the related submittal.
- 2. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.
- 3. Transmittal Form: Provide locations on form for the following information:
  - a. Project name.
  - b. Date.
  - c. Destination (To:).
  - d. Source (From:).
  - e. Names of subcontractor, manufacturer, and supplier.
  - f. Category and type of submittal.
  - g. Submittal purpose and description.
  - h. Submittal and transmittal distribution record.
  - i. Remarks.
  - j. Signature of transmitter.
- H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- I. Use for Construction: Use only final submittals with mark indicating action taken by Architect in connection with construction.

### PART 2 - PRODUCTS

### 2.1 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
  - 1. Number of Copies: Submit **One Electronic PDF format** copy of each submittal, unless otherwise indicated. Architect will return one marked up copy.
  - 2. Modifications of the number required may be modified by the Architect to fit specific project needs where additional copies may be required for portions of the work.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
  - 1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
  - 2. Mark each copy of each submittal to show which products and options are applicable.
  - 3. Include the following information, as applicable:
    - a. Manufacturer's written recommendations.
    - b. Manufacturer's product specifications.
    - c. Manufacturer's installation instructions.
    - d. Standard color charts.
    - e. Manufacturer's catalog cuts.
    - f. Wiring diagrams showing factory-installed wiring.

- g. Printed performance curves.
- h. Operational range diagrams.
- i. Standard product operating and maintenance manuals.
- j. Compliance with recognized trade association standards.
- k. Compliance with recognized testing agency standards.
- I. Application of testing agency labels and seals.
- m. Notation of coordination requirements.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
  - 1. Preparation: Include the following information, as applicable:
    - a. Dimensions.
    - b. Identification of products.
    - c. Fabrication and installation drawings.
    - d. Roughing-in and setting diagrams.
    - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
    - f. Shop work manufacturing instructions.
    - g. Templates and patterns.
    - h. Schedules.
    - i. Design calculations.
    - j. Compliance with specified standards.
    - k. Notation of coordination requirements.
    - I. Notation of dimensions established by field measurement.
  - 2. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
    - a. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 40 inches.
    - b. Number of Copies: Submit one electronic PDF format copy of each submittal.
- D. Coordination Drawings: Comply with requirements in Division 1 Section "Project Management and Coordination."
- E. Samples: Prepare physical units of materials or products, including the following:
  - 1. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
  - 2. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from the same material to be used for the Work, cured and finished in manner specified, and physically identical with the product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
  - 3. Preparation: Mount, display, or package Samples in manner specified to facilitate review of qualities indicated. Prepare Samples to match Architect's sample where so indicated. Attach label on unexposed side that includes the following:
    - a. Generic description of Sample.
    - b. Product name or name of manufacturer.
    - c. Sample source.

- 4. Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, provide the following:
  - a. Size limitations.
  - b. Compliance with recognized standards.
  - c. Availability.
  - d. Delivery time.
- 5. Submit Samples for review of kind, color, pattern, and texture for a final check of these characteristics with other elements and for a comparison of these characteristics between final submittal and actual component as delivered and installed.
  - a. Refer to individual Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.
- 6. Number of Samples for Initial Selection: Submit two full sets of available choices where establishment of a level of quality is required to be selected from manufacturer's product line. Architect will return submittal with options selected.
- 7. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
  - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
  - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
- F. Product Schedule or List: Prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
  - 1. Type of product. Include unique identifier for each product.
  - 2. Location.
- G. Contractor's Construction Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation" for Construction Manager's action.
- H. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
  - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
  - 2. Number and title of related Specification Section(s) covered by subcontract.
  - 3. Drawing number and detail references, as appropriate, covered by subcontract.

## 2.2 INFORMATIONAL SUBMITTALS

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

- 1. Number of Copies: Submit FOUR copies of each submittal, unless otherwise indicated. Architect will not return copies.
- 2. Certificates and Certifications: Provide a notarized statement that includes signature of Contractor, testing agency, or design professional responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of the company.
- 3. Test and Inspection Reports: Comply with requirements in Division 1 Section "Quality Requirements."
- B. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- C. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements.
- D. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
- E. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements and, where required, is authorized for this specific Project.
- F. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.
- G. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements.
- H. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.
- I. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements.
- J. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements.
- K. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- L. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
  - 1. Name of evaluation organization.
  - 2. Date of evaluation.
  - 3. Time period when report is in effect.

- 4. Product and manufacturers' names.
- 5. Description of product.
- 6. Test procedures and results.
- 7. Limitations of use.
- M. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements in Division 1 Section "Closeout Procedures."
- N. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable.
- O. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
  - 1. Preparation of substrates.
  - 2. Required substrate tolerances.
  - 3. Sequence of installation or erection.
  - 4. Required installation tolerances.
  - 5. Required adjustments.
  - 6. Recommendations for cleaning and protection.
- P. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.
- Q. Material Safety Data Sheets: Submit information directly to Owner. If submitted to Architect, Architect will not review this information but will return it with no action taken.

### PART 3 - EXECUTION

### 3.1 ARCHITECT'S ACTION

- A. General: ARCHITECT WILL NOT REVIEW SUBMITTALS THAT DO NOT BEAR THE CONTRACTOR'S APPROVAL STAMP AND WILL RETURN THEM WITHOUT ACTION.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken.
- C. Informational Submittals: Architect will review each submittal and will not return it, or will reject and return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Submittals not required by the Contract Documents will not be reviewed and may be discarded.

# SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
  - 1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

#### 1.2 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Jordan School District Employees, Architect, Contractors, Subcontractors, testing agencies, and authorities having jurisdiction.
- B. Water Service from Existing System: Water from Owner's existing water system is available for use with required metering from the city and with payment of use charges. Provide connections and extensions of services as required for construction operations.
- C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use after coordination with the owner. Payment of use charges may be required by the owner. Provide connections and extensions of services as required for construction operations.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
- B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
- C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire prevention program.

#### 1.4 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines ICC/ANSI A117.1

### 1.5 PROJECT CONDITIONS

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

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch OD line posts and 2-7/8-inch OD corner and pull posts, with 1-5/8-inch OD top and bottom rails. Provide galvanized-steel bases for supporting posts.
- B. Portable restrooms: Supply portable restrooms for the use of construction workers.

### 2.2 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, selfcontained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
  - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
  - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
  - 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8.

### PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
  - 1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

C. Maintain portable restrooms in a clean and functional state.

## 3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
  - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
  - 1. Connect temporary sewers to private system indicated as directed by authorities having jurisdiction.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- D. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- E. Sanitary Facilities: Provide portable toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- F. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.
- G. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
  - 1. Install electric power service underground unless otherwise indicated.
  - 2. Connect temporary service to Owner's existing power source, as directed by Owner.
- H. Post a list of important telephone numbers.
  - a. Police and fire departments.
  - b. Ambulance service.
  - c. Contractor's home office.
  - d. Contractor's emergency after-hours telephone number.
  - e. Architect's office.
  - f. Engineers' offices.
  - g. Owner's office.
  - h. Principal subcontractors' field and home offices.
  - 2. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

## 3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

- 1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
- 2. Maintain support facilities until Architect Schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.
  - 1. Provide dust-control treatment that is nonpolluting and non-tracking. Reapply treatment as required to minimize dust.
- C. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
  - 1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
  - 2. Prepare sub-grade and install sub-base and base for temporary roads and paved areas according to Section 312000 "Earth Moving."
  - 3. Recondition base after temporary use, including removing contaminated material, re-grading, proof rolling, compacting, and testing.
  - 4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Section 321216 "Asphalt Paving."
- D. Traffic Controls: Comply with requirements of authorities having jurisdiction.
  - 1. Protect existing site improvements to remain including curbs, pavement, and utilities.
  - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- E. Parking: Use designated areas of Owner's existing parking areas for construction personnel.
- F. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
  - 1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
  - 2. Remove snow and ice as required to minimize accumulations.
- G. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
  - 1. Identification Signs: Provide Project identification signs as indicated on Drawings.
  - 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
    - a. Provide temporary, directional signs for construction personnel and visitors.
  - 3. Maintain and touchup signs so they are legible at all times.

- H. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- I. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."
- J. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
  - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- K. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.
  - 1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.
- L. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

### 3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
- C. Temporary Erosion and Sedimentation Control: Comply with requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent and requirements specified in Section 311000 "Site Clearing."
- D. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
- E. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- F. Tree and Plant Protection: Comply with requirements specified in Section 015639 "Temporary Tree and Plant Protection."
- G. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

- H. Site Enclosure Fence: Prior to commencing earthwork, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
  - 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
  - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel.
- I. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.
- J. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- K. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- L. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire prevention program.
  - 1. Prohibit smoking in construction areas.
  - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
  - 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
  - 4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

## 3.5 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
  - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

- 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
- 2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

# SECTION 017300 - EXECUTION

#### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
  - 1. Construction layout.
  - 2. Field engineering and surveying.
  - 3. Installation of the Work.
  - 4. Cutting and patching.
  - 5. Coordination of Owner-installed products.
  - 6. Progress cleaning.
  - 7. Starting and adjusting.
  - 8. Protection of installed construction.
  - 9. Correction of the Work.
- B. Related Requirements:
  - 1. Section 011000 "Summary" for limits on use of Project site.
  - 2. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
  - 3. Section 078413 "Penetration Fire stopping" for patching penetrations in fire-rated construction.

#### 1.2 INFORMATIONAL SUBMITTALS

- A. Certificates: Submit certificate signed by professional engineer certifying that location and elevation of improvements comply with requirements.
- B. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

#### 1.3 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
  - 1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural element during cutting and patching. Do not cut and

patch structural elements in a manner that could change their load-carrying capacity or increase deflection

Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.

Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

2. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
  - For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with requirements of Section 018113.13 "Sustainable Design Requirements - LEED for New Construction and Major Renovations," Section 018113.16 "Sustainable Design Requirements - LEED for Commercial Interiors," Section 018113.19 "Sustainable Design Requirements - LEED for Core and Shell Development," and Section 018113.23 "Sustainable Design Requirements - LEED for Schools."
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
  - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

### PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning site work, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

- 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
- 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
- C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

### 3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect and Construction Manager promptly.
- B. General: Engage a professional **land surveyor** to lay out the Work using accepted surveying practices.
  - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
  - 2. Establish limits on use of Project site.
  - 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
  - 4. Inform installers of lines and levels to which they must comply.
  - 5. Check the location, level and plumb, of every major element as the Work progresses.
  - 6. Notify Architect and Construction Manager when deviations from required lines and levels exceed allowable tolerances.

- 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect and Construction Manager.

### 3.4 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
- B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
  - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
- C. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and site work.
- D. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
  - 1. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

### 3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
  - 1. Make vertical work plumb and make horizontal work level.
  - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
  - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.

- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
  - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
  - 2. Allow for building movement, including thermal expansion and contraction.
  - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

### 3.6 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
  - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of work to be cut.

- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.
- G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
  - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  - 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
  - 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
  - 6. Proceed with patching after construction operations requiring cutting are complete.
- H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
  - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
  - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
- I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

### 3.7 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
  - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
  - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).

- 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
  - 1. Remove liquid spills promptly.
  - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

### 3.8 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements"

# 3.9 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

# SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

## PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
  - 1. Salvaging nonhazardous demolition and construction waste.
  - 2. Recycling nonhazardous demolition and construction waste.
  - 3. Disposing of nonhazardous demolition and construction waste.

#### B. Related Requirements:

- 1. Section 024116 "Structure Demolition" for disposition of waste resulting from demolition of buildings, structures, and site improvements, and for disposition of hazardous waste.
- 2. Section 024119 "Selective Structure Demolition" for disposition of waste resulting from partial demolition of buildings, structures, and site improvements, and for disposition of hazardous waste.
- 3. Section 042000 "Unit Masonry" for disposal requirements for masonry waste.
- 4. Section 044313.13 "Anchored Stone Masonry Veneer" for disposal requirements for excess stone and stone waste.
- 5. Section 044313.16 "Adhered Stone Masonry Veneer" for disposal requirements for excess stone and stone waste.
- 6. Section 311000 "Site Clearing" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

### 1.2 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

## 1.3 PERFORMANCE REQUIREMENTS

## 1.4 ACTION SUBMITTALS

A. Waste Management Plan: Submit plan within 7 days of date established for the Notice of Award.

### 1.5 INFORMATIONAL SUBMITTALS

- A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Include the following information:
  - 1. Material category.
  - 2. Generation points of waste.
  - 3. Total quantity of waste in tons.
  - 4. Quantity of waste salvaged, both estimated and actual in tons.
  - 5. Quantity of waste recycled, both estimated and actual in tons.
  - 6. Total quantity of waste recovered (salvaged plus recycled) in tons.
  - 7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated endof-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- G. Qualification Data: For waste management coordinator.

### 1.6 QUALITY ASSURANCE

- A. Waste Management Coordinator Qualifications: Waste management coordinator may also serve as LEED coordinator.
- B. Waste Management Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination."
#### 1.7 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan according to ASTM E 1609 and requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition site-clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
  - Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
  - 2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
  - 3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
  - 4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
  - 5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
  - 6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

# PART 2 - PRODUCTS (Not Used)

# PART 3 - EXECUTION

#### 3.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible.
- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
  - 1. Distribute waste management plan to everyone concerned.
  - 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
  - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
  - 2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

## 3.2 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Reuse in the Work:
  - 1. Clean salvaged items.
  - 2. Pack or crate items after cleaning. Identify contents of containers.
  - 3. Store items in a secure area until installation.
  - 4. Protect items from damage during transport and storage.
  - 5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- B. Salvaged Items for Owner's Use:
  - 1. Clean salvaged items.
  - 2. Pack or crate items after cleaning. Identify contents of containers.
  - 3. Store items in a secure area until delivery to Owner.
  - 4. Transport items to Owner's storage area designated by Owner.
  - 5. Protect items from damage during transport and storage.

# 3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
  - 1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
    - a. Inspect containers and bins for contamination and remove contaminated materials if found.
  - 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  - 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
  - 4. Store components off the ground and protect from the weather.
  - 5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

#### 3.4 RECYCLING DEMOLITION WASTE

- A. Asphalt Paving: Grind asphalt to maximum 1-1/2-inch size.
- B. Asphalt Paving: Break up and transport paving to asphalt-recycling facility.
- C. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
  - 1. Pulverize concrete to maximum 1-1/2-inch size.
- D. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
  - 1. Pulverize masonry to maximum 1-1/2-inch size.
  - 2. Clean and stack undamaged, whole masonry units on wood pallets.
- E. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- F. Metals: Separate metals by type.
  - 1. Structural Steel: Stack members according to size, type of member, and length.
  - 2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
- G. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.
- H. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.
- I. Conduit: Reduce conduit to straight lengths and store by type and size.

# 3.5 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
  - 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
  - 2. Polystyrene Packaging: Separate and bag materials.
  - 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
  - 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Wood Materials:
  - 1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
  - 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

## 3.6 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
  - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
  - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.
- C. Burning: Burning of waste materials is permitted only at designated areas on Owner's property, provided required permits are obtained. Provide full-time monitoring for burning materials until fires are extinguished.
- D. Disposal: Remove waste materials and dispose of at designated spoil areas on Owner's property.
- E. Disposal: Remove waste materials from Owner's property and legally dispose of them.

## 3.7 SAMPLE FORMS

END OF SECTION 017419

# SECTION 017700 - CLOSEOUT PROCEDURES

#### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
  - 1. Substantial Completion procedures.
  - 2. Final completion procedures.
  - 3. Warranties.
  - 4. Final cleaning.
  - 5. Repair of the Work.

#### B. Related Requirements:

- 1. Section 013233 "Photographic Documentation" for submitting final completion construction photographic documentation.
- 2. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
- 3. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
- 4. Section 017900 "Demonstration and Training" for requirements for instructing Owner's personnel.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For cleaning agents.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

#### 1.3 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest control inspection.

#### 1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

## 1.5 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
  - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
  - 2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
  - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
  - 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Contractor. Label with manufacturer's name and model number where applicable.
    - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Construction Manager's signature for receipt of submittals.
  - 5. Submit test/adjust/balance records.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
  - 1. Advise Owner of pending insurance changeover requirements.
  - 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
  - 3. Complete startup and testing of systems and equipment.
  - 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
  - Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
  - 6. Advise Owner of changeover in heat and other utilities.
  - 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
  - 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
  - 9. Complete final cleaning requirements, including touchup painting.
  - 10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
  - 1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
  - 2. Results of completed inspection will form the basis of requirements for final completion.

# 1.6 FINAL COMPLETION PROCEDURES

- A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:
  - 1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
  - 2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
  - 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
  - 4. Submit pest-control final inspection report and warranty.
  - 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
- B. Inspection: Submit a written request for final inspection to determine acceptance. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
  - 1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

#### 1.7 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
  - 1. Organize list of spaces in sequential order.
  - 2. Submit list of incomplete items in the following format:
    - a. MS Excel electronic file. Architect will return annotated copy.
    - b. PDF electronic file. Architect will return annotated copy.
    - c. One paper copies unless otherwise indicated. Architect will return copies.
    - d. Punch list items to be completed within 30 days of receipt of the punch list by the contractor.

#### 1.8 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
  - 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
  - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
  - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
  - 4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
- C. Provide additional copies of each warranty to include in operation and maintenance manuals.

## PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
  - 1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

#### PART 3 - EXECUTION

#### 3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
  - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

- a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
- b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
- c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
- d. Remove tools, construction equipment, machinery, and surplus material from Project site.
- e. Remove snow and ice to provide safe access to building.
- f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
- g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
- h. Sweep concrete floors broom clean in unoccupied spaces.
- i. Remove labels that are not permanent.
- j. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
- k. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
- I. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
- m. Leave Project clean and ready for occupancy.

#### 3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
  - 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
  - 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.
    - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
  - 3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
  - 4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 017700

# **SECTION 017839 - PROJECT RECORD DOCUMENTS**

PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
  - 1. Record Drawings.
  - 2. Record Specifications.
  - 3. Record Product Data.
- B. Related Requirements:
  - 1. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

#### 1.2 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
  - 1. Number of Copies: Submit one full set of marked-up record prints.
  - 2. Number of Copies: Submit copies of record Drawings as follows:
    - a. Initial Submittal:
      - 1) Submit one paper-copy set of marked-up record prints.
      - 2) Submit PDF electronic files of scanned record prints and one set of file prints.
      - 3) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
    - b. Final Submittal:
      - 1) Submit one paper-copy set of marked-up record prints.
      - 2) Submit PDF electronic files of scanned record prints and one set of prints.
      - 3) Print each drawing, whether or not changes and additional information was recorded.
- B. Record Product Data: Submit one sheet of each submittal.

#### PART 2 - PRODUCTS

#### 2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised Drawings as modifications are issued.

- 1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
  - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
  - b. Record data as soon as possible after obtaining it.
  - c. Record and check the markup before enclosing concealed installations.
- 2. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
- 3. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
- 4. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
  - 1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
  - 2. Format: **DWG** Version
  - 3. Format: Annotated PDF electronic file
  - 4. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
  - 5. Refer instances of uncertainty to Architect through Construction Manager for resolution.
  - 6. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.
- C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
  - 1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
  - 2. Format: Annotated PDF electronic file
  - 3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
  - 4. Identification: As follows:
    - a. Project name.
    - b. Date.
    - c. Designation "PROJECT RECORD DRAWINGS."
    - d. Name of Architect

#### 2.2 RECORD SPECIFICATIONS

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

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

#### 2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
  - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  - 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
  - 3. Note related Change Orders and record Drawings where applicable.
- B. Format: Submit record Product Data as annotated PDF electronic file

## 2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals as PDF electronic file.

# PART 3 - EXECUTION

#### 3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
- B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION 017839

# SECTION 024119 - SITE DEMOLITION

# PART 1 - GENERAL

# 0.1 SUMMARY:

- A. Section includes requirement for demolition work.
  - 1. Verify existing utilities to be removed as well as site features to be demolished with owner and engineer.
- B. Demolition includes, but is not limited to, the removal of the following items within the demolition limit lines:
  - 1. Sidewalks
  - 2. SRW Retaining Walls
  - 3. Curb and Gutter
  - 4. Paving
  - 5. Water Lines and Hydrants
  - 6. Unmarked Trees and all their Roots
  - 7. Tree Stumps and all their Roots
  - 8. Minor Overhead Utility Lines and Poles
  - 9. Sod, Lawn and all irrigated wet soils
  - 10. Shrubs and all their Roots
  - 11. Underground Structures including Septic Tanks, vaults, Basements
- C. Related Sections
  - 1. Refer to Section 02300 for earthwork requirements.
- D. Drawings and general provisions of contract, including general and supplementary Conditions and site clearing specifications apply to work in this section.

# 0.2 SUBMITTALS:

- A. Schedule: Submit proposed methods and operations of demolition to review prior to start of work. Include in schedule coordination for shut-off, capping, and continuation of utility services as required.
- B. Explosives: The use of explosives is not permitted.
- C. Traffic: Conduct demolition operations and removal of debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.
  - 1. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulation.

- D. Protections: Ensure safe passage of persons around area of demolition. Conduct operations to prevent injury to adjacent buildings, structures, other facilities, and persons.
  - 1. Erect temporary covered passageways as required by authorities having jurisdiction.
  - 2. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement or collapse of structures to be demolished and adjacent facilities to remain.
- E. Damage: Promptly repair damage caused to adjacent facilities by demolition operations.
  - 1. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.
- F. Hazardous Materials Removal:
  - 1. When hazardous materials are encountered, notify the Owner immediately.

PART 1 - PRODUCTS

Not used.

- PART 2 EXECUTION
  - A. Demolition:
    - 1. Pollution Controls: Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Comply with governing regulations pertaining to environmental protection.
      - a. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.
      - b. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations, as directed by Architect or governing authorities. Return adjacent areas to condition existing prior to start of work.
  - B. Cutting Asphalt, Concrete and Concrete Block: Saw cut asphalt paving, concrete slabs and concrete block walls with approved saws at lines and levels indicated on drawings. Saw cut concrete walks and curbs only if they cannot be removed to an existing control joint.
  - C. Capping and Abandonment: Cap all abandoned lines and conduits and drains in accordance with requirements of Utility Companies having jurisdiction. Remove abandoned lines, unless otherwise noted.
  - D. Overhead Utility Lines: The Utility companies that own or otherwise control the overhead utility lines, will remove and relocate their poles and overhead utility lines at the Owner's expense. The Contractor shall coordinate these utility changes with the proper utility companies.

- E. Permits: Contractor is required to obtain a Demolition Permit and Utility Disconnection Permits from the City and utility companies.
  - 1. Record on Record Document location and extent of all capped and abandoned lines below grade.
- F. Relocation: Relocate utilities as indicated. Work performed for relocation of utilities to conform to new utility line construction.

# 2.1 DISPOSAL OF DEMOLISHED MATERIALS:

A. General: remove from site debris, rubbish, and other materials resulting from demolition operations and dispose in a legal manner.

# 2.2 BACKFILL

- A. Excavated areas associated with the removal of all substructures should be backfilled with a well-graded granular material having a maximum size of 2 inches and not more than 15 percent passing a #200 sieve. All earth materials placed in excavated areas should be placed in maximum eight inch loose lifts and densified to an in-place unit weight equal to 95% of the Maximum Laboratory Density as determined by ASTM D 1557-78.
  - 1. Refer to section 312000 for placement and compaction requirements.

# END OF SECTION

# SECTION 310700 GENERAL SITE CONSTRUCTION REQUIREMENTS

PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Includes but Not Limited to
  - 1. General procedures and requirements for Site Work.

#### PART 2 - PRODUCTS: Not Used

#### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Site Verification Of Conditions
  - 1. 48 hours minimum prior to performing any work on site, contact Dig Line to arrange for utility location services.
  - 2. Perform minor, investigative excavations to verify location of various existing underground facilities at sufficient locations to assure that no conflict with the proposed work exists and sufficient clearance is available to avoid damage to existing facilities.
  - 3. Perform investigative excavating 5 days minimum in advance of performing any excavation or underground work.
  - 4. Upon discovery of conflicts or problems with existing facilities, notify Architect by phone or fax within 24 hours. Follow telephone or fax notification with letter and diagrams indicating conflict or problem and sufficient measurements and details to evaluate problem.
  - 5. Notify Owner of utilities a minimum of 48 hours prior to an work taking place.
  - 6. Any work required within public Right-of-Ways will require encroachment permit from entity with jurisdiction.

#### 3.2 PREPARATION

- A. Protection
  - 1. Spillage:
    - a. Avoid spillage by covering and securing loads when hauling on or adjacent to public streets or highways.
    - b. Remove spillage and sweep, wash, or otherwise clean project, streets, and highways.
  - 2. Dust Control:

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- a. Take precautions necessary to prevent dust nuisance, both on-site and adjacent to public and private properties.
- b. Correct or repair damage caused by dust.
- 3. Erosion Control:
  - a. Take precautions necessary to prevent erosion and transportation of soil downstream, to adjacent properties, and into on-site or off-site drainage systems.
  - b. Develop, install, and maintain an erosion control plan if required by law.
  - c. Repair and correct damage caused by erosion.
- 4. Existing Plants and Features: Do not damage tops, trunks, and roots of existing trees and shrubs on site which are intended to remain. Do not use heavy equipment within branch spread. Interfering branches may be removed only with permission of Architect. Do not damage other plants and features which are to remain.
- 5. Protect site from fire caused by welding, cutting, smoking, or other sources of ignition.
- B. If specified precautions are not taken or corrections and repairs made promptly, Owner may take such steps as may be deemed necessary and deduct costs of such from monies due to Contractor. Such action or lack of action on Owner's part does not relieve Contractor from responsibility for proper protection of the Work.

#### 3.3 REPAIR / RESTORATION

- A. Adjust existing covers, boxes, and vaults to grade.
- B. Replace broken or damaged covers, boxes, and vaults.
- C. Independently confirm size, location, and number of covers, boxes, and vaults which require adjustment.

#### 3.4 FIELD QUALITY CONTROL

- A. Notify Architect 48 hours prior to performing excavation or fill work.
- B. If work has been interrupted by weather, scheduling, or other reason, notify Architect 24 hours minimum prior to intended resumption of grading or compacting.
- C. Owner reserves right to require additional testing to re-affirm suitability of completed work including compacted soils which have been exposed to adverse weather conditions.

END OF SECTION 310700

# SECTION 311000 - SITE CLEARING

## PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Removing existing trees, shrubs, groundcovers, plants, and grass as indicated on demolition plan.
  - 2. Clearing and grubbing.
  - 3. Stripping and stockpiling topsoil.
  - 4. Removing asphalt and concrete walks, curb and gutter and paving
  - 5. Removing above and below grade site improvements.
  - 6. Disconnecting, capping or sealing, abandoning site utilities in place, and removing site utilities.
  - 7. Temporary erosion and sedimentation control measures.
- B. Related Sections include the following:
  - 1. Division 01 Section "Temporary Facilities and Controls" for temporary utilities, temporary construction and support facilities, temporary security, protection facilities, and temporary erosion and sedimentation control procedures.
  - 2. Division 02 Section "Selective Site Demolition" for demolition of buildings, structures, and site improvements.
  - 3. Division 31 Section "Earth Moving" for soil materials, excavating, backfilling, and site grading.

#### 1.3 DEFINITIONS

- A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other non-soil materials.
- B. Tree Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

#### 1.4 MATERIAL OWNERSHIP

A. Except for stripped topsoil or other materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

#### 1.5 SUBMITTALS

- A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.
- B. Record drawings, according to Division 01 Section "Project Record Documents," identifying and accurately locating capped utilities and other subsurface structural, electrical, and mechanical conditions.

## 1.6 QUALITY ASSURANCE

A. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

# 1.7 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
  - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
  - 2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
  - 1. Do not proceed with work on adjoining property until directed by Architect.
- C. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.
- D. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.
- E. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

#### PART 2 - PRODUCTS

#### 2.1 SOIL MATERIALS

- A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 31 Section "Earth Moving."
  - 1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

# PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Locate and clearly flag trees and vegetation to remain or to be relocated.
- C. Protect existing site improvements to remain from damage during construction.
  - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

## 3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction, sediment and erosion control Drawings, a sediment and erosion control plan, specific to the site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
- B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

#### 3.3 UTILITIES

- A. Owner will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing, when requested by Contractor.
  - 1. Verify that utilities have been disconnected and capped before proceeding with site clearing.
- B. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.
  - 1. Arrange with utility companies to shut off indicated utilities.
  - 2. Owner will arrange to shut off indicated utilities when requested by Contractor.
- C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
  - 1. Notify Architect not less than two days in advance of proposed utility interruptions.
  - 2. Do not proceed with utility interruptions without Architect's written permission.
- D. Excavate for and remove underground utilities indicated to be removed.
- E. Removal of underground utilities is included in Division 21, Division 22, Division 26, Division 27, and Division 28 Sections covering site utilities.

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#### 3.4 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction.
  - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
  - 2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
  - 3. Grind stumps and remove roots, obstructions, and debris extending to a depth of 18 inches below exposed subgrade.
  - 4. Use only hand methods for grubbing within tree protection zone.
  - 5. Remove tree branches and dispose of off-site.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
  - 1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to a density equal to adjacent original ground.

#### 3.5 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.
  - 1. Remove subsoil and non-soil materials from topsoil, including trash, debris, weeds, roots, and other waste materials.
- C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  - 1. Limit height of topsoil stockpiles to 120 inches.
  - 2. Dispose of excess topsoil as specified for waste material disposal.
  - 3. Stockpile surplus topsoil to allow for re-spreading deeper topsoil.

#### 3.6 SITE IMPROVEMENTS

- A. Remove existing above-grade and below-grade improvements as indicated and as necessary to facilitate new construction. Refer to project plans for improvements to be abandoned in place.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
  - 1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.
  - 2. Paint cut ends of steel reinforcement in concrete to remain to prevent corrosion.

# 3.7 DISPOSAL

- A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
  - 1. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.

END OF SECTION 311000

# SECTION 312000 - EARTH MOVING

#### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Refer to the Geotechnical Report titled "Geotechnical Investigation Proposed High School 4600 West 14200 South Herriman, Utah" prepared by AGEC Applied GeoTech dated September 14, 2016, Project No. 1160655 for additional grading requirements.
- 1.2 SUMMARY
- A. This Section includes the following:
  - 1. Preparing sub-grades for slabs on grade, walks, pavements, lawns and grasses, and exterior plants.
  - 2. Excavating and backfilling for buildings and structures.
  - 3. Drainage course for slabs-on-grade.
  - 4. Subbase course for concrete walks and pavements.
  - 5. Subbase and base course for asphalt paving patches.
  - 6. Subsurface drainage backfill for walls and trenches.
  - 7. Excavating and backfilling for utility trenches.
  - 8. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures.
- B. Related Sections include the following:
  - 1. Division 01 Section "Temporary Facilities and Controls" for temporary controls, utilities, and support facilities.
  - 2. Division 03 Section "Cast-in-Place Concrete" for granular course if placed over vapor retarder and beneath the slab-on-grade.
  - 3. Divisions 21, 22, 23, 26, 27, and 28 Sections for installing underground mechanical and electrical utilities and buried mechanical and electrical structures.
  - 4. Division 31 Section "Site Clearing" for temporary erosion and sedimentation control measures, site stripping, grubbing, stripping and stockpiling topsoil, and removal of above-grade and below-grade improvements and utilities.
  - 5. Division 32 Section "Finish Grading and Soil Preparation" and "Sodding" for finish grading, including preparing and placing topsoil and planting soil for lawns.
  - 6. Division 32 Section "Plants" for planting bed establishment and tree and shrub pit excavation and planting.

#### 1.3 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

- 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
- 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Course placed between the subbase course and hot-mix asphalt paving.
- C. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Drainage Course: Course supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
  - 1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices and changes in the work.
  - 2. Bulk Excavation: Excavation more than 10-feet in width and more than 30-feet in length.
  - 3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.
- G. Fill: Soil materials used to raise existing grades.
- H. Rock: Rock material in beds, ledges, un-stratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cubic yard for bulk excavation or 3/4 cubic yard for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:
  - Excavation of Footings, Trenches, and Pits: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch wide, maximum, short-tip-radius rock bucket; rated at not less than 138hp flywheel power with bucket-curling force of not less than 28,090-lbf and stick-crowd force of not less than 18,650-lbf; measured according to SAE J-1179.
  - 2. Bulk Excavation: Late-model, track-mounted loader; rated at not less than 210-hp flywheel power and developing a minimum of 48,510-lbf breakout force with a general-purpose bare bucket; measured according to SAE J-732.
- I. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- J. Subbase Course: Course placed between the subgrade and base course for hot-mix asphalt pavement, or course placed between the subgrade and a cement concrete pavement or a cement concrete or hotmix asphalt walk.
- K. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.
- L. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

#### 1.4 SUBMITTALS

- A. Product Data: For the following:
  - 1. Each type of plastic warning tape.
  - 2. Geotextile.
  - 3. Controlled low-strength material, including design mixture.
- B. Samples: 12-by-12-inch Sample of sub-drainage and other geotextiles used.
- C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
  - 1. Classification according to ASTM D 2487 of each on-site and borrow soil material proposed for fill and backfill.
  - 2. Laboratory compaction curve according to ASTM D698 or ASTM D1557 for each on-site and borrow soil material proposed for fill and backfill.
- D. Blasting Plan: For record purposes and for approval of authorities having jurisdiction.
- E. Seismic Survey Report: For record purposes; from seismic survey agency.
- F. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by earthwork operations. Submit before earthwork begins.

#### 1.5 QUALITY ASSURANCE

- A. Blasting: Comply with applicable requirements in NFPA 495, "Explosive Materials Code," and prepare a blasting plan reporting the following:
  - 1. Types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.
  - 2. Seismographic monitoring during blasting operations.
- B. Seismic Survey Agency: An independent testing agency, acceptable to authorities having jurisdiction, experienced in seismic surveys and blasting procedures to perform the following services:
  - 1. Report types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.
  - 2. Seismographic monitoring during blasting operations.
- C. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.
- D. Pre-excavation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

## 1.6 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated.
  - 1. Notify Architect not less than two days in advance of proposed utility interruptions.
  - 2. Do not proceed with utility interruptions without Architect's written permission.
  - 3. Contact utility-locator service for area where Project is located before excavating.
- B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

# PART 2 - PRODUCTS

# 2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: ASTM D 2487 Soil Classification Groups GW, GP, GM, SW, SP, and SM or AASHTO M 145 Soil Classification Groups A-1, A-2-4, A-2-5, and A-3, or a combination of these groups; free of rock or gravel larger than 3-inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter. Native rock crushed to meet the above requirements and free from significant porosity may also be used as satisfactory soils.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487 or A-2-6, A-2-7, A-4, A-5, A-6, and A-7 according to AASHTO M 145, or a combination of these groups.
  - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- F. Engineered / Structural Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with 4-inch maximum particle size, at least 90 percent passing a 1-1/2-inch sieve, maximum 30 percent passing 3/4-inch sieve, not more than 15 percent passing a No. 200 sieve, a maximum Liquid Limit of fines of 35 and a maximum Plastic Index of 15.
- G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 3/4-inch sieve and not more than 8 percent passing a No. 200 sieve.

- H. Drainage Course: Narrowly graded mixture of washed or crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.
- I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No. 4 sieve.
- J. Sand: ASTM C 33; fine aggregate, natural, or manufactured sand.
- K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

## 2.2 GEOTEXTILES

- A. Subsurface Drainage Geotextile: Non-woven needle-punched geotextile, manufactured in the USA for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
  - 1. Survivability: Class 2; AASHTO M 288.
  - 2. Grab Tensile Strength: 157 lbf; ASTM D 4632.
  - 3. Sewn Seam Strength: 142 lbf; ASTM D 4632.
  - 4. Tear Strength: 56 lbf; ASTM D 4533.
  - 5. Puncture Strength: 56 lbf; ASTM D 4833.
  - 6. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
  - 7. Permittivity: 0.2 per second, minimum; ASTM D 4491.
  - 8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.
- B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made in the USA from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
  - 1. Survivability: Class 2; AASHTO M 288.
  - 2. Grab Tensile Strength: 247 lbf; ASTM D 4632.
  - 3. Sewn Seam Strength: 222 lbf; ASTM D 4632.
  - 4. Tear Strength: 90 lbf; ASTM D 4533.
  - 5. Puncture Strength: 90 lbf; ASTM D 4833.
  - 6. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
  - 7. Permittivity: 0.02 per second, minimum; ASTM D 4491.
  - 8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

## 2.3 CONTROLLED LOW-STRENGTH MATERIAL

- A. Controlled Low-Strength Material: Low-density, self-compacting, flowable concrete material as follows:
  - 1. Portland Cement: ASTM C 150, Type II.
  - 2. Fly Ash: ASTM C 618, Class C or F.
  - 3. Normal-Weight Aggregate: ASTM C 33, 3/4-inch to 3/8-inch nominal maximum aggregate size.
  - 4. Foaming Agent: ASTM C 869.
  - 5. Water: ASTM C 94/C 94M.

- 6. Air-Entraining Admixture: ASTM C 260.
- B. Produce low-density, controlled low-strength material made in the USA with the following physical properties:
  - 1. As-Cast Unit Weight: 30 to 36 lb/cu. ft. at point of placement, when tested according to ASTM C 138/C 138M.
  - 2. Compressive Strength: 80 psi , when tested according to ASTM C 495.

#### 2.4 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured in the USA for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:
- B. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured in the USA for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows when required by utility purveyor:
  - 1. Red: Electric.
  - 2. Yellow: Gas, oil, steam, and dangerous materials.
  - 3. Orange: Telephone and other communications.
  - 4. Blue: Water systems.
  - 5. Green: Sewer systems.

#### PART 3 - EXECUTION

# 3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Division 31 Section "Site Clearing."
- C. Protect and maintain erosion and sedimentation controls, which are specified in Division 31 Section "Site Clearing," during earthwork operations.
- D. Provide protective insulating materials to protect subgrades and foundation soils against freezing temperatures or frost.

#### 3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
  - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
  - 2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

#### 3.3 EXPLOSIVES

- A. Explosives: Obtain written permission from authorities having jurisdiction and from architect and owner before bringing explosives to Project site or using explosives on Project site.
  - 1. Perform blasting without damaging adjacent structures, property, or site improvements.
  - 2. Perform blasting without weakening the bearing capacity of rock subgrade and with the leastpracticable disturbance to rock to remain.

## 3.4 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
  - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
  - 2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:
    - a. 24 inches outside of concrete forms other than at footings.
    - b. 12 inches outside of concrete forms at footings.
    - c. 6 inches outside of minimum required dimensions of concrete cast against grade.
    - d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
    - e. 6 inches beneath bottom of concrete slabs on grade.
    - f. 6 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 inches wide.

#### 3.5 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
  - 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
  - 2. Pile Foundations: Stop excavations 6 to 12 inches above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.

3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

# 3.6 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

## 3.7 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
  - 1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.
  - 1. Clearance: 12 inches each side of pipe or conduit.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
  - 1. For pipes and conduit less than 6 inches in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
  - 2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
  - 3. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

#### 3.8 SUBGRADE INSPECTION

- A. Notify Architect when excavations have reached required subgrade.
- B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Proof-roll subgrade below the building slabs and pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
  - 1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
  - 2. Proof-roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons or vehicle with similar unit axel weight.

- 3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.
- D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices and changes in the Work.
- E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

#### 3.9 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.
  - 1. Fill unauthorized excavations under other construction or utility pipe as directed by Architect.

## 3.10 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  - 1. Stockpile soil materials away from edge of excavations.

#### 3.11 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
  - 1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
  - 2. Surveying locations of underground utilities for Record Documents.
  - 3. Testing and inspecting underground utilities.
  - 4. Removing concrete formwork.
  - 5. Removing trash and debris.
  - 6. Removing temporary shoring and bracing, and sheeting.
  - 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
- B. Place backfill on subgrades free of mud, frost, snow, or ice.

#### 3.12 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

- C. Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 03 Section "Cast-in-Place Concrete."
- D. Provide 4-inch- thick, concrete-base slab support for piping or conduit less than 12 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase.
- E. Place and compact initial backfill of subbase material or satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the utility pipe or conduit.
  - 1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- F. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches over the utility pipe or conduit.
- G. Backfill voids with satisfactory soil while installing and removing shoring and bracing.
- H. Place and compact final backfill of satisfactory soil to final subgrade elevation.
- I. Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final subgrade elevation.
- J. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

#### 3.13 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
  - 1. Under grass and planted areas, use satisfactory soil material.
  - 2. Under walks and pavements, use satisfactory soil material.
  - 3. Under steps and ramps, use engineered fill.
  - 4. Under building slabs, use engineered fill.
  - 5. Under footings and foundations, use engineered fill.
- C. Place soil fill on subgrades free of mud, frost, snow, or ice.

#### 3.14 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
  - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.

2. Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

# 3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 12-inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers. Reduce loose depths as needed to achieve required compactions.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698 or ASTM D 1557:
  - 1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
  - 2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent.
  - 3. Under lawn or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
  - 4. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent if in landscaping areas or 95 percent if under structures, pavements, or walks.
  - 5. Under structure, buildings slabs, steps, pavements and walkways placed on five or more feet of fill scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 98 percent.

#### 3.16 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
  - 1. Provide a smooth transition between adjacent existing grades and new grades.
  - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
  - 1. Lawn or Unpaved Areas: Plus or minus 1 inch.
  - 2. Walks: Plus or minus 1 inch
  - 3. Pavements: Plus or minus 1/2 inch
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

## 3.17 SUBSURFACE DRAINAGE

- A. Subdrainage Pipe: Specified in Division 33 Section "Subdrainage."
- B. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches of filter material, placed in compacted layers 6 inches thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
  - 1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 698 with a minimum of two passes of a plate-type vibratory compactor.
- C. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick. Overlay drainage backfill with 1 layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
  - 1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 698 with a minimum of two passes of a plate-type vibratory compactor].
  - 2. Place and compact impervious fill over drainage backfill in 6-inch- thick compacted layers to final subgrade.

#### 3.18 SUBBASE AND BASE COURSES

- A. Place subbase and base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase and base course under pavements and walks as follows:
  - 1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends where called for on details and on plans.
  - 2. Place base course material over subbase course under hot-mix asphalt pavement.
  - 3. Shape subbase and base course to required crown elevations and cross-slope grades.
  - 4. Place subbase and base course 6 inches or less in compacted thickness in a single layer.
  - 5. Place subbase and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
  - 6. Compact subbase and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698 or ASTM D 1557.
- C. Pavement Shoulders: Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 698 or ASTM D 1557 where called for on project plans.

# 3.19 DRAINAGE COURSE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-ongrade as follows:
  - 1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
  - 2. Place drainage course 6 inches or less in compacted thickness in a single layer.
  - 3. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
  - 4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

#### 3.20 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.
- C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.
- D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
  - 1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least 1 test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than 3 tests.
  - 2. Foundation Wall Backfill: At each compacted backfill layer, at least 1 test for each 100 feet or less of wall length, but no fewer than 2 tests.
  - 3. Trench Backfill: At each compacted initial and final backfill layer, at least 1 test for each 150 feet or less of trench length, but no fewer than 2 tests.
- E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

#### 3.21 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
  - 1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
  - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

# 3.22 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.
- B. Disposal: Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Architect.
  - 1. Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 312000

### SECTION 315000 - EXCAVATION SUPPORT AND PROTECTION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

A. Section includes temporary excavation support and protection systems.

#### B. Related Sections:

- 1. Division 01 Section "Construction Progress Documentation" for recording preexisting conditions and excavation support and protection system progress.
- 2. Division 01 Section "Temporary Facilities and Controls" for temporary utilities and support facilities.

### 1.3 PERFORMANCE REQUIREMENTS

- A. Design, furnish, install, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting soil and hydrostatic pressure and superimposed and construction loads.
  - 1. Delegated Design: Design excavation support and protection system, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
  - 2. Prevent surface water from entering excavations by grading, dikes, or other means.
  - 3. Install excavation support and protection systems without damaging existing buildings, structures, and site improvements adjacent to excavation.
  - 4. Monitor vibrations, settlements, and movements.

#### 1.4 SUBMITTALS

- A. Shop Drawings: For excavation support and protection system.
- B. Delegated-Design Submittal: For excavation support and protection system indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Coordinate first paragraph below with qualification requirements in Division 01 Section "Quality Requirements." Qualification Data: For qualified professional engineer.
- D. Other Informational Submittals:
  - 1. Photographs or Videotape: Show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by the absence of, the installation of, or the performance of excavation support and protection systems. Submit before Work begins.
  - 2. Record Drawings: Identifying and locating capped utilities and other subsurface structural, electrical, or mechanical conditions.

a. Note locations and capping depth of wells and well points.

### 1.5 QUALITY ASSURANCE

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review methods and procedures related to excavation support and protection system including, but not limited to, the following:
    - a. Geotechnical report.
    - b. Existing utilities and subsurface conditions.
    - c. Proposed excavations.
    - d. Proposed equipment.
    - e. Monitoring of excavation support and protection system.
    - f. Working area location and stability.
    - g. Coordination with waterproofing.
    - h. Abandonment or removal of excavation support and protection system.

### 1.6 PROJECT CONDITIONS

- A. Interruption of Existing Utilities: Do not interrupt any utility serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:
  - 1. Notify Architect no fewer than two days in advance of proposed interruption of utility.
  - 2. Do not proceed with interruption of utility without Architect's, Construction Manager's, and Owner's written permission.
- B. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by geotechnical engineer. Owner will not be responsible for interpretations or conclusions drawn from the data.
  - 1. Make additional test borings and conduct other exploratory operations necessary for excavation support and protection.
  - 2. The geotechnical report is referenced elsewhere in the Project Manual.
- C. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.
  - 1. During installation of excavation support and protection systems, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify Architect if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

A. General: Provide materials that are either new or in serviceable condition and made in the USA.

### 2.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.
  - 1. Shore, support, and protect utilities encountered.
- B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
  - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- C. Locate excavation support and protection systems clear of permanent construction so that forming and finishing of concrete surfaces are not impeded.
- D. Monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open. Promptly correct bulges, breakage, or other evidence of movement to ensure that excavation support and protection systems remain stable.
- E. Promptly repair damages to adjacent facilities caused by installing excavation support and protection systems.
- F. Install wood lagging within flanges of soldier piles as excavation proceeds. Trim excavation as required to install lagging. Fill voids behind lagging with soil, and compact.
- G. Install wales horizontally at locations indicated on Drawings and secure to soldier piles.

## 2.3 BRACING

- A. Bracing: Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.
  - 1. Do not place bracing where it will be cast into or included in permanent concrete work unless otherwise approved by Architect.
  - 2. Install internal bracing, if required, to prevent spreading or distortion of braced frames.
  - 3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

### 2.4 REMOVAL AND REPAIRS

- A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils or damaging structures, pavements, facilities, and utilities.
  - 1. Remove excavation support and protection systems to a minimum depth of 48 inches below overlaying construction and abandon remainder.
  - 2. Fill voids immediately with approved backfill compacted to density specified in Division 31 Section "Earth Moving."
  - 3. Repair or replace, as approved by Architect, adjacent work damaged or displaced by removing excavation support and protection systems.
- B. Leave excavation support and protection systems permanently in place.

END OF SECTION 315000

# SECTION 321216 - ASPHALT PAVING

# PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

## A. Section Includes:

- 1. Cold milling of existing hot-mix asphalt pavement.
- 2. Hot-mix asphalt patching.
- 3. Asphalt surface treatments.
- 4. Pavement-marking paint.
- 5. Traffic-calming devices.
- B. Related Sections:
  - 1. Division 02 Section "Selective Site Demolition" for demolition, removal, and recycling of existing asphalt pavements, and for geotextiles that are not embedded within courses of asphalt paving.
  - 2. Division 31 Section "Earth Moving" for aggregate subbase and base courses and for aggregate pavement shoulders.
  - 3. Division 32 Sections for other paving installed as part of crosswalks in asphalt pavement areas.
  - 4. Division 32 Section "Concrete Paving Joint Sealants" for joint sealants and fillers at paving terminations.

## 1.3 UNIT PRICES

A. Work of this Section is affected by unit prices and as defined in Division 1.

## 1.4 DEFINITION

A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.

## 1.5 SUBMITTALS

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
  - 1. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
  - 2. Job-Mix Designs: For each job mix proposed for the Work.

- B. Shop Drawings: Indicate pavement markings, lane separations, and defined parking spaces. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.
- C. Samples: For each paving fabric, 12 by 12 inches minimum if used.
- D. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:
  - 1. Each paving fabric, 12 by 12 inches minimum.
  - 2. Each type and color of preformed traffic-calming device.
  - 3. Each pattern and color of imprinted asphalt and precut marking material.
- E. Qualification Data: For qualified manufacturer and Installer.
- F. Material Certificates: For each paving material, from manufacturer.
- G. Material Test Reports: For each paving material.

# 1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Provide copy of manufactures experience for verification of qualifications.
- B. Installer Qualifications: Imprinted-asphalt manufacturer's authorized installer who is trained and approved for installation of imprinted asphalt required for this Project.
- C. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.
- D. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of city and DOT for asphalt paving work.
  - 1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.
- E. Preinstallation Conference: Conduct conference at Project site
  - 1. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:
    - a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
    - b. Review condition of subgrade and preparatory work.
    - c. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
    - d. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.
- B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

## 1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
  - 1. Tack Coat: Minimum surface temperature of 60 deg F.
  - 2. Slurry Coat: Comply with weather limitations in ASTM D 3910.
  - 3. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
  - 4. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.
- B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials 55 deg F for water-based materials, and not exceeding 95 deg F.

# PART 2 - PRODUCTS

## 2.1 AGGREGATES

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.
- B. Coarse Aggregate: ASTM D 692, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.
- C. Fine Aggregate: ASTM D 1073 or AASHTO M 29, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.
  - 1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.
- D. Mineral Filler: ASTM D 242 or AASHTO M 17, rock or slag dust, hydraulic cement, or other inert material.

## 2.2 ASPHALT MATERIALS

A. Asphalt Cement: AC 20 per ASTM D 3381 for viscosity-graded material except use ductility at 39.2 deg. F., >5 for AC 20 and delete the loss on heating requirement on residue from "Thin-Film Oven Test".

- B. Prime Coat: Not required if paving is done within 48 hours of final compaction.
- C. Tack Coat: ASTM D 977 or AASHTO M 140 emulsified asphalt, or ASTM D 2397 or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.
- D. Fog Seal: ASTM D 977 or AASHTO M 140 emulsified asphalt, or ASTM D 2397 or AASHTO M 208 cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.
- E. Water: Potable.
- F. Undersealing Asphalt: ASTM D 3141, pumping consistency.

# 2.3 AUXILIARY MATERIALS

- A. Herbicide: Commercial chemical for weed control, registered by the EPA. Provide in granular, liquid, or wettable powder form.
- B. Sand: ASTM D 1073 or AASHTO M 29, Grade Nos. 2 or 3.
- C. Paving Geotextile: AASHTO M 288, nonwoven polypropylene; resistant to chemical attack, rot, and mildew; and specifically designed for paving applications.
- D. Joint Sealant: ASTM D 6690 or AASHTO M 324, Type I Type II or III Type IV, hot-applied, single-component, polymer-modified bituminous sealant.
- E. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with AASHTO M 248, Type N, Type F, and Type S; colors complying with FS TT-P-1952.
  - 1. Color: White, Yellow, Blue, and As indicated.
- F. Pavement-Marking Paint: MPI #32 Alkyd Traffic Marking Paint.
  - 1. Color: White, Yellow, Blue, and As indicated.
- G. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, Type II, with drying time of less than 45 minutes.
  - 1. Color: White, Yellow, Blue, and As indicated.
- H. Pavement-Marking Paint: MPI #97 Latex Traffic Marking Paint.
  - 1. Color: White, Yellow, Blue, and As indicated.
- I. Glass Beads: AASHTO M 247, Type 1.
- J. Wheel Stops: Precast, air-entrained concrete, 2500-psi minimum compressive strength, 4-1/2 inches high by 9 inches wide by 72 inches. Provide chamfered corners, drainage slots on underside, and holes for anchoring to substrate.
  - 1. Dowels: Galvanized steel, 3/4-inch diameter, 20-inch minimum length.

## 2.4 MIXES

- A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction; **designed** according to procedures in AI MS-2, "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types"; and complying with the following requirements:
  - 1. Provide mixes with a history of satisfactory performance in geographical area where Project is located. Provide mix with the following characteristics:
    - a. Number of compaction blows each end of specimen: 50.
    - b. Satiability based on ASTM D5581: 1200 minimum.
    - c. Flow in 0.01-inch units per ASTM D5581: 10-18.
    - d. Voids in mineral aggregate VMA: 14.
    - e. The percentage of bituminous material by weight added to aggregate will be between 4% and 7% of the weight of the bituminous mixture.
  - 2. Surface Course: 3-inch minimum compacted thickness and as indicated on the drawings with aggregate meeting the following gradation table:
    - 3/4 inch 100  $\frac{1}{2}$  inch 74-99 3/8 inch 69-91 49-65 No. 4 No. 8 33-47 No. 16 21-35 No. 50 6-18 No. 200 2-6
- B. Emulsified-Asphalt Slurry: ASTM D 3910, Type 1.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to begin paving.
- B. Verify that the road base has been properly compacted and is at the correct line, grade, and slope.
- C. Verify that the road base thickness is as indicated on the project plans.
- D. Verify that sufficient depth at curbs, walks, lips and other vertical edges is available to place the required thickness of compacted asphalt.
- E. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
  - 1. Completely proof-roll subgrade in one direction. Limit vehicle speed to 3 mph.
  - 2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons or other vehicle with similar axel weight.
  - 3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

F. Proceed with paving only after unsatisfactory conditions have been corrected. Mountain Ridge High School Access Roads

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G. Verify that utilities, traffic loop detectors, and other items requiring a cut and installation beneath the asphalt surface have been completed and that asphalt surface has been repaired flush with adjacent asphalt prior to beginning installation of imprinted asphalt.

# 3.2 PATCHING

- A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.
- B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseat concrete pieces firmly.
  - 1. Pump hot undersealing asphalt under rocking slab until slab is stabilized or, if necessary, crack slab into pieces and roll to reseat pieces firmly.
  - Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Recompact existing unbound-aggregate base course to form new subgrade.
- C. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd.
  - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
  - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
- D. Patching: Fill excavated pavements with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.
- E. Patching: Partially fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

## 3.3 REPAIRS

- A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch in existing pavements.
  - 1. Install leveling wedges in compacted lifts not exceeding 3 inches thick.
- B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch.
  - 1. Clean cracks and joints in existing hot-mix asphalt pavement.
  - 2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.
  - 3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.

## 3.4 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
- B. Herbicide Treatment: Not used.
- C. Prime Coat: Do not use if paving takes place not more than 48 hours after final compaction and grading of road bases. If paving must be delayed significantly, re-grade and re-compact road base or apply Prime Coat. Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.15 to 0.50 gal./sq. yd. Apply enough material to penetrate and seal but not flood surface. Allow prime coat to cure.
  - 1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
  - 2. Protect primed substrate from damage until ready to receive paving.
- D. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd.
  - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
  - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings.
  - 3. Remove and replace items damaged by overspray or clean affected surfaces as directed by architect at no additional cost to owner.

## 3.5 HOT-MIX ASPHALT PLACING

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
  - 1. Place hot-mix asphalt surface course in single lift if design thickness is less than 3-inches. If design thickness is more than 3-inches, place in multiple lifts with a minimum thickness of 1.5-inches and a maximum thickness of 3-inches.
  - 2. Spread mix at minimum temperature of 250 deg F.
  - 3. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
  - 4. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.
  - 1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

# 3.6 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
  - 1. Clean contact surfaces and apply tack coat to joints.
  - 2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
  - 3. Offset transverse joints, in successive courses, a minimum of 24 inches.
  - 4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations.".
  - 5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
  - 6. Compact asphalt at joints to a density within 2 percent of specified course density.

# 3.7 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
  - 1. Complete compaction before mix temperature cools to 185 deg F.
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hotmix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
  - 1. Average Density: 96 percent of the laboratory Marshal Mix design density according to ASTM D 1559.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.
- F. Place asphalt so that final compacted asphalt is even with lip of gutter on curbs that drain away from the curb and gutter (open face or depressed curb and gutter). Place asphalt so that final compacted asphalt is 1/4-inch above lip of gutter on curbs that carry water (slope of parking lot is towards the curb). In transition areas, use extra care to make sure that no ponds, bird baths, or depressions are left after paving.
- G. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
- H. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

I. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

## 3.8 INSTALLATION TOLERANCES

- A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
  - 1. Surface Course: Plus 1/4 inch, no minus.
- B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
  - 1. Surface Course: 1/8 inch.
  - 2. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.
- C. After paving is complete, pour water on paved areas and identify ponds, bird baths, and depressions. Identify the same at open face and transition sections of curb and gutter. Remove and replace asphalt, curb and gutter, road base, and or sub-base as necessary to fix ponds, bird baths, or depressions at no additional cost to owner.

## 3.9 SURFACE TREATMENTS

- A. Fog Seals: Apply fog seal at a rate of 0.10 to 0.15 gal./sq. yd. to existing asphalt pavement and allow to cure. With fine sand, lightly dust areas receiving excess fog seal.
- B. Slurry Seals: Apply slurry coat in a uniform thickness according to ASTM D 3910 and allow curing.
  - 1. Roll slurry seal to remove ridges and provide a uniform, smooth surface.

## 3.10 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow paving to age for 7 days minimum days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.
  - 1. Broadcast glass beads uniformly into wet pavement markings at a rate of 6 lb/gal.
- E. Color
  - 1. Yellow: Parking stalls and pedestrian crossings.
  - 2. Blue: Handicap insignia at appropriate stalls.
  - 3. Red: Fire lanes and no parking areas.
  - 4. White: Directional arrows.

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### 3.11 WHEEL STOPS

A. Securely attach wheel stops to pavement with not less than two galvanized-steel dowels embedded at one-quarter to one-third points. Securely install dowels into pavement and bond to wheel stop. Recess head of dowel beneath top of wheel stop.

## 3.12 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.
- C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- D. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979 or AASHTO T 168.
  - 1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
  - 2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726. Cores will also be measured for compacted thickness. The owner and architect may also direct additional cores to be taken at locations of their choosing to verify final pavement thickness.
    - a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than 3 cores taken.
    - b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.
    - c. Coordinate the time and locations of all holes so that cores may be filled.
- E. The contractor will replace and compact hot-mix asphalt where core tests were taken.
- F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

## 3.13 DISPOSAL

- A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.
  - 1. Do not allow milled materials to accumulate on-site.

## END OF SECTION 321216

# SECTION 321313 - CONCRETE PAVING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

- A. This Section includes exterior cement concrete pavement for the following:
  - 1. Walkways.
- B. Related Sections include the following:
  - 1. Division 03 Section "Cast-in-Place Concrete" for general building applications of concrete.
  - 2. Division 31 Section "Earth Moving" for subgrade preparation, grading, and subbase course.
  - 3. Division 32 Section "Concrete Paving Joint Sealants" for joint sealants of joints in concrete pavement and at isolation joints of concrete pavement with adjacent construction.

### 1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

### 1.4 SUBMITTALS

- A. Product Data: For each type of manufactured material and product indicated.
- B. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Samples: 10-lb sample of exposed aggregate.
- D. Qualification Data: For manufacturer and testing agency.
- E.Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:

- 1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.
- F.Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:
  - 1. Cementitious materials.
  - 2. Steel reinforcement and reinforcement accessories.
  - 3. Fiber reinforcement.
  - 4. Admixtures.
  - 5. Curing compounds.
  - 6. Applied finish materials.
  - 7. Bonding agent or epoxy adhesive.
  - 8. Joint fillers.
- G. Field quality-control test reports.
- H. Minutes of preinstallation conference.

## 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.
  - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- B. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
  - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
- C. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.
- D. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- E.Mockups: Cast mockups of full-size sections of concrete pavement to demonstrate typical joints, surface finish, texture, color, and standard of workmanship.
  - 1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
  - 2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
  - 3. Obtain Architect's approval of mockups before starting construction.
  - 4. Maintain approved mockups during construction in an undisturbed condition as a standard for judging the completed pavement.
  - 5. Demolish and remove approved mockups from the site when directed by Architect.

- 6. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- F.Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."
  - 1. Before submitting design mixtures, review concrete pavement mixture design and examine procedures for ensuring quality of concrete materials and concrete pavement construction practices. Require representatives, including the following, of each entity directly concerned with concrete pavement, to attend conference:
  - a. Contractor's superintendent.
  - b. Independent testing agency responsible for concrete design mixtures.
  - c. Ready-mix concrete producer.
  - d. Concrete pavement subcontractor.

### 1.6 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

### PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
  - 2. Products: Subject to compliance with requirements, provide one of the products specified.
  - 3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
  - 4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

### 2.2 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
  - 1. Use flexible or curved forms for curves with a radius 100 feet or less.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

## 2.3 STEEL REINFORCEMENT

- A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
- B. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.
- C. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.
- D. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60, deformed bars; assembled with clips.

E.Plain Steel Wire: ASTM A 82.

F.Deformed-Steel Wire: ASTM A 496.

- G. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60. Cut bars true to length with ends square and free of burrs.
- H. Tie Bars: ASTM A 615/A 615M, Grade 60, deformed.
- I. Hook Bolts: ASTM A 307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against pavement form and in position during concreting operations,
- and

to permit removal without damage to concrete or hook bolt.

- J. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete, and as follows:
  - 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
  - 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

# 2.4 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout the Project:
  - 1. Portland Cement and as specified in Division 3 except that for exterior concrete, the minimum compressive strength is 4000 psi at 28 days.
- B. Normal-Weight Aggregates: ASTM C 33, coarse aggregate, uniformly graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar pavement applications and service conditions using similar aggregates and cementitious materials.
  - 1. Maximum Coarse-Aggregate Size: 1 inch nominal.
  - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

- C. Exposed Aggregate: Selected, hard, and durable; washed; free of materials with deleterious reactivity to cement or that cause staining; from a single source, with gap-graded coarse aggregate as follows:
  - 1. Aggregate Sizes: 3/4 to 1 inch nominal.
  - 2. Aggregate Source, Shape, and Color and as required by the architect.
- D. Water: ASTM C 94/C 94M.

E.Air-Entraining Admixture: ASTM C 260.

- F.Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
  - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
  - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
  - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
  - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
  - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
  - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

## 2.5 FIBER REINFORCEMENT

- A. Synthetic Fiber: Monofilament or fibrillated polypropylene fibers engineered and designed for use in concrete pavement, complying with ASTM C 1116, Type III, 1/2 to 1-1/2 inches long.
  - 1. Products:
  - a. Monofilament Fibers:
    - 1) Axim Concrete Technologies; Fibrasol IIP.
    - 2) Euclid Chemical Company (The); Fiberstrand 100.
    - 3) FORTA Corporation; Forta Mono.
    - 4) Grace, W. R. & Co.--Conn.; Grace MicroFiber.
    - 5) Metalcrete Industries; Polystrand 1000.
    - 6) SI Concrete Systems; Fibermix Stealth.
  - b. Fibrillated Fibers:
    - 1) Axim Concrete Technologies; Fibrasol F.
    - 2) FORTA Corporation; Forta.
    - 3) Euclid Chemical Company (The); Fiberstrand F.
    - 4) Grace, W. R. & Co.--Conn.; Grace Fibers.
    - 5) SI Concrete Systems; Fibermesh.

## 2.6 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.

- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.
  - 1. Products:
  - a. Axim Concrete Technologies; Cimfilm.
  - b. Burke by Edeco; BurkeFilm.
  - c. ChemMasters; Spray-Film.
  - d. Conspec Marketing & Manufacturing Co., Inc.; Aquafilm.
  - e. Dayton Superior Corporation; Sure Film.
  - f. Euclid Chemical Company (The); Eucobar.
  - g. Kaufman Products, Inc.; Vapor Aid.
  - h. Lambert Corporation; Lambco Skin.
  - i. L&M Construction Chemicals, Inc.; E-Con.
  - j. MBT Protection and Repair, ChemRex Inc.; Confilm.
  - k. Meadows, W. R., Inc.; Sealtight Evapre.
  - I. Metalcrete Industries; Waterhold.
  - m. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
  - n. Sika Corporation, Inc.; SikaFilm.
  - o. Symons Corporation; Finishing Aid.
  - p. Vexcon Chemicals, Inc.; Certi-Vex EnvioAssist.

E.Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

- 1. Products:
- a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
- b. Burke by Edoko; Aqua Resin Cure.
- c. ChemMasters; Safe-Cure Clear.
- d. Conspec Marketing & Manufacturing Co., Inc.; W.B. Resin Cure.
- e. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
- f. Euclid Chemical Company (The); Kurez DR VOX.
- g. Kaufman Products, Inc.; Thinfilm 420.
- h. Lambert Corporation; Aqua Kure-Clear.
- i. L&M Construction Chemicals, Inc.; L&M Cure R.
- j. Meadows, W. R., Inc.; 1100 Clear.
- k. Nox-Crete Products Group, Kinsman Corporation; Resin Cure E.
- I. Symons Corporation; Resi-Chem Clear.
- m. Tamms Industries Inc.; Horncure WB 30.
- n. Unitex; Hydro Cure 309.
- o. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.

F.White Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B.

1. Products:

Anti-Hydro International, Inc.; AH Curing Compound #2 WP WB.

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- b. Burke by Edoco; Resin Emulsion White.
- c. ChemMasters; Safe-Cure 2000.
- d. Conspec Marketing & Manufacturing Co., Inc.; W.B. Resin Cure.
- e. Dayton Superior Corporation; Day-Chem White Pigmented Cure (J-10-W).
- f. Euclid Chemical Company (The); Kurez VOX White Pigmented.
- g. Kaufman Products, Inc.; Thinfilm 450.
- h. Lambert Corporation; Aqua Kure-White.
- i. L&M Construction Chemicals, Inc.; L&M Cure R-2.
- j. Meadows, W. R., Inc.; 1200-White.
- k. Symons Corporation; Resi-Chem White.
- I. Tamms Industries, Inc.; Horncure 200-W.
- m. Unitex; Hydro White.
- n. Vexcon Chemicals, Inc.; Certi-Vex Enviocure White 100.

### 2.7 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.
- B. Color stain: Match Architect's sample or as selected by Architect from manufacturer's full range of stains.
- C. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.
- D. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- E.Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to requirements, and as follows:
  - 1. Types I and II, non-load bearing and types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- F.Chemical Surface Retarder: Water-soluble, liquid-set retarder with color dye, for horizontal concrete surface application, capable of temporarily delaying final hardening of concrete to a depth of 1/8 to 1/4 inch.
  - 1. Products:
  - a. Burke by Edeco; True Etch Surface Retarder.
  - b. ChemMasters; Exposee.
  - c. Conspec Marketing & Manufacturing Co., Inc.; Delay S.
  - d. Euclid Chemical Company (The); Surface Retarder S.
  - e. Kaufman Products, Inc.; Expose.
  - f. Metalcrete Industries; Surftard.
  - g. Nox-Crete Products Group, Kinsman Corporation; Crete-Nox TA.
  - h. Scofield, L. M. Company; Lithotex.
  - i. Sika Corporation, Inc.; Rugasol-S.
  - j. Vexcon Chemicals, Inc.; Certi-Vex Envioset.

- G. Pigmented Mineral Dry-Shake Hardener: Factory-packaged dry combination of portland cement, graded quartz aggregate, color pigments, and plasticizing admixture. Use color pigments that are finely ground, nonfading mineral oxides interground with cement.
  - 1. Products:
  - a. Conspec Marketing & Manufacturing Co., Inc.; Conshake 600 Colortone.
  - b. Dayton Superior Corporation; Quartz Tuff.
  - c. Euclid Chemical Company (The); Surflex.
  - d. Lambert Corporation; Colorhard.
  - e. L&M Construction Chemicals, Inc.; Quartz Plate FF.
  - f. MBT Protection and Repair, ChemRex Inc.; Mastercron.
  - g. Metalcrete Industries; Floor Quartz.
  - h. Scofield, L. M. Company; Lithochrome Color Hardener.
  - i. Symons Corporation; Hard Top.
  - 2. Color: Match Architect's sample or as selected by Architect from manufacturer's full range.
- H. Rock Salt: Sodium chloride crystals, kiln dried, coarse gradation with 100 percent passing 3/8inch sieve and 85 percent retained on a No. 8 sieve.

### 2.8 PAVEMENT MARKINGS

- A. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with FS TT-P-115, Type I or II or AASHTO M 248, Type N or F.
  - 1. Color: White, Yellow, Blue. See Section 321216 for color locations.
- B. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, with drying time of less than 45 minutes.
  - 1. Color: White, Yellow, Blue. See Section 321216 for color locations.
- C. Glass Beads: AASHTO M 247, Type 1.

### 2.9 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.
  - 1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.
- B. Proportion mixtures to provide normal-weight concrete with the following properties:
  - 1. Compressive Strength (28 Days): 4000 psi
  - 2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45
  - 3. Select slump limit from options in subparagraph below or revise to suit Project.
  - 4. Slump Limit: 4 inches, plus or minus 1 inch.

- C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:
  - 1. Air Content: 5-8 percent nominal maximum aggregate size.
- D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

E.Chemical Admixtures: Use admixtures according to manufacturer's written instructions.

- 1. Use water-reducing admixture, high-range, water-reducing admixture, high-range, water-reducing and retarding admixture, plasticizing, and retarding admixture in concrete, as required, for placement and workability.
- 2. Specify admixtures as part of submittal. Verify that admixtures proposed do not adversely effect stained concrete and will not modify colors of stain.
- 3. Coordinate acceptability of admixtures with architect.

F.Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements as follows:

- 1. Fly Ash or Pozzolan: 25 percent.
- 2. Ground Granulated Blast-Furnace Slag: 50 percent.
- 3. Combined Fly Ash or Pozzolan, and Ground Granulated Blast-Furnace Slag: 50 percent, with fly ash or pozzolan not exceeding 25 percent.
- G. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than 1.0 lb/cu. yd. where specified and approved in mix submittal.
- H. Color Stain: Add stain to concrete per manufacturers recommendations and to meet color required by architect and owner on areas of stained concrete.

### 2.10 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates for each batch discharged and used in the Work.
  - When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
  - 1. For concrete mixes of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
  - 2. For concrete mixes larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.

3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

# PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- B. Proof-roll prepared subbase surface below concrete pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.
  - 1. Completely proof-roll subbase in one direction. Limit vehicle speed to 3 mph.
  - 2. Proof-roll with a loaded 10-wheel tandem-axle dump truck weighing not less than 15 tons or similar axel weight vehicle.
  - 3. Subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch require correction according to requirements in Division 31 Section "Earth Moving."
- C. Proceed with concrete pavement operations only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

### 3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

### 3.3 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

### 3.4 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

- D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- E.Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap of adjacent mats.

### 3.5 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
  - 1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.
  - 1. Continue steel reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
  - 2. Provide tie bars at sides of pavement strips where indicated.
  - 3. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
  - 4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
  - Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
  - 1. Locate expansion joints at intervals of 50 feet, unless otherwise indicated.
  - 2. Extend joint fillers full width and depth of joint.
  - 3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
  - 4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
  - 5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
  - 6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated, but not more than 12-feet apart. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:

- 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
- Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

E.Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated.

Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of

F.Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

# 3.6 CONCRETE PLACEMENT

joint.

- A. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E.Do not add water to concrete during delivery or at Project site.

F.Do not add water to fresh concrete after testing.

- G. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- H. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
  - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

I. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.

- 1. Remove and replace concrete that has been placed for more than 15 minutes without being covered by top layer, or use bonding agent if approved by Architect.
- J. Screed pavement surfaces with a straightedge and strike off.
- K. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.
- L.Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
  - When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
  - 2. Do not use frozen materials or materials containing ice or snow.
  - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.
- M. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
  - Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  - 2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
  - 3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

## 3.7 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.
- B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
  - 1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
  - 2. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

- 3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating floatfinished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.
- 4. Coordinate with architect the locations of each type of finish.

# 3.8 SPECIAL FINISHES

- A. Monolithic Exposed-Aggregate Finish: Expose coarse aggregate in pavement surfaces as follows:
  - 1. Immediately after float finishing, spray-apply chemical surface retarder to pavement according to manufacturer's written instructions.
  - 2. Cover pavement surface with plastic sheeting, sealing laps with tape, and remove when ready to continue finishing operations.
  - 3. Without dislodging aggregate, remove excess mortar by lightly brushing surface with a stiff, nylon-bristle broom.
  - 4. Fine-spray surface with water and brush. Repeat water flushing and brushing cycle until cement film is removed from aggregate surfaces to depth required.
- B. Coordinate the locations of finishes with the architect and owner prior to placing concrete.

# 3.9 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.
- C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- E.Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
  - 1. Moist Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
  - a. Water.
  - b. Continuous water-fog spray.
  - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
  - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

# 3.10 PAVEMENT TOLERANCES

- A. Comply with tolerances of ACI 117 and as follows:
  - 1. Elevation: 1/4 inch.
  - 2. Thickness: Plus 3/8 inch, minus 1/4 inch.
  - 3. Surface: Gap below 10-foot-long, unleveled straightedge not to exceed 1/4 inch.
  - 4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch.
  - 5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch.
  - 6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch.
  - 7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches.
  - 8. Joint Spacing: 3 inches.
  - 9. Contraction Joint Depth: Plus 1/4 inch, no minus.
  - 10. Joint Width: Plus 1/8 inch, no minus.
  - 11.

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## 3.11 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
  - 1. Testing Frequency: Obtain at least 1 composite sample for each 100 cu. yd. or 5000 sq. ft. or fraction thereof of each concrete mix placed each day.
  - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
  - 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
  - 3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
  - 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
  - 5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
  - 6. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.

- a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.
- C. Strength of each concrete mix will be satisfactory if average of any 3 consecutive compressivestrength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- E.Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- F.Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
- G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.
- H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

## 3.12 REPAIRS AND PROTECTION

- A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.
- B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.
- C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

# SECTION 321373 - CONCRETE PAVING JOINT SEALANTS

### PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Expansion and contraction joints within cement concrete pavement.
  - 2. Joints between cement concrete and asphalt pavement.
- B. Related Sections include the following:
  - 1. Division 07 Section "Joint Sealants" for sealing nontraffic and traffic joints in locations not specified in this Section.
  - 2. Division 32 Section "Asphalt Paving" for constructing joints between concrete and asphalt pavement.
  - 3. Division 32 Section "Concrete Paving" for constructing joints in concrete pavement.

### 1.3 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Verification: For each type and color of joint sealant required. Install joint-sealant samples in 1/2-inch wide joints formed between two 6-inch long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance for a minimum of 5-years.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- C. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants, as determined by Architect.

- 1. Use manufacturer's standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
- 2. Submit not fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
- 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
- 4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
- 5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

# 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials to comply with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

## 1.6 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
  - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
  - 2. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (4.4 deg C).
  - 3. When joint substrates are wet or covered with frost.
  - 4. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
  - 5. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

## 2.2 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

# 2.3 COLD-APPLIED JOINT SEALANTS

- A. Multi-component Non-sag Urethane Sealant:
  - 1. Products:
    - a. Sikaflex 2c NS; Sika Corporation or approved equal (Sooneborn NP-2, Tremco 240, Pecora Dynatrol 2).
  - 2. Type and Grade: M (multi-component) and NS (non-sag).
  - 3. Class: 25.
  - 4. Additional Movement Capability: 50 percent movement in extension and 50 percent in compression for a total of 100 percent movement.
  - 5. Use Related to Exposure: NT (non-traffic) and T (Traffic).
  - 6. Uses Related to Joint Substrates: M, G, A, O, I.
  - 7. Applications: Exterior and interior joints and gaps in vertical and horizontal surfaces. Submerged or immersion grade applications also apply.
- B. Multicomponent Jet-Fuel-Resistant Sealant for Concrete: Pourable, chemically curing elastomeric formulation complying with the following requirements for formulation and with ASTM C 920 for type, grade, class, and uses indicated:
  - 1. Urethane Formulation: Type M; Grade P; Class 12-1/2; Uses T, M, and, as applicable to joint substrates indicated, O.
    - a. Products:
      - 1) Pecora Corporation; Urexpan NR-300; Sikaflex 2c SL.
- C. Single-Component Jet-Fuel-Resistant Urethane Sealant for Concrete: Single-component, pourable, coal-tar-modified, urethane formulation complying with ASTM C 920 for Type S; Grade P; Class 25; Uses T, M, and, as applicable to joint substrates indicated, O.
  - 1. Products:
    - a. Sonneborn, Div. of ChemRex, Inc.; Sonomeric 1; Sikaflex 1a.
- D. Type NS Silicone Sealant for Concrete: Single-component, low-modulus, neutral-curing, nonsag silicone sealant complying with ASTM D 5893 for Type NS.
  - 1. Products:
    - a. Crafco Inc.; RoadSaver Silicone.
    - b. Dow Corning Corporation; 888.
- E. Type SL Silicone Sealant for Concrete and Asphalt: Single-component, low-modulus, neutral-curing, self-leveling silicone sealant complying with ASTM D 5893 for Type SL.
  - 1. Products:

a. Crafco Inc.; RoadSaver Silicone SL. **Mountain Ridge High School Access Roads** GBE Project #23N216 b. Dow Corning Corporation; 890-SL.

## 2.4 JOINT-SEALANT BACKER MATERIALS

- A. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint-sealant manufacturer based on field experience and laboratory testing.
- B. Round Backer Rods for Cold- and Hot-Applied Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

### 2.5 PRIMERS

A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

### PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.
- B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

## 3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install backer materials of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

- 1. Do not leave gaps between ends of backer materials.
- 2. Do not stretch, twist, puncture, or tear backer materials.
- 3. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.
- D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
  - 1. Place sealants so they directly contact and fully wet joint substrates.
  - 2. Completely fill recesses provided for each joint configuration.
  - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
  - 1. Remove excess sealants from surfaces adjacent to joint.
  - 2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.
- F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions, unless otherwise indicated.
- G. Provide recessed joint configuration for silicone sealants of recess depth and at locations indicated.

# 3.4 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

## 3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations with repaired areas are indistinguishable from the original work.

## END OF SECTION 321373
## SECTION 32 84 00 - IRRIGATION SYSTEMS

PART I - GENERAL

### 1.1 SUMMARY

- A. SECTION INCLUDES
  - 1. Complete irrigation system including all valves, piping, sprinkler heads, drip emitters, tubing, accessories, controls, and wiring.
- B. RELATED SECTIONS
  - 1. Section 31 2000 Earth Moving
  - 2. Section 32 9300 Landscape Planting
  - 3. Section 33 0000 Utilities

#### 1.2 REFERENCES

- A. American Society of Testing Materials (ASTM):
  - 1. D1784 Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
  - 2. D2241 Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
  - 3. D2466 Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40

#### 1.3 SYSTEM REQUIREMENTS

- A. Irrigation systems to be furnished and installed a subcontract to section 32 9300 –Landscape planting.
- B. IRRIGATION HEAD LAYOUT
  - 1. Design location of irrigation heads may be adjusted slightly in the field as necessary to meet actual site conditions, existing head layout, and to avoid planting and obstructions such as utility boxes, signs light poles and fire hydrants.
- C. MINIMUM WORKING PRESSURE
  - 1. Mainline piping with a minimum working pressure of 150 psig.
  - 2. Circuit and drain piping with a minimum working pressure of 100 psig.

## 1.4 SUBMITTALS

- A. Product data including pressure loss, pressure rating, rated capacity, and electrical data of the following equipment to be used on the project:
  - 1. Manual and automatic control valves
  - 2. Quick coupler valves
  - 3. Valve boxes and vaults
  - 4. Wire, wire connectors and grounding equipment

- 5. Pipe sleeves, circuit pipe, mainline pipe, and drain pipe, fittings and restraints.
- B. Maintenance data for inclusion in "Operating and Maintenance Manual"
  - 1. Automatic control valves
  - 2. Sprinklers
  - 3. Flow Sensor
  - 4. Backflow Preventer
- C. Record Drawings
  - 1. Record Drawings shall be furnished to the Landscape Architect at the time of Substantial Completion Inspection before a letter of Substantial Completion for the irrigation sprinkler system will be Issued.
  - 2. Provide name and phone number of the servicing water purveyor, include the name of the installer and the date irrigation work was completed.
  - 3. Indicate locations, sizes and kinds of equipment installed.
  - 4. Provide dimensions from two points of reference for the following items:
    - a. Remote Control Valves
    - b. Quick Couplers
    - c. Pressure Main Lines
    - d. Manual Drain Valves and Sumps
    - e. Control Wire (When not in mainline trench)
    - f. Note and identify location(s) of existing utility systems as encountered during installation, i.e.; gas, phone, sewer, etc.
    - g. Lateral Lines when deviated from plan
    - h. Sleeves and sizes
    - i. Control wire conduit and size
    - j. Flush Valves
- D. Color coded drawing of the irrigation system, 11x17", indicating valve numbers and the area covered. Laminate drawing and mount drawing on the wall near the irrigation controller.
- 1.5 QUALITY ASSURANCE
  - A. Comply with requirements of water utility service
  - B. Comply with all applicable codes, laws and ordinances that apply to irrigation systems.
  - C. Installer Qualifications: Irrigation contractor must have a minimum of 5 years of experience and has completed 5 irrigation systems of similar size using similar materials. Irrigation contractor shall be able to supply proof of a successful performance record.
  - D. Listing, labeling
    - 1. Listing, label or other marking on equipment that has been made to specific standards.
    - 2. Listing and Labeling: Equipment, specialties, and accessories that are listed and labeled.
    - 3. The Terms "Listed" and "Labeled": As defined in "National Electrical Code," Article 100.
    - Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
  - E. Product Options: The design of irrigation head spacing, pipe sizing, and valving is based on specific manufacturers and models. Substitutions may be considered provided that the proposed substituted equipment is equal in performance, throw radius, flow rates, and pressure ratings.

Substituted equipment may not be cause for a redesign of any portion of the irrigation system. The burden of proof of product equality is on the Contractor. The Landscape Architect will make a determination of any proposed substitutions prior to the bid. No requests for substitutions will be reviewed after bids have been received by the Owner.

## 1.6 PROJECT CONDITIONS

- A. Verify existing utility locations and verify that irrigation system piping may be installed in compliance with original design and referenced standards.
- B. Installation of the irrigation system may begin after the grading of the subgrade has been approved and the site is free of construction debris. Report to the Landscape Architect any unsatisfactory conditions.
- C. Reports on subsurface condition investigations made during design of the project are available for informational purposes only; data in reports are not intended as representations or warranties of accuracy or continuity of conditions (between soil borings). Owner assumes no responsibility for interpretations or conclusions drawn from this information.

## 1.7 SEQUENCING AND SCHEDULING

- A. Maintain uninterrupted water service to adjacent users during normal irrigation hours. Arrange for temporary water shutoff with Owner and neighbors.
- B. Coordinate work with landscape work specified in Section 32 9300 -Landscape Planting and with work specified in Section 33 0000 Utilities

## 1.8 EXTRA MATERIALS

- A. Extra materials shall be delivered to the Owner. Extra materials shall be identical to the equipment installed on the project. Materials shall be packaged in the original shipping boxes if available and packaged to prevent damage. Boxes shall be taped closed and the contents of the box shall be clearly marked on the outside.
- B. Quick Couplers: Furnish one quick coupler for every 15 installed on the project with a minimum of one.
- C. Quick Coupler Hose Swivels: Furnish two.
- D. Quick Coupler Operating Keys: Furnish two.
- E. Sprinklers: Furnish one sprinkler head of each type for every 20 installed with a minimum of 5.
- F. Emitters and bubblers: Furnish 1 for every 50 installed. with a minimum of 10.
- G. Valve Keys: Furnish two tee-handle units.

## 1.9 WARRANTY/GUARANTEE

A. Contractor will guarantee all workmanship and materials of the irrigation system for the period of one year after the final acceptance of the irrigation system. Contractor shall repair or replace any defect in workmanship or material within seven days after receiving written notice from the owner or the owner's representative. Contractor shall make warranty repairs at his own expense. If the contractor fails to make repairs within seven days, the owner shall make the repairs at the contractor's expense. In case of emergency, where the Owner determines that a delay presents a hazard or could result in serious loss or damage, the Owner may make repairs at the contractor's expense after a verbal communication with the contractor, without written notice.

- B. The guarantee shall be in the form of a letter from the Contractor addressed to the Owner. The letter shall incorporate the language stated above and be signed by an authorized officer/agent or Owner of the Contractor.
- C. During the guarantee period, the Contractor will drain the system in the fall and put the system back into operation in the spring. This work shall be done in the presence of the Owner's representative and maintenance personnel.
- 1.10 PRODUCT DELIVERY, STORAGE AND HANDLING
  - A. Deliver irrigation system components in manufacturer's original undamaged and unopened containers with labels intact and legible.
  - B. Deliver plastic piping in bundles, packaged to provide adequate protection of pipe ends, both threaded or plain.
  - C. Store and handle materials to prevent damage and deterioration.
  - D. Provide secure, locked storage for valves, sprinkler heads, and similar components that cannot be immediately replaced, to prevent installation delays.

## PART II – PRODUCTS

- 2.1 PIPES, TUBES, AND FITTINGS
  - A. MANUFACTURES
    - 1. J-M Manufacturing Company, Inc.
    - 2. Pacific Western Extruded Plastics Co.
    - 3. Eagle Pacific Industries, Inc.
    - 4. The Harrington Corporation (HARCO)
    - 5. Sigma
    - 6. Leemco
    - 7. Spears
    - 8. Lasco
    - 9. Nibco
  - B. Irrigation Mainline Pipe
    - 1. 4" and larger:
      - a. Pipe: ASTM D 2241, PVC Class-200, SDR-21, 260 psig.
      - b. Joint: ASTM D 2241, PVC Class-200 bell end.
      - c. Fitting: ASTM A 3139, ASTM A-536, Deep socket cast iron.
      - d. Joint Restraints: UNI-B-13-94, grip ring pipe restraints.
      - e. Flanges: ASME B16.24, Class 150, cast bronze.
    - 2. 3" and smaller:
      - a. Pipe: ASTM D 1785, PVC 1120, Schedule 40, 160 psig.
      - b. Joints: ASTM D2241 Schedule 40 bell end
      - c. Fittings: ASTM D 2466 Schedule 40 Socket type

## C. Irrigation Lateral Pipe

- 1. Pipe: ASTM D 1785, PVC 1120, Schedule 40, 160 psig.
- 2. Joints: ASTM D2241 bell end
- 3. Fittings: ASTM D 2466 Schedule 40 Socket type

## D. Manifold pipe

| 1. | Pipe:              | ASTM D 1785, PVC 1120 compound, Schedule 80 |
|----|--------------------|---|
| 2. | Socket Fittings:   | ASTM D 2467, Schedule 80 Socket             |
| 3. | Threaded Fittinas: | ASTM D 2464. Schedule 80:                   |

# 2.2 JOINING MATERIALS

- A. Solvent Cement: ASTM F656 primer and ASTM D2564 solvent cement in color other than orange.
- B. Gaskets for Plastic Flanged Joints: Materials recommended by plastic pipe and fittings manufacturer.
- C. Gaskets for Plastic Joints: Trans gaskets as recommended the fittings manufacturer.

## 2.3 VALVES

- A. Gate Valves
  - 1. 3" and larger: AWWA C509, resilient seated; bronze stem, ductile iron body and bonnet, stem nut, 200 psig (1380 kPa) working pressure; and ends that fit NPS dimension, PVC pipe. Include elastomeric gaskets.
  - 2-1/2" and smaller: Bronze, Nonrising Stem Gate Valves MSS SP-80, Type 1, solid wedge; nonrising, copper-silicon-alloy stem; Class 125, body and screw bonnet of ASTM B 62 cast bronze, with threaded ends. Include polytetrafluoroethylene (PTFE) impregnated packing, brass packing gland, and malleable-iron handwheel.
  - 3. Manufacturers:
    - a. Nibco, Inc.
    - b. Clow Valve Co. Div., McWane, Inc
    - c. Stockham Valves & Fittings, Inc.
    - d. Waterous Co.

## B. Curb Stops

- 1. 2" inches and Smaller: Bronze body, ground key plug or ball, 150 psig (1035 kPa) minimum pressure rating, wide tee head, with inlet and outlet to match service piping material.
- 2. Manufacturers:
  - a. Ford Meter Box Co., Inc.
  - b. Hays Div., Romac Industries
  - c. A.Y McDonald Mfg. Co.
  - d. Mueller Co., Grinnel Corp.
- C. Plastic Ball Valves: Polyvinyl Chloride (PVC) Plastic, with 150 psig (1035 kPa) minimum pressure rating, ends compatible to piping where valve is to be installed, and tee handle.

- 1. Manufacturers:
  - a. Spears Manufacturing
  - b. Nibco, Inc.
  - c. Matco-Norca
- D. Ball Valves: Ball valves shall be solid bronze meeting Federal Specification WW-V-35C, TYPE II, COMPOSITION: BZ, STYLE: 3. Size shall be the same size as the main line on which it is installed. Valves shall be installed on the up-stream side of the electric remote control valve manifold and in the same valve box.
  - 1. Manufacturers:
    - a. Nibco, Inc.
    - b. Stockham Valves & Fittings, Inc.
    - c. Waterous Co.
- E. Master Valve: Electric remote control operated valve. Class 125, Normally Open Main valve and actuator cast iron or brass.
  - 1. Manufacturers:
    - a. Hunter Industries
- F. Drain Valves: All drain valves shall be <sup>3</sup>/<sub>4</sub>" brass full turn ball cocks and installed as per details on the Drawings. Valves shall be tested for 150 psi working pressure. This valve is to be installed on mainlines only.
  - 1. Manufacturers:
    - a. Ford Meter Box Co., Inc.
    - b. Hays Div., Romac Industries
    - c. Mueller Co., Grinnel Corp.
- G. Automatic Control Valves: Diaphragm-type, normally closed, with manual flow adjustment, and operated by 24-volt-a.c. solenoid.
  - 1. Manufactures:
    - a. Rain Bird
- H. Quick-Couplers: Factory-fabricated, 2-piece assembly. Include coupler water-seal valve; removable upper body with spring-loaded or weighted, rubber-covered cap; hose swivel with ASME B1.20.7, <sup>3</sup>/<sub>4</sub>-11.5NH Threads for garden hose on outlet; and operating key.
  - 1. Manufactures:
    - a. Rain Bird
- B. Valve Boxes: Polyethylene (PE), acrylonitrile-butadiene-styrene (ABS), fiberglass, polymer concrete, or precast concrete box and cover. Size as required for application. Lid color to match surrounding landscape surface.
  - 1. Drainage Backfill: Cleaned gravel or crushed stone, graded form 3-inches (75 mm) maximum to <sup>3</sup>/<sub>4</sub>-inch (19 mm) minimum.
  - 2. Valve boxes shall be of sufficient size to house one (1) electric remote control valves with unions, and still allow room for maintenance without having to excavate or perform similar

operations. Boxes shall have lock down lids and shall meet ASTM D638 for tensile strength of 4,300 pounds per square inch.

- 3. Manufactures:
  - a. Ametek by Plymouth Products Div., AMTETK
  - b. Brooks Products, Inc. Polyplastics Div.
  - c. Carson Industries, Inc.
  - d. DFW/HPI by Hefco Plastics, Inc.
  - e. Rain Bird Sprinkler Mfg. Corp.

### 2.2 SPRINKLERS

- A. Description: Manufacturer's standard sprinklers designed to provide uniform coverage over entire area of spray shown on Drawings at available water pressure, as follows:
  - 1. Housings: plastic, except where material is specified.
- B. Pop-up, Spray: Fixed pattern, with screw-type flow adjustment and stainless steel retraction spring.
- C. Manufactures:1. Rain Bird match existing.
- 2.3 AUTOMATIC CONTROL SYSTEM
  - A. Existing WeatherTrak Controller
- 2.4 WIRING
  - A. Irrigation control wires: Rain Bird Maxi Cable or Hunter Decoder Cable 12 AWG Two Conductor cable in 1" pvc conduit, solid copper conductor, pvc insulated cable, suitable for direct burial.
  - B. Wire Connectors: 3M DBRY-6 Direct Bury Splice Kit.
- 2.5 THRUST BLOCKS
  - A. All main lines shall have a thrust block of poured concrete installed at each change of direction. The thrust block shall be of sufficient size for the pipe involved and rest on undisturbed ground. Thrust blocks are not required where fittings are installed with joint restraints.

## Part III – EXECUTION

- 3.1 SITE CONDITIONS
  - A. Verify water supply location, size and pressure.
  - B. Inspect site to ensure that it is free of large rocks, plant material, and construction debris.
  - C. Verify that the site has been rough graded to the proper subgrade elevations.

### 3.2 PREPARATION

A. Set stakes or flags to identify proposed sprinkler locations. Obtain Landscape Architect's approval before excavation.

## 3.3 PIPING APPLICATIONS

- A. Refer to Part 2 of this Section for detailed specifications for pipe and fittings products listed below. Use pipe, tube, fittings, and joining methods according to the following applications. Piping in pits and aboveground may be joined with flanges instead of joints indicated.
- B. Pressure Piping Underground: Use the following:
  - 1. 3-inches and smaller: Schedule 40 PVC plastic pipe, and schedule 40, PVC plastic socket-type pipe fittings and solvent-cemented joints.
  - 2. 4-inches and larger: Class 200 PVC plastic pipe with flanged or deep socket cast iron fittings with joint restraints.
- C. Circuit Piping: Use the following:
  - 1. All Sizes: Schedule 40 PVC plastic pipe, and schedule 40, PVC plastic socket-type pipe fittings and solvent-cemented joints.
- D. Branches and Offsets at Sprinkler and Devices: Schedule 80 PVC plastic pipe with threaded ends and schedule 80 PVC plastic threaded fittings and threaded joints.
- E. Drain Piping: Schedule 40 PVC plastic pipe, and schedule 40, PVC plastic socket-type pipe fittings and solvent-cemented joints.
- F. Sleeves: Schedule 40 PVC plastic pipe, and schedule 40, PVC plastic socket-type pipe fittings and solvent-cemented joints.

## 3.4 JOINT CONSTRUCTION

- A. Flanged Joints: Align flanges and install gaskets. Assemble joints by sequencing bolt tightening. Use lubricant on bolt threads.
- B. Threaded Joints: Thread pipes with tapered pipe threads according to ASME B1.20.1, apply tape or joint compound, and apply wrench to valve ends into which pipes are being threaded.
- C. PVC Piping Gasketed Joints: Construct joints between underground AWWA-type, cast-iron valves and NPS PVC pipe; with elastomeric seals that fit pipe diameter and valve ends; and lubricant, according to ASTM D 3139.
- D. PVC Piping Solvent-Cemented Joints: Construction joints according to ASTM D 2672 and ASTM D 2855.
  - 1. Handling of Solvent Cements, Primers, and Cleaners: Comply with procedures in ASTM F 402 for safe handling when joining plastic pipe and fittings with solvent cements.

## 3.5 PIPING SYSTEMS – COMMON REQUIREMENTS

- A. General Locations and Arrangements: Drawings indicated general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, and in other design considerations. Install piping as indicated, except where deviations to layout are approved on coordination drawings.
- B. Install piping at a uniform slope of 6-inches per 100-feet (1:200) minimum, down to drain points.

- C. Install components having pressure rating equal to or greater than system operating pressure.
- D. Install piping free of sags and bends.
- E. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
- F. Install fittings for changes in direction and branch connections.
- G. Piping Connections: Except as otherwise indicated make piping connections as specified below.
  - Install unions, in piping 2-inches (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment having 2-inch (DN 50) or smaller threaded pipe connection.
  - Install flanges, in piping 2<sup>1</sup>/<sub>2</sub>-inches (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment having flanged pipe connection. 3. Install dielectric fittings to connect piping of dissimilar metals.

## 3.6 TRENCHES:

- A. Trenches shall be dug as wide and deep as necessary to properly place the sprinkling system according to the requirements herein. Any rock uncovered in this excavation shall not be left in the backfill. All excess rock shall be removed from the site by this Contractor and legally disposed of off the property. All trenches shall be backfilled and compacted to insure no settling of the surface, after the lawn is planted.
- B. If backfill soil is rocky or lumpy, protect the pipe and the pipe conduit with 8" of sand or loose, rock free, soil under, over and on sides of pipe. Avoid putting large rocks against pipe during backfilling operation.
- C. All trenches must be compacted to 90% in 6" lifts and watered in. Lines from control valves shall be installed after topsoil is in place and properly graded.
- D. This Contractor, in placing the sprinkling lines, etc., may uncover material not suitable for finished grading. This material shall be removed from the site by this Contractor. After the installation of the lines, the finished grading shall be smoothed over and restored to its original condition, using additional topsoil at this Contractor's expense, if this is necessary. The upper 6" of topsoil removed in the excavation of trenches for pipeline shall be conserved and kept separate from subsoil and reinstalled without mixing with other soil.
- E. Trenches where more than one pipe is to be installed, a distance of 6" is to be maintained between each pipe.
- F. All trenches are to be 12" away from all curbs, buildings and sidewalks.

# 3.7 PIPING INSTALLATION

- A. Install underground polyvinyl chloride (PVC) plastic pipe according to ASTM D 2774.
- B. Lay piping on solid sub-base, uniformly sloped without humps or depressions.
  - 1. Slope circuit piping down toward drain valve minimum of  $\frac{1}{2}$ -inch in 10-feet (1:240).

- Install polyvinyl chloride (PVC) plastic pipe in dry weather when temperature is above 40 deg. F (4 deg. C). Allow joints to cure at least 24-hours at temperature above 40 deg. F (4 deg. C) before testing, unless otherwise recommended by manufacturer.
- C. Drain Pockets: Excavate to sizes indicated. Backfill with cleaned gravel and crushed stone, graded from 3-inches (75 mm) to <sup>3</sup>/<sub>4</sub>-inch (19mm) minimum, drain material to 12-inches (300 mm) below grade. Cover drain material with sheet of ASTM D 226, Type II, asphalt-saturated felt and backfill remainder with excavated material. Drain pocket to be minimum 6 cubic feet.
- D. Minimum Cover: Provide following minimum cover over top of buried piping:
  - 1. Pressure Piping: Greater depth of minimum of 24-inches (600 mm) below finished grade.
  - 2. Circuit Piping: 15-inches (380 mm).
  - 3. Drain Piping: 24 inches (380 mm).
  - 4. Sleeves: 24-inches (600 mm).
  - 5. Install piping under sidewalks and paving in sleeves.

## 3.8 MANUAL FLUSH VALVES:

A. These valves serve to provide flushing during installation and in case of major breaks or contaminations in the system. They shall be installed one for every auto line flush valve, at grade and directly adjacent to the auto flush valves in a separate box.

## 3.9 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, following requirements apply:
  - 1. Buried Valves 3-inches (DN 80) and Larger: AWWA, gate valves, non-rising stem, with stem nut and valve box.
  - 2. Buried Valves 2-inches (DN 50) and Smaller: Bronze-body, curb stop, with tee head, service box and shutoff rod.

## 3.10 VALVE INSTALLATION

- A. Valves: Install underground valves in valve boxes.
  - 1. Install valves and polyvinyl chloride (PVC) pipe with restrained, gasketed joints.
- B. Curb Stops: Install underground curb stops in service boxes.
- C. Control and Ball Valves: Install in valve control valve boxes, arranged for easy adjustment and removal. Install unions with one (1) on upstream side at each valve manifold.

## 3.11 FLOW SENSOR

A. Install the flow sensor as per the detail and the manufacturers' literature and recommendations.

## 3.12 PRESSURE REGULATOR INSTALLATION

A. Install pressure regulators with shutoff valve and strainer on inlet and pressure gage on outlet. Install shutoff valve on.

## 3.13 SPRINKLER INSTALLATION

- A. Sprinklers: Flush circuit piping with full head of water and install sprinklers after hydrostatic test is complete.
  - 1. Install lawn sprinklers at manufacturer's recommended heights.
  - 2. Install shrubbery sprinklers at heights indicated.
  - 3. Locate part-circle sprinklers to maintain a minimum distance of 12-inches (400 mm) from walls and 2-inches (50 mm) from other boundaries, unless otherwise indicated.

## 3.14 AUTOMATIC CONTROL SYSTEM INSTALLATION

- A. Maintain existing controller(s). Update the programing in the controller for the new valves. Program each valve, entering the site data, learn flows, and all other aspect of programing new valves.
- B. Install control wiring in same trench with mainline piping. Install in 1" PVC conduit.

## 3.15 FIELD QUALITY CONTROL

- A. Testing: Perform hydrostatic test of piping and valves before backfilling trenches. Piping may be tested in sections to expedite work.
  - Cap and subject the piping system to a static water pressure of 50 psig (345 kPa) above the operating pressure without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for 4-hours. Leaks and loss in test pressure constitute defects that must be repaired.
  - 2. Repair leaks and defects with new materials and retest system or portion thereof until satisfactory results are obtained.
  - 3. Notify Architect 24 hour in advance of pressure testing so test may be observed.

## 3.16 CLEANING AND ADJUSTING

- A. Flush dirt and debris from piping before installing sprinklers and other devices.
- B. Adjust automatic control valves to provide flow rate of rated operating pressure required for each sprinkler circuit.
- C. Carefully adjust lawn sprinklers so they will be flush with, or not more than ½-inch (13 mm) above, finish grade after completion of landscape work.
- D. Adjust settings of controllers and automatic control valves.

## 3.17 COMMISSIONING

- A. Starting Procedures: Follow manufacturer's written procedures. If no procedures are prescribed by manufacturers, proceed as follows:
  - 1. Verify that specialty vales and their accessories have been installed correctly and operate correctly.
  - 2. Verify that specified test of piping are complete.
  - 3. Check that sprinklers and devices are correct type.

- 4. Check that damaged sprinklers and devices have been replaced with new materials.
- 5. Check that potable water supplies have correct type backflow preventers.
- 6. Energize circuits to electrical equipment and devices.
- 7. Adjust operating controls.
- B. Operational Testing: Perform operational testing after hydrostatic testing is completed, backfill is in place, and sprinklers are adjusted to final position.
- C. Provide irrigation system layout and diagram with water zones clearly identified. Layout to be color coded with a maximum of 5 colors for easy legibility. Record water budget for each irrigation control zone and current settings. Provide laminated copy and mount near controller. Verify location with Architect.

## 3.18 DEMONSTRATION

- A. Demonstrate to Architect that system meets coverage requirements and that automatic controls function properly.
- B. Demonstrate to Owner's maintenance personnel operation of equipment, sprinklers, specialties, and accessories. Review operating and maintenance information.
- C. Provide 7-days' written notice in advance of demonstration.

END OF SECTION 32840

# SECTION 32 93 00 - LANDSCAPE PLANTING

### PART I - GENERAL

### 1.1 SUMMARY

- A. The extent of the landscaping development work is shown on the drawings and in schedules. This work includes:
  - 1. Obtaining and paying for permit fees, inspections and tests required for the installation of landscape planting.
  - 2. Providing and placement of all plant material, topsoil, mulch, sod, and miscellaneous materials and maintenance of landscape planting and associated guarantees.
  - 3. Attendance at Pre-Construction Conference

# 1.2 RELATED WORK

A. Section 328400 - Irrigation Systems

## 1.3 QUALITY ASSURANCE

- A. Contractor will provide and pay for materials testing. Testing agency shall be acceptable to the Landscape Architect.
  - Test representative samples of materials proposed for use. Materials used in the work shall be the same materials as tested. Do not use proposed material in the work until test reports have been reviewed by the Landscape Architect and approval obtained to proceed with plant excavations.
- B. Test reports: Provide the following test results of the imported topsoil:
  - 1. Topsoil:
    - a. Mechanical analysis.
    - b. Percentage of organic content.
    - c. Recommendations on the type and quantity of soil nutrient additives required to bring nutrients to a satisfactory level for specified plants.
    - d. Recommendations on the type and quantity of soil additives required to bring the pH of soil to a value of 5.5-7.0 (unless otherwise noted).
    - e. SAR
    - f. Soluble Salts
- C. Landscape work shall be done by a single firm specializing in landscape construction work with minimum 5 years experience completing 5 projects of similar size and complexity.
  - 1. Contractor to provide list of past projects completed during last 3 years at time of first bid proposal.

### 1.4 SUBMITTALS

- A. Submit topsoil test reports of the stockpiled topsoil.
- B. Submit soil amendment material test reports.
- C. Submit a label from the manufacturer's container certifying fertilizer content.

- D. Submit samples of proposed mulch.
- E. Submit complete written maintenance instruction at least 10 days prior to end of maintenance period. Include all requirements for proper care, development and maintenance of planting.
- F. Submit within 20 days of award of the bid to general contractor a planting schedule stating sources from which said Contractor can provide the plant materials in the quantity and size indicated on the Drawings.
  - 1. Substitutions for plant material that is not obtainable may be proposed in writing prior to bid. Submit written statement from plant materials supplier(s) with proposal for equivalent material for evaluation and acceptance prior to bid.
- G. Submit contractor's Guarantee Form for Landscape Architect's review.
- H. Submit anticipated planting schedule.
- 1.5 VERIFICATION OF DIMENSIONS AND QUANTITIES
  - A. All scaled dimensions are approximate. Before proceeding with any work, the Contractor shall carefully check and verify all dimensions and quantities, and shall immediately inform the Landscape Architect of any discrepancy between the information on the Drawings and actual conditions, refraining from doing any work on said areas until given approval to do so by the Landscape Architect.
  - B. Plant quantities listed on the Drawings are for the convenience of the Contractor only and are not guaranteed. All planting indicated on the Drawings will be required.

## 1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Prepare, transport and handle plants to ensure protection against injury. Cover all plants while transporting to the site.
- B. Deliver plants with legible waterproof identification labels.
- C. Do not use topsoil in frozen or muddy conditions.
- D. Packaged materials shall be delivered in factory labeled containers showing weight, content and manufacturer. Protect all materials from damage and deterioration during delivery and storage at site.
- E. Harvest, deliver and install sod within 24 hours.
- 1.7 GRADING
  - A. Examine the subgrade, verify the elevations of topsoil, planting mix or mulch. Observe the conditions under which work is to be performed, and notify the Landscape Architect of unsatisfactory conditions. Do not begin landscape work until unsatisfactory conditions have been improved.
- 1.8 EXCAVATION

Mountain Ridge High School Access Roads GBE Project #23N216 A. When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify the Landscape Architect before planting.

## 1.9 EXISTING UTILITIES

A. Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate, as required, to minimize possibility of damage to underground utilities. The Contractor shall have the area "Blue Staked" prior to digging. It is the responsibility of the Contractor to repair or replace any damage caused by its workers at no expense to the Owner.

## 1.10 PLANTING SCHEDULE

- A. Before bidding each bidder shall investigate sources of supply and determine availability of all plants specified on the planting list in size, variety and quantity. Failure to take this precaution will not relieve the successful bidder from responsibility as a contractor to furnish and install all plant material in strict accordance with the contract without additional expense to the Owner.
- B. Prepare a proposed planting schedule for approval by the Landscape Architect. Schedule the dates for each type of landscape work during the normal seasons for such work in the area of the site. Correlate with specified maintenance periods to provide maintenance throughout the specified time period. Once accepted, revise dates only as approved in writing, after documentation of reasons for delays.
- C. Proceed with and complete the landscape work as rapidly as portions of the site become available, working within the seasonal limitations for each kind of landscape work required.

## 1.11 ESTABLISHMENT, MAINTENANCE, REPLACEMENT, AND GUARANTEE

- A. The establishment period shall begin at the time of planting and will continue for 3 growing months or until the substantial completion walkthrough whichever is longer.
- B. Maintenance shall include but not be limited to watering, weeding, pruning, spraying, and lawn maintenance as described herein.
- C. Mow lawn as soon as the sod is tall enough to cut. Do not remove more than 40% of grass-leaf growth in initial or subsequent mowings. Do not mow when grass is wet. Mow grass at 2-3" high.
- D. Apply fertilizer after initial mowing and when grass is dry. Apply a 16-1-8 fertilizer at label rate.
- E. Guarantee a close knit stand of grass by watering, mowing, regrading and resodding eroded areas and otherwise maintaining lawn area to the satisfaction of the Landscape Architect, until final acceptance. Any areas, which fail to show a thick, vigorous, healthy grass stand, shall be reseeded at Contractor's expense with the same seed or sod originally specified. Resod or reseed as required until all affected areas are accepted by the Landscape Architect.
- F. The Contractor shall instruct the Owner as to the watering requirements and shall monitor such operations at all times. The Contractor shall be held responsible for failure to monitor the watering requirements and shall be held responsible to replace any or all plants that are lost due to improper application of water.

- G. All lawns shall be fertilized every three (3) weeks with two (2) pounds of 16-16-8 commercial fertilizer per 1000 sq ft until the end of the maintenance period required. It shall be the responsibility of this Contractor to notify the Landscape Architect and Owner in writing 48 hours prior to fertilizing to provide visual verification of work.
- H. Maintenance shall include, in addition to the above, cleaning, edging and repair to erosion and all other necessary work of maintenance. Sidewalks and other paved areas shall be kept clean when planting and maintenance are in progress.
- I. Any and all sprinkler lines broken or disrupted during the construction and maintenance period shall be replaced to proper working order and be acceptable to the Owner.
- J. Guarantee all planting for one year following signature of Owner on the final contract payment application.
- K. The Contractor will not be responsible for plants destroyed or lost due to occupancy of the project, or vandalism on the parts of others or if the failure of any plant material can be proven to the Landscape Architect to be beyond the control of the Contractor.
- L. At the end of the guarantee period a final inspection of all planting included in this contract will be made by the Landscape Architect. At that time any plant found not to be in a healthy growing condition, broken, damaged, or not exhibiting the desired characteristics of the plant shall be noted. These noted plants shall be removed as specified above.

# PART 2 - MATERIALS

# 2.1 TOPSOIL

- A. Topsoil shall be harvested and stockpiled on site.
  - 1. Topsoil shall be free from debris such as rocks, roots, sticks and clods.
  - 2. Imported topsoil shall conform to the following topsoil guidelines, contractor to submit testing reports that verify conformance to the following acceptable characteristics.

| a. | Soluble Salts                               | <4  |
|----|---|---|
| b. | PH  | 5.5-8.2                                   |
| c. | Sand  | <70%                                      |
| d. | Silt  | <70%                                      |
| e. | Clay  | <30%                                      |
| f. | Texture Class                               | L, SiL, SCL, SL, CL, SiCL                 |
| g. | Organic Matter                              | ≥1%                                       |
| h. | Coarse Fragments > 2mm dia.                 | ≤5%                                       |
| i. | SAR   | 3-7 for SiL, SiCL CL, 3-10 for SCL, SL, L |
| j. | Topsoil shall not contain rocks larger that | n 1 $\frac{1}{2}$ " in diameter.          |

- k. Topsoil report shall also contain fertilizer recommendations.
- B. Topsoil shall not be used for planting operations while in a frozen or muddy condition.

## 2.2 COMMERCIAL FERTILIZER – LAWNS

- A. Fertilizer for planting shall be 4-6-4 spread over the topsoil prior to planting.
- B. Fertilizer for lawns shall be commercial fertilizer, uniform in composition, dry and free flowing. It shall contain the following percentage by weight: 20% of nitrogen, 1% of phosphoric acid, 8% of potash. Fertilizer shall be delivered mixed as specified in standard-sized bags, showing weight, analysis of content, and name of manufacturer as required by state regulations. If soil tests recommend variance from these percentages obtain Landscape Architect's approval prior to applications.

## 2.3 PLANT MATERIAL

- A. All plants are subject to approval regarding size, health, quantity, character, etc. by the Landscape Architect.
- B. The Contractor shall furnish and plant all plants shown on the Drawings, as specified and in quantities as shown. Quantities if shown, are included for the convenience of the Contractor only and the Contractor shall be required to furnish all individual plants in quantities actually located on the Drawings. Each bidder shall investigate the sources of supply and satisfy himself that he can supply all of the plants mentioned in the planting lists in size, variety and quality noted and specified before submitting his bid. Failure to take this precaution will not relieve the successful bidder from his responsibility as Contractor for the furnishing and installing of all the plant material in strict accordance with the contract requirements without additional expense to the Owner.

## 2.4 WATER

A. Potable water

## 2.5 MULCHES

A. Decorative Stone Mulch: Washed, crushed angular gravel as described on the drawings. Submit color samples for approval of owner and Landscape Architect.

## 2.6 WEED BARRIER FABRIC

A. Dewitt Pro 5 Weed Barrier. Fabric shall be UV resistant, woven spunbond needle punch, polyproplene, wt. 5 oz, per square yard, color black.

## 2.7 NATIVE SEED

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances. State-certified seed of grass species, as shown on the drawings with not less than 95 percent germination, not less than 95 percent pure seed, and not more than 0.5 percent weed seed:
  - 1. The seeding rate is 18.26 pounds per acre.
  - 2. Store seed delivered before use in a way that protects it from damage by heat, moisture, rodents, or other causes. Discard and replace any seed that becomes damaged.

## PART 3 - EXECUTION

## 3.1 COORDINATION

A. The contractor shall coordinate his work with other contractors on site, and shall cooperate to the fullest extent to see that the work is completed in a timely and workmanship like manner.

## 3.2 INSTALLATION OF TOPSOIL

- A. Prior to the installation of any topsoil, Contractor shall inspect the existing subgrade for compliance to the specifications regarding elevation, slope, grade and cleanliness. Any deficiency shall be reported to the Landscape Architect. Work begun in any area will acknowledge acceptance of area for Landscape planting.
- B. When contract operations have been completed to a point where planting areas will not be disturbed, subgrade shall be cleaned free of waste material of all kinds. In all planted areas dig out all to weeds by their roots and remove from site. Scarify and pulverize the subgrade to a depth of not less than 6" inches. Scarification shall be completed in all areas that are to be planted, or sodded.
- C. Do not place topsoil over subgrade that is frozen or damp.
- D. Lawn areas: Spread the topsoil to a minimum depth of 6" and apply compost at a rate of 3 cubic yards per 1000 sf and fertilizer recommended by the topsoil report. Till to a depth of 6". Spread planting fertilizer over topsoil prior to planting. Allow 1-1/2" for sod thickness.
- E. Seed areas: Spread topsoil to a minimum depth of 2".
- F. Topsoil shall be rolled by a hand roller on small areas. After rolling at a weight of 150-200 pounds per linear foot of roller, the grade shall again be graded to the specified grade with a smooth surface. Large areas shall be graded by passing a land plane in three different directions over the entire area to be planted.
- G. Surface drainage shall be insured, and if shown, shall be directed in the manner indicated on the drawings by molding the surface to facilitate the run-off water. Fill low spots and pockets with topsoil and grade to drain properly.
- 3.3 The Landscape Architect shall approve the finish grading prior to application of seed, sod or plant material. Make minor adjustments to finish grades at the direction of the Landscape Architect.

## 3.4 SODDING

- A. Place sod after fine grading has been completed. The top soil and subbase shall be moist and firm. Apply one (1) application of planting fertilizer 4-6-4 at the rate of 3 lbs. per 1,000 sq. ft. just prior to the laying of the sod.
- B. The surface on which lawn is to be installed shall be firm and free of footprints, depressions or undulations of any kind. The surface shall be free of all rocks larger than 1/2" in diameter and all sticks, roots, rubbish, and other extraneous materials.
- C. Sod may be placed at any time when the ground is not frozen. Sod shall be cut and laid on site within a 48 hour period following harvest. Install butting the edges and ends together tightly. Do not leave gaps or stretch sod. Stagger joints.

- D. The joints shall be closely laid and filled with a mixture of grass seed and screened topsoil at the rate of two (2) pounds of seed to each cubic yard of topsoil. It shall be thoroughly tamped to a true and even surface at the required finished grade.
- E. Roll firmly but lightly, tamp with suitable wooden or metal tamper, all new sod sufficiently to set or press sod into underlying soil.
- F. Protection of the newly laid sod shall be the complete responsibility of the Contractor. Provide acceptable visual barriers by means of barricades set at appropriate distances and strings or tapes between the barriers as an indication of new work. Restore any damaged areas caused by others, erosion or vehicular traffic until such a time as the lawn is accepted by the Owner.
- G. Saturate sod with fine water spray within one hour of planting. During first week, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches (38 mm) below sod.

## 3.5 HYDROSEEDING

- A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.
  - 1. Mix slurry with tackifier.
  - 2. Apply slurry uniformly to all areas to be seeded in a one-step process. Apply mulch at a minimum rate of 1500-lb/acre dry weight but not less than the rate required to obtain specified seed-sowing rate.

# 3.6 CLEAN UP AND PROTECTION

- A. During landscape work store materials and equipment where directed. Keep pavement clean and work area in an orderly condition.
- B. Protect landscape areas, work and materials from damage due to operations by other contractors and trades, trespassers. Maintain protection during installation and maintenance periods. Treat, repair or replace damaged landscape work as directed.
- C. Keep the site free from accumulation of waste material. At the time of completion, all areas must be swept and washed clean and all rubbish removed to the satisfaction of the Landscape Architect.
- D. Temporary occupancy of the project shall not relieve the contractor of any of the obligations enumerated in the Contract Documents.

## 3.7 FINAL INSPECTION AND ACCEPTANCE

- A. Inspection will be made of the entire site periodically and at the conclusion of the maintenance period required.
- B. The landscape work may be inspected for acceptance in parts agreeable to the Landscape Architect, provided the work offered for inspection is complete, including maintenance and that the area comprises one unit or area of substantial size.

- C. Written notice requesting final inspection shall be submitted to the Landscape Architect at least ten (10) days prior to the anticipated inspection date.
- D. Where inspected landscape work does not comply with the requirement, replace rejected work and continue specified maintenance until re-inspected by the Landscape Architect and found to be acceptable. Remove rejected plants and materials promptly from the project site.
- E. Final Acceptance: The work under this contract will be accepted upon written approval by the Landscape Architect and the Owner, on the satisfactory completion of all work, including maintenance.
- F. All work done under this contract shall be left in good order to the satisfaction of the Owner and the Landscape Architect and the Contractor shall without additional expense, replace any plantings, etc. which develop defects or die within one year of the substantial completion.
  - 1. A written guarantee that covers the above provisions shall be signed by the Contractor and delivered to the Landscape Architect upon acceptance of the work.
  - 2. The guarantee shall not be binding upon the Contractor if any failure should be proved to the satisfaction of the Landscape Architect to result from circumstances or negligence of parties over whom the Contractor has no control.

## 3.8 RECORD DRAWINGS

A. Record Drawings shall be furnished to the Landscape Architect at the time of the substantial completion inspection before a letter documenting Substantial Completion for the landscape planting will be issued.

END OF SECTION 329300

# SECTION 330500 - COMMON WORK RESULTS FOR UTILITIES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Piping joining materials.
  - 2. Transition fittings.
  - 3. Dielectric fittings.
  - 4. Sleeves.
  - 5. Identification devices.
  - 6. Grout.
  - 7. Flowable fill.
  - 8. Piped utility demolition.
  - 9. Piping system common requirements.
  - 10. Equipment installation common requirements.
  - 11. Painting.
  - 12. Concrete bases.
  - 13. Metal supports and anchorages.

## 1.3 DEFINITIONS

- A. Exposed Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions.
- B. Concealed Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- C. PVC: Polyvinyl chloride plastic.
- D. DI: Ductile Iron pipe

## 1.4 SUBMITTALS

- A. Product Data: For the following:
  - 1. Dielectric fittings.
  - 2. Identification devices.

B. Welding certificates. **Mountain Ridge High School Access Roads** GBE Project #23N216

## 1.5 QUALITY ASSURANCE

A. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

## 1.7 COORDINATION

- A. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- B. Coordinate installation of identifying devices after completing covering and painting if devices are applied to surfaces.
- C. Coordinate size and location of concrete bases. Formwork, reinforcement, and concrete requirements are specified in Division 03.

## PART 2 - PRODUCTS

## 2.1 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
  - 1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness, unless otherwise indicated.
    - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
    - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
  - 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- D. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- E. Solvent Cements for Joining Plastic Piping:

- 1. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
- F. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

## 2.2 TRANSITION FITTINGS

- A. Transition Fittings, General: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.
- B. Transition Couplings NPS 1-1/2 and Smaller:
  - 1. Underground Piping: Manufactured piping coupling or specified piping system fitting.
  - 2. Aboveground Piping: Specified piping system fitting.
- C. AWWA Transition Couplings NPS 2 and Larger:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Cascade Waterworks Mfg. Co.
    - b. Dresser, Inc.; DMD Div.
    - c. Ford Meter Box Company, Inc. (The); Pipe Products Div.
    - d. JCM Industries.
    - e. Smith-Blair, Inc.
    - f. Viking Johnson.
  - 3. Description: AWWA C219, metal sleeve-type coupling for underground pressure piping.
- D. Plastic-to-Metal Transition Fittings:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Spears Manufacturing Co.
  - 3. Description: PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions.
- E. Plastic-to-Metal Transition Unions:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Colonial Engineering, Inc.
    - b. NIBCO INC.

- c. Spears Manufacturing Co.
- F. Flexible Transition Couplings for Underground Nonpressure Drainage Piping:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Cascade Waterworks Mfg. Co.
    - b. Fernco, Inc.
    - c. Mission Rubber Company.
    - d. Plastic Oddities.
- G. Description: ASTM C 1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion-resistant metal band on each end.

## 2.3 DIELECTRIC FITTINGS

- A. Dielectric Fittings, General: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.
- B. Dielectric Unions:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Capitol Manufacturing Co.
    - b. Central Plastics Company.
    - c. Epco Sales, Inc.
    - d. Hart Industries, International, Inc.
    - e. Watts Water Technologies, Inc.
    - f. Zurn Plumbing Products Group; Wilkins Div.
  - 3. Description: Factory fabricated, union, NPS 2 and smaller.
    - a. Pressure Rating: 150 psig minimum.
- C. Dielectric Flanges:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Capitol Manufacturing Co.
    - b. Central Plastics Company.

- c. Epco Sales, Inc.
- d. Watts Water Technologies, Inc.
- 3. Description: Factory-fabricated, bolted, companion-flange assembly, NPS 2-1/2 to NPS 4 and larger.
  - a. Pressure Rating: 175 psig minimum.
- D. Dielectric-Flange Kits:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Advance Products & Systems, Inc.
    - b. Calpico, Inc.
    - c. Central Plastics Company.
    - d. Pipeline Seal and Insulator, Inc.
  - 3. Description: Nonconducting materials for field assembly of companion flanges, NPS 2-1/2 and larger.
    - a. Pressure Rating: 150 psig minimum.
    - b. Gasket: Neoprene or phenolic.
    - c. Bolt Sleeves: Phenolic or polyethylene.
    - d. Washers: Phenolic with steel backing washers.
- E. Dielectric Couplings:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Calpico, Inc.
    - b. Lochinvar Corporation.
  - 3. Description: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining, NPS 3 and smaller.
    - a. Pressure Rating: 300 psig at 225 deg F
    - b. End Connections: Threaded.
- F. Dielectric Nipples:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Perfection Corporation.
- b. Precision Plumbing Products, Inc.
- c. Victaulic Company.
- 3. Description: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining.
  - a. Pressure Rating: 300 psig at 225 deg F.
  - b. End Connections: Threaded or grooved.

## 2.4 SLEEVES

- A. Mechanical sleeve seals for pipe penetrations are specified in Division 22 Section "Common Work Results for Plumbing."
- B. Galvanized-Steel Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- C. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized, plain ends.
- D. Cast-Iron Sleeves: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- E. Molded PVC Sleeves: Permanent, with nailing flange for attaching to wooden forms.
- F. PVC Pipe Sleeves: ASTM D 1785, Schedule 40.
- G. Molded PE Sleeves: Reusable, PE, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

## 2.5 IDENTIFICATION DEVICES

- A. General: Products specified are for applications referenced in other Division 33 Sections. If more than single type is specified for listed applications, selection is Installer's option.
- B. Equipment Nameplates: Metal permanently fastened to equipment with data engraved or stamped.
  - 1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and essential data.
  - 2. Location: Accessible and visible.

## 2.6 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
  - 1. Characteristics: Post hardening, volume adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
  - 2. Design Mix: 5000-psi, 28-day compressive strength.
  - 3. Packaging: Premixed and factory packaged.

## 2.7 FLOWABLE FILL

- A. Description: Low-strength-concrete, flowable-slurry mix.
  - 1. Cement: ASTM C 150, Type I, portland.
  - 2. Density: 115- to 145-lb/cu. ft.
  - 3. Aggregates: ASTM C 33, natural sand, fine and crushed gravel or stone, coarse.
  - 4. Aggregates: ASTM C 33, natural sand, fine.
  - 5. Admixture: ASTM C 618, fly-ash mineral.
  - 6. Water: Comply with ASTM C 94/C 94M.
  - 7. Strength: 100 to 200 psig at 28 days.

## PART 3 - EXECUTION

## 3.1 PIPED UTILITY DEMOLITION

- A. Refer to Division 01 Section "Cutting and Patching" and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.
- B. Disconnect, demolish, and remove piped utility systems, equipment, and components indicated to be removed.
  - 1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
  - 2. Piping to Be Abandoned in Place: Drain piping. Fill abandoned piping with flowable fill, and cap or plug piping with same or compatible piping material.
  - 3. Equipment to Be Removed: Disconnect and cap services and remove equipment.
  - 4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make operational.
  - 5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

## 3.2 DIELECTRIC FITTING APPLICATIONS

- A. Dry Piping Systems: Connect piping of dissimilar metals with the following:
  - 1. NPS 2 and Smaller: Dielectric unions.
  - 2. NPS 2-1/2 to NPS 12: Dielectric flanges or dielectric flange kits.
- B. Wet Piping Systems: Connect piping of dissimilar metals with the following:
  - 1. NPS 2 and Smaller: Dielectric couplings or dielectric nipples or nipples.
  - 2. NPS 2-1/2 to NPS 4 : Dielectric nipples.
  - 3. NPS 2-1/2 to NPS 8: Dielectric nipples or dielectric flange kits.
  - 4. NPS 10 and NPS 12: Dielectric flange kits.

## 3.3 PIPING INSTALLATION

- A. Install piping according to the following requirements and Division 33 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on the Coordination Drawings.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping to permit valve servicing.
- E. Install piping at indicated slopes.
- F. Install piping free of sags and bends.
- G. Install fittings for changes in direction and branch connections.
- H. Select system components with pressure rating equal to or greater than system operating pressure.
- I. Sleeves are not required for core-drilled holes.
- J. Permanent sleeves are not required for holes formed by removable PE sleeves.
- K. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
  - 1. Cut sleeves to length for mounting flush with both surfaces.
  - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
    - a. PVC or Steel Pipe Sleeves: For pipes smaller than NPS 6.
- L. Verify final equipment locations for roughing-in.
- M. Refer to equipment specifications in other Sections for roughing-in requirements.

## 3.4 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 33 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

- D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
  - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- E. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- G. Grooved Joints: Assemble joints with grooved-end pipe coupling with coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.
- H. Soldered Joints: Apply ASTM B 813 water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy (0.20 percent maximum lead content) complying with ASTM B 32.
- I. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- J. Pressure-Sealed Joints: Assemble joints for plain-end copper tube and mechanical pressure seal fitting with proprietary crimping tool to according to fitting manufacturer's written instructions.
- K. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
  - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
  - 2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 appendixes.
  - 3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
  - PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
  - 5. PVC Nonpressure Piping: Join according to ASTM D 2855.
  - 6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.
- L. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.
- M. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.
- N. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
  - 1. Plain-End PE Pipe and Fittings: Use butt fusion.
  - 2. Plain-End PE Pipe and Socket Fittings: Use socket fusion.
- O. Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

## 3.5 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
  - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
  - 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
  - 3. Install dielectric fittings at connections of dissimilar metal pipes.

## 3.6 EQUIPMENT INSTALLATION

- A. Install equipment level and plumb, unless otherwise indicated.
- B. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference with other installations. Extend grease fittings to an accessible location.
- C. Install equipment to allow right of way to piping systems installed at required slope.

## 3.7 PAINTING

- A. Painting of piped utility systems, equipment, and components is specified in Division 09 painting Sections.
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

## 3.8 IDENTIFICATION

- A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.
  - Plastic markers, with application systems. Install on insulation segment if required for hot noninsulated piping. Place direct bury marker 12-18 inches above top of pipe but not less than 12-inches below finish grade.

## 3.9 GROUTING

- A. Mix and install grout for equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.

F.Place grout on concrete bases and provide smooth bearing surface for equipment.Mountain Ridge High School Access RoadsCommon Work Results for UtilitiesGBE Project #23N216Section 330500- 10

- G. Place grout around anchors.
- H. Cure placed grout.

END OF SECTION 330500

## SECTION 331100 - WATER UTILITY PIPING

## PART 1 - GENERAL

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### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Codes and Standards:
  - 1. Plumbing Code Compliance: Comply with applicable portions of National Standard Plumbing Code pertaining to selection and installation of potable water system materials and products.
  - 2. Water Purveyor Compliance: Comply with requirements of Purveyor supplying water to project, obtain required permits and inspections.
  - 3. NFPA Compliance: Install fire water systems in accordance with NFPA 24 "Standard for Installation of Private Fire Service Mains and Their Appurtenances".
  - 4. Local Fire Department/Marshall Regulations: Comply with governing regulations pertaining to hydrants, including hose unit threading and similar matching of connections.
  - 5. UL Compliance: Provide fire hydrants that comply with UL 246 "Hydrants for Fire-Protection Service", and are listed by UL.

#### 1.2 SUMMARY

- A. This Section includes pressure water pipes and fire systems outside the building, with the following components:
  - 1. Special fittings for expansion and deflection.
  - 2. Pipes and valves.

#### 1.3 DEFINITIONS

A. DI: Ductile Iron pressure pipe.

#### 1.4 PERFORMANCE REQUIREMENTS

A. Pressure Rating: 175 psi static water pressure for all pipes and fittings. Pipe joints shall be water tight.

#### 1.5 SUBMITTALS

- A. Product Data: For the following:
  - 1. Special pipe fittings.
  - 2. Valves.
  - 3. Valve boxes and appurtenances.

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- 4. Pipes.
- 5. Disinfection reports and practices
- 6. Product Data: Submit manufacturer's technical product data and installation instructions for fire water system materials and products.
- 7. Maintenance Data: Submit maintenance data and parts lists for fire water system materials and products. Include this data, product data, shop drawings, and record drawings in maintenance manual.
- B. Shop Drawings: For the following:
  - 1. Thrust Blocks: Include plans, elevations, sections, details, and forces for thrust blocks for each size of pipe and type of bend.
- C. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from storm drainage system piping and sewer system piping. Indicate interface and spatial relationship between piping and proximate structures.
- D. Profile Drawings: Show system piping in elevation. Draw profiles at horizontal scale of not less than 1 inch equals 50 feet and vertical scale of not less than 1 inch equals 5 feet. Indicate manholes and piping. Show types, sizes, materials, and elevations of other utilities crossing system piping.
- E. Field quality-control test reports.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic pipe, and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.

## 1.7 PROJECT CONDITIONS

- A. Interruption of Water Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
  - 1. Notify Architect, Construction Manager, and Owner no fewer than two days in advance of proposed interruption of service. Coordinate interruptions during weekly meetings and at preconstruction meeting.
  - 2. Do not proceed with interruption of service without Architect's, Construction Manager's, and Owner's written permission.

## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

- 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work.
- 2. Line Markers:
  - a. Allen Systems Inc.
  - b. Seton Name Plate Corp.
  - c. Engineer Approved Equal.
- 3. Pipe Strainers:
  - a. "Automatic" Sprinkler Corp. of America; Div. A-T-O Inc.
  - b. Cleveland Gear Co.; Sub of Vesper Corp.
  - c. Grinnell Fire Protection Systems Co., Inc.
  - d. Hersey Products Inc.; Hersey Div.
  - e. Mueller Steam Specialty; Div. of Core Industries Inc.
  - f. Neptune Water Meter Co.
  - g. Rockwell International Corp.; Municipal & Utility Div.
  - h. Rockwood Systems Corp.
  - i. Zurn Industries Inc.; Fluid Handling Div.
- 4. Detector Meter: Not Required
- 5. Gate Valves:
  - a. American Valve Mfg. Corp.
  - b. American-Darling Valve; Div. of American Cast Iron Pipe Co.
  - c. Clow Corp.; Valve Div.
  - d. Dresser Mfg. Div. of ITT Grinnell Valve Co. Inc.
  - e. Fairbanks Co.
  - f. Kennedy Valve; Div. of ITT Grinnell Valve Co., Inc.
  - g. Stockham Valves & Fittings Inc.
  - h. United Brass Works Inc.
  - i. United States Pipe and Foundry Co.
  - j. Waterous Co.
- 6. Check Valves:
  - a. American-Darling Valve; Div. of American Cast Iron Pipe Co.
  - b. Clow Corp.; Valve Corp.
  - c. Fairbanks Co.
  - d. Kennedy Valve; Div. of ITT Grinnell Valve Co., Inc.
  - e. Mueller Co.
  - f. Nibbco Inc.
  - g. Stockham Valves & Fittings Inc.
  - h. Walworth Co.
  - i. Waterous Co.
- 7. Yard Hydrants
  - a. Josam Mfg. Co.
  - b. Smith (Jay R.) Mfg. Co.
  - c. Zern Industries, Inc.; Hydromechanics Div.
- 8. Fire Hydrants: Approved by authority having jurisdiction.
- 9. Backflow Preventors: Approved by authority having jurisdiction.

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## 2.2 IDENTIFICATION

- A. Underground –Type Plastic Line Markers: Manufacturer's standard permanent, bright-colored, continuous-printed plastic tape, intended for direct-burial service; not less than 6" wide x 4 mils thick. Provide blue tape with black printing reading "CAUTION WATER LINE BURIED BELOW".
- B. Nonmetallic Piping Label: If nonmetallic piping is used for water service, provide engraved plastic laminate, label permanently affixed to main electrical meter panel stating "THIS STRUCTURE HAS A NONMETALLIC WATER SERVICE".

## 2.3 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, fitting, and joining materials.
- B. Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, and capacities indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in potable water systems. Where more than one type of materials or products are indicated, selection is Installer's option.
- C. Piping: Provide pipe fittings and accessories of same material and weight/class as pipes, with joining method as indicated.
- D. Ductile Iron Pipe: Polyethylene wrapped Ductile Iron Class 50, with cement mortar lining complying with AWWA C104 (for 6" pipe and larger).
  - 1. Fitting: Ductile iron AWWA C151; cement lined AWWA C104; and rubber-gasket joints, AWWA C111.
- E. PE, AWWA Pipe: AWWA C906, DR No. 7.3, 9, or 9.3; with PE compound number required to give pressure rating not less than 200 psig.
  - 1. PE, AWWA Fittings: AWWA C906, socket- or butt-fusion type, with DR number matching pipe and PE compound number required to give pressure rating not less than 200 psig.

## 2.4 VALVES

- A. Gate Valves: UL-listed, 175 psi working pressure for 12" and smaller, 150 psi for sizes larger than 12". Threaded, flanged, hub, or other end configurations to suit size of valve and piping connection. Inside screw type for use with indicator post, iron body bronze mounted, non- rising stem, solid wedge disc.
- B. Check Valves: UL-listed, 175 psi working pressure for 2" through 12", 150 psi for sizes larger than 12". Swing type, iron body bronze mounted with metal-to-metal or rubber-faced checks. Threaded, flanged, or hub end, to suit size and piping connections.

## 2.5 FIRE HYDRANT

- A. Provide cast-iron body fire hydrants, compression type, opening against pressure and closing with pressure, base valve design, 200 psi working pressure, with 1/4" gage tapping and bronze plug in standpipe, conforming to the latest edition of AWWA C-502, "Dry Barrel Fire Hydrants."
- B. Features: Provide the following features:
  - 1. Size: 5" valve opening.
  - 2. Direction to Open Hydrant: Left.
  - 3. Size and Shape of Operating and Cap Nuts: Pentagon 1-1/2" point to flat.
  - 4. Hose Nozzles: 2-1/2" National Standard Thread cap and chain.
  - 5. Pumper Nozzles: 5" National Standard Thread cap and chain.
  - 6. Depth of Trench: 4'-6".
  - 7. Connection to Main: 6" mechanical joint.

## 2.6 ACCESSORIES

- A. Anchorages: Provide anchorages for tees, wyes, crosses, plugs, caps, bends, valves, and hydrants. After installation, apply full coat of asphalt or other acceptable corrosion-retarding material to surfaces of ferrous anchorages.
- B. Clamps, Straps, and Washers: Steel, ASTM A 506.
- C. Rods: Steel, ASTM A 575.
- D. Rod Couplings: Malleable-iron, ASTM A 197.
- E. Bolts: Steel, ASTM A 307.
- F. Cast-Iron Washers: Gray-iron, ASTM A 126.
- G. Thrust Blocks: Concrete, 3,000 psi.

## 2.7 CONCRETE

- A. General: Cast-in-place concrete according to ACI 318/318R, ACI 350R, and the following:
  - 1. Cement: ASTM C 150, Type II.
  - 2. Fine Aggregate: ASTM C 33, sand.
  - 3. Coarse Aggregate: ASTM C 33, crushed gravel.
  - 4. Water: Potable.
- B. Thrust Blocks, Hydrant Supports, and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water-cementitious materials ratio.
### PART 3 - EXECUTION

3.1 Examination: Examine areas and conditions under which potable water system's materials and products are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

### 3.2 EARTHWORK

A. Excavation trenching, and backfilling are specified in Division 31 Section "Earth Moving."

### 3.3 INSTALLATION

- A. Identification: During back-filling/top-soiling of underground fire water piping systems, install continuous underground-type plastic line marker, located directly over buried line at 6" to 8" below finished grade. If pvc pipe is used, install a tracer wire along the top of the pipe, secured with tape, and extending to fire hydrants and valves.
- B. Pipe and pipe fittings:
  - 1. Pipe: Install in accordance with AWWA C600 "Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances".
  - Depth of Cover: Provide minimum depth of cover over underground piping in accordance with NFPA 24, Figure A-8-11 "Recommended Depth of Cover Above Top of Underground Yard Mains" or 60" below finish grade, whichever is greater.
- C. Piping Specialties:
  - 1. Pipe Line Strainers: Install as indicated, with valved blowoff piped to drain.
- D. Meters: Install as indicated with shutoff valve on either side of meter and valved bypass full line size.
- E. Valves: Provide post indicator for control valves.
  - 1. Shutoff Valves: Install shutoff valve ahead of each hydrant.

### 3.4 PIPING APPLICATIONS

- A. Pipe:
  - 1. Ductile Iron Pipe: Install in accordance with AWWA C600 "standard for installation of ductile-iron water mains and their appurtenances" and in accordance with instructions from water purveyor.
  - 2. PE Pipe: Install in according to ASTM D 2774 and ASTM F 645.
- B. Depth of Cover: Provide minimum cover over piping of 12" below average local frost depth or 42" below finished grade, whichever is greater.
- C. Water Main Connection: Arrange and pay for tap in water main, of size and in location as indicated, from water Purveyor.

- D. Water Service Termination: Terminate potable water piping 5'-0" from building foundation in location and invert as indicated. Provide temporary pipe plug for piping extension into building.
  - 1. Mark location with surface marker.

### 3.5 PIPING INSTALLATION

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- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground water pipes. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- C. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or a combination of both.
- D. Install piping according to the following:
  - 1. Install piping with restrained joints at tee fittings and at horizontal and vertical changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
  - 2. Install piping with line and grade as indicated or below frost line if not inidcated.
  - 3. Install ductile-iron pressure piping according to AWWA C600 or AWWA M41.
  - 4. Install ductile-iron special fittings according to AWWA C600.

#### 3.6 INSTALLATION OF VALVES

A. Install valves with stems pointing up. Provide valve box over underground valves.

#### 3.7 INSTALLATION OF WATER METER AND VAULT

A. Install Water Meter and Vault to comply with City Water Department Standards.

#### 3.8 PIPE JOINT CONSTRUCTION

- A. Basic pipe joint construction is specified in Division 33 Section "Common Work Results for Utilities." Where specific joint construction is not indicated, follow piping manufacturer's written instructions.
- B. Join pressure piping according to the following:
  - 1. Join ductile-iron pressure piping according to AWWA C660 or AWWA M41 for push-on joints.
  - 2. Join ductile-iron special fittings according to AWWA C660 or AWWA M41 for push-on joints.
- C. Join dissimilar pipe materials with pressure-type couplings.

### 3.9 FIELD QUALITY CONTROL

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- A. Piping Tests: Conduct piping tests before joints are covered, and after thrust blocks have sufficiently hardened. Fill pipeline with water 24-hrs prior to testing, and apply test pressure to stabilize system.
- B. Hydrostatic Tests: Test at not less than 200 psi for 2-hrs, or at 50 psi above maximum static pressure if it is greater than 150 psi.
  - 1. Test fails if leakage exceeds 2-qts per hour per 100 gaskets or joints irrespective of pipe diameter.
  - Increase pressure in 50 psi increments and inspect each joint between increments. Hold at test pressure for one hour, decrease to 0 psi. Slowly increase again to test pressure and hold for one more hour.
- C. Operating Tests: Open and close all valves and hydrants under system water pressure. Check dry barrel hydrants for proper drainage.
  - 1. For systems with fire pumps, run pumps during operating tests.

### 3.10 ADJUSTING AND CLEANING

- A. Disinfection of Potable Water System: Flush pipe system with clean potable water until no dirty water appears at point of outlet. Fill system with water-chlorine solution containing at least 50 ppm of chlorine. Valve off system and let stand for 24- hrs minimum. Flush with clean potable water until no chlorine remains in water coming from system.
  - 1. Repeat procedure if contamination is present in bacteriological examination.
- B. Disinfection of Water Mains: Flush and disinfect in accordance with AWWA C651 "Standard for Disinfecting Water Mains".
  - 1. Contractor shall submit written verification to Project Manager stating, Disinfection has been completed in strict compliance with specification for this project and with jurisdiction having authority over water system.

#### 3.11 ADJUSTING AND CLEANING

- A. Flushing: Flush underground mains and lead-in connections to sprinkler risers before connection is made to sprinklers, standpipes, or other fire protection system piping.
  - 1. Flush at flow rate not less than that indicated in NFPA 24, or at hydraulically calculated water demand rate of the system, whichever is greater.
- B. Adjusting: adjust fire hydrants to face street and be have base 2-6 inches above adjacent curb and gutter.

### 3.12 CLOSING ABANDONED WATER SYSTEMS

- A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:
  - 1. Close open ends of piping with at least 8-inch-thick, brick masonry bulkheads.
  - 2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.
- B. Backfill to grade according to Division 31 Section "Earth Moving."

END OF SECTION 331100

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### SECTION 334100 - STORM UTILITY DRAINAGE PIPING

### PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes gravity-flow, non pressure storm drainage outside the building, with the following components:
  - 1. Special fittings for expansion and deflection.
  - 2. Cleanouts.
  - 3. Drains.
  - 4. Precast concrete manholes, inlet boxes, catch basins.

#### 1.3 DEFINITIONS

- A. PVC: Polyvinyl chloride plastic.
- B. CP: Non-reinforced concrete pipe.
- C. RCP: Reinforced concrete pipe.

#### 1.4 PERFORMANCE REQUIREMENTS

A. Gravity-Flow, Non pressure, Drainage-Piping Pressure Rating: 10-foot head of water. Pipe joints shall be at least silttight, unless otherwise indicated.

#### 1.5 SUBMITTALS

- A. Product Data: For the following:
  - 1. Special pipe fittings.
  - 2. Drains.
  - 3. Storage.
  - 4. Pipes.
- B. Shop Drawings: For the following:
  - 1. Manholes: Include plans, elevations, sections, details, and frames and covers. Include design calculations, and concrete design-mix report for cast-in-place manholes.
  - 2. Catch Basins and Stormwater Inlets. Include plans, elevations, sections, details, and frames, covers, and grates.

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- 3. Stormwater Detention Structures: Include plans, elevations, sections, details, frames and covers, design calculations, and concrete design-mix report.
- C. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from storm drainage system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.
- D. Profile Drawings: Show system piping in elevation. Draw profiles at horizontal scale of not less than 1 inch equals 50 feet and vertical scale of not less than 1 inch equals 5 feet. Indicate manholes and piping. Show types, sizes, materials, and elevations of other utilities crossing system piping.
- E. Field quality-control test reports.

### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic manholes, pipe, and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.
- C. Handle manholes according to manufacturer's written rigging instructions.
- D. Handle catch basins and stormwater inlets according to manufacturer's written rigging instructions.

### 1.7 PROJECT CONDITIONS

- A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
  - 1. Notify Architect, Construction Manager, and Owner no fewer than two days in advance of proposed interruption of service. Coordinate interruptions during weekly meetings and at pre-construction meeting.
  - 2. Do not proceed with interruption of service without Architect's, Construction Manager's, and Owner's written permission.

### PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include local pre-cast manufacturers but are subject to approval of the engineer and architect.

- 2.2 PIPING MATERIALS
  - A. Refer to Part 3 "Piping Applications" Article for applications of pipe, fitting, and joining materials.
- 2.3 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS
  - A. Pipe and Fittings: ASTM A 74, Service class.
  - B. Gaskets: ASTM C 564, rubber.
  - C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

#### 2.4 PVC PIPE AND FITTINGS

- A. PVC Pressure Pipe: AWWA C900, Class 150 for gasketed joints and using ASTM F 477, elastomeric seals.
  - 1. Fittings NPS 4 to NPS 8: PVC pressure fittings complying with AWWA C907, for gasketed joints and using ASTM F 477, elastomeric seals.
  - 2. Fittings NPS 10 and Larger: Ductile-iron, compact fittings complying with AWWA C153, for push-on joints and using AWWA C111, rubber gaskets.
- B. PVC Water-Service Pipe and Fittings: ASTM D 1785, Schedule 80 pipe, with plain ends for solvent-cemented joints with ASTM D 2467, Schedule 80, socket-type fittings.
- C. PVC Cellular-Core Pipe and Fittings: ASTM F 891, Sewer and Drain Series, PS 50 minimum stiffness pipe with ASTM D 3034, SDR 35, socket-type fittings for solvent-cemented joints.
- D. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D 3034, SDR 35, with bell-and-spigot ends for gasketed joints with ASTM F 477, elastomeric seals.
- E. PVC Sewer Pipe and Fittings, NPS 18 and Larger: ASTM F 679, T 2 wall thickness, with belland-spigot ends for gasketed joints with ASTM F 477, elastomeric seals.
- F. PVC Profile Gravity Sewer Pipe and Fittings: ASTM F 794 pipe, with bell-and-spigot ends; ASTM D 3034 fittings, with bell ends; and ASTM F 477, elastomeric seals.

#### 2.5 CONCRETE PIPE AND FITTINGS

- A. Nonreinforced-Concrete Sewer Pipe and Fittings: ASTM C 14, Class I, II or III, with bell-andspigot ends and gasketed joints with ASTM C 443, rubber gaskets.
- B. Piping in paragraph below is available in 5 classes and 3 wall thicknesses, and in NPS 12 to NPS 144. Not all classes and wall thicknesses are available. Joints are gasket type. Contractor, at his option, may use non-reinforced pipe for sizes up to 21-inches if structural requirements based on load on pipe are not exceeded for that pipe. If reinforced pipe is selected, choose the pipe class and wall thickness to suit availability and structural requirements based on loads and cover.

- C. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76, with bell-and-spigot ends and gasketed joints with ASTM C 443, rubber gaskets.
  - 1. Class III

### 2.6 NONPRESSURE-TYPE PIPE COUPLINGS

- A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.
- B. Sleeve Materials:
  - 1. For Concrete Pipes: ASTM C 443, rubber.
  - 2. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
  - 3. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
  - 4. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
- C. Unshielded Flexible Couplings: Elastomeric sleeve with stainless-steel shear ring and corrosionresistant-metal tension band and tightening mechanism on each end.
  - 1. Manufacturers:
    - a. Dallas Specialty & Mfg. Co.
    - b. Fernco Inc.
    - c. Logan Clay Products Company (The).
    - d. Mission Rubber Company; a division of MCP Industries, Inc.
    - e. NDS Inc.
    - f. Plastic Oddities, Inc.
- D. Shielded Flexible Couplings: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
  - 1. Manufacturers:
    - a. Cascade Waterworks Mfg.
    - b. Dallas Specialty & Mfg. Co.
    - c. Mission Rubber Company; a division of MCP Industries, Inc.
- E. Ring-Type Flexible Couplings: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.
  - 1. Manufacturers:
    - a. Fernco Inc.
    - b. Logan Clay Products Company (The).
    - c. Mission Rubber Company; a division of MCP Industries, Inc.

### 2.7 CLEANOUTS

- A. Gray-Iron Cleanouts: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
  - 1. Manufacturers:
    - a. Josam Company.
    - b. MIFAB Manufacturing, Inc.
    - c. Smith, Jay R. Mfg. Co.
    - d. Wade Div.; Tyler Pipe.
    - e. Watts Industries, Inc.
    - f. Watts Industries, Inc.; Enpoco, Inc. Div.
    - g. Zurn Industries, Inc.; Zurn Specification Drainage Operation.
  - 2. Top-Loading Classification(s): Light, Medium, Heavy, and Extra-heavy duty depending on location and expected driving load on cleanout.
  - 3. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.
- B. PVC Cleanouts: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping. Place in grey iron housing with clamping device and round, secured, scoriated, gray-iron cover.
  - 1. Manufacturers:
    - a. Canplas Inc.
    - b. IPS Corporation.
    - c. NDS Inc.
    - d. Plastic Oddities, Inc.
    - e. Sioux Chief Manufacturing Company, Inc.
    - f. Zurn Industries, Inc.; Zurn Light Commercial Specialty Plumbing Products.

#### 2.8 DRAINS

- A. Gray-Iron Area Drains: ASME A112.21.1M, round body with anchor flange and round secured grate. Include bottom outlet with inside calk or spigot connection, of sizes indicated.
  - 1. Manufacturers:
    - a. Josam Company.
    - b. MIFAB Manufacturing, Inc.
    - c. Smith, Jay R. Mfg. Co.
    - d. Wade Div.; Tyler Pipe.
    - e. Watts Industries, Inc.
    - f. Watts Industries, Inc.; Enpoco, Inc. Div.
    - g. Zurn Industries, Inc.; Zurn Specification Drainage Operation.
  - 2. Top-Loading Classification(s): Medium and heavy duty depending on location and expected driving load.

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### 2.9 MANHOLES

- A. Standard Precast Concrete Manholes: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
  - 1. Diameter: 48 inches minimum, unless otherwise indicated and as needed for pipe sizes.
  - 2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
  - 3. Base Section: 9-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
  - 4. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
  - 5. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
  - 6. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
  - 7. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
  - 8. Steps: Not used.
  - 9. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and diameter matching manhole frame and cover. Include sealant recommended by ring manufacturer.
  - 10. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover.
  - 11. Manhole Frames and Covers: Ferrous; 24-inch ID by 7- to 9-inch riser with 4-inchminimum width flange and 26-inch- diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."
    - a. Material: ASTM A 536, Grade 60-40-18 ductile or ASTM A 48, Class 35 gray iron, unless otherwise indicated and to match existing manhole frames and covers.
    - b. Protective Coating: Foundry-applied, SSPC-Paint 16, coal-tar, epoxy-polyamide paint; 15-mil minimum thickness applied to all surfaces, unless otherwise indicated.
- B. Cast-in-Place Concrete Manholes: Construct of reinforced-concrete bottom, walls, and top; designed according to ASTM C 890 for A-16 (ASSHTO HS20-44), heavy-traffic, structural loading; of depth, shape, dimensions, and appurtenances indicated.
  - 1. Ballast: Increase thickness of concrete, as required to prevent flotation.
  - 2. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
  - 3. Steps: Not used.
  - 4. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and diameter matching manhole frame and cover. Include sealant recommended by ring manufacturer.
  - 5. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover.
  - 6. Manhole Frames and Covers: Ferrous; 24-inch ID by 7- to 9-inch riser with 4-inchminimum width flange and 26-inch- diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."
    - a. Material: ASTM A 536, Grade 60-40-18 ductile or ASTM A 48, Class 35 gray iron, unless otherwise indicated and to match existing frames and covers.
    - b. Protective Coating: Foundry-applied, SSPC-Paint 16, coal-tar, epoxy-polyamide paint 15-mil minimum thickness applied to all surfaces, unless otherwise indicated.

### 2.10 CONCRETE

- A. General: Cast-in-place concrete according to ACI 318/318R, ACI 350R, and the following:
  - 1. Cement: ASTM C 150, Type II.
  - 2. Fine Aggregate: ASTM C 33, sand.
  - 3. Coarse Aggregate: ASTM C 33, crushed gravel.
  - 4. Water: Potable.
- B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water-cementitious materials ratio.
  - 1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
  - 2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.
- C. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water-cementitious materials ratio.
  - 1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
  - 2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

### 2.11 CATCH BASINS

- A. Standard Precast Concrete Catch Basins: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
  - 1. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
  - 2. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
  - 3. Top Section: Flat-slab-top type with hole for frame and grate is indicated.
  - 4. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
  - 5. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.
  - 6. Grade Rings: Include 2 or 3 reinforced-concrete rings, of 6- to 9-inch total thickness, that match frame and grate.
  - 7. Steps: Not Used.
  - 8. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section. Size sections and box or manhole to fit pipes without necesary
- B. Cast-in-Place Concrete, Catch Basins: Construct of reinforced concrete; designed according to ASTM C 890 for structural loading; of depth, shape, dimensions, and appurtenances indicated.
  - 1. Bottom, Walls, and Top: Reinforced concrete.
  - 2. Channels and Benches: Concrete.
  - 3. Steps: Not used.
- C. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include flat grate with small square or short-slotted drainage openings.
  - 1. Size: 24 by 24 inches minimum, unless otherwise indicated.
  - 2. Grate Free Area: Approximately 50 percent, unless otherwise indicated.

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- D. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch-diameter flat grate with small, square or short-slotted drainage openings.
  - 1. Grate Free Area: Approximately 50 percent, unless otherwise indicated.

### 2.12 STORMWATER INLETS

- A. Gutter Inlets: Horizontal gutter opening, of materials and dimensions indicated. Include heavyduty frames and grates. All grates to be bicycle safe.
- B. Combination Inlets: Vertical curb and horizontal gutter openings, of materials and dimensions indicated. Include heavy-duty frames and grates.

### 2.13 DRY WELLS

- A. Description: ASTM C 913, precast, reinforced, perforated concrete manholes with ring and cover, frame and grate, or lid as indicated and include the following:
  - 1. Floor: Cast-in-place concrete support ring.
  - 2. Cover: Liftoff-type concrete cover with cast-in lift rings.
  - 3. Wall Thickness: 4 inches minimum with 1-inch diameter or 1-by-3-inch maximum slotted perforations arranged in rows parallel to axis of ring.
    - a. Total Free Area of Perforations: Approximately 15 percent of ring interior surface.
    - b. Ring Construction: Designed to be self-aligning.
  - 4. Filtering Material: ASTM D 448, Size No. 24, 3/4- to 2-1/2-inch washed, crushed stone or gravel.

### PART 3 - EXECUTION

#### 3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

### 3.2 PIPING APPLICATIONS

- A. Pipe couplings and special pipe fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.
  - 1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping, unless otherwise indicated.
    - a. Flexible or rigid couplings for same or minor difference OD pipes.
    - b. Unshielded, increaser/reducer-pattern, flexible or rigid couplings for pipes with different OD.
    - c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

- 2. Use pressure-type pipe couplings for force-main joints.
- B. Gravity-Flow, Non pressure Sewer Piping: Use any of the following pipe materials for each size range:
  - 1. PVC water-service pipe; PVC Schedule 40, water-service-pipe fittings; and solventcemented joints.
  - 2. PVC sewer pipe and fittings; gaskets; and gasketed joints.
  - 3. Class 2, nonreinforced-concrete sewer pipe and fittings, gaskets, and gasketed joints.
  - 4. Ductile-iron culvert pipe, ductile-iron standard or compact fittings, gaskets, and gasketed joints.
  - 5. Reinforced-concrete sewer pipe and fittings, gaskets, and gasketed joints.
  - 6. Corrugated steel pipe and fittings, standard and special-joint bands, and banded joints.
  - 7. Corrugated aluminum pipe and fittings, standard and special-joint bands, and banded joints.
  - 8. Corrugated PE pipe and fittings, silttight couplings, and coupled joints.

### 3.3 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
- C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.
- D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or a combination of both.
- F. Install gravity-flow, non pressure drainage piping according to the following:
  - 1. Install piping pitched down in direction of flow, at slope indicated.
  - 2. Install piping with restrained joints at tee fittings and at changes in direction for pressure pipe. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
  - 3. Install piping with cover indicated.
  - 4. Notify engineer of clearance problems that would result in changes to grade and alignment.
  - 5. Install hub-and-spigot, cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
  - 6. Install ductile-iron culvert piping according to ASTM A 716.
  - 7. Install ductile-iron and special fittings according to AWWA C600 or AWWA M41.
  - 8. Install corrugated steel piping according to ASTM A 798/A 798M.
  - 9. Install corrugated aluminum piping according to ASTM B 788/B 788M.
  - 10. Install PVC cellular-core piping according to ASTM D 2321 and ASTM F 1668.

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- 11. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.
- 12. Install PVC profile gravity sewer piping according to ASTM D 2321 and ASTM F 1668.
- 13. Install nonreinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."
- 14. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."

### 3.4 PIPE JOINT CONSTRUCTION

- A. Basic pipe joint construction is specified in Division 33 Section "Common Work Results for Utilities." Where specific joint construction is not indicated, follow piping manufacturer's written instructions.
- B. Join gravity-flow, non pressure drainage piping according to the following:
  - 1. Join ductile-iron culvert piping according to AWWA C600 for push-on joints.
  - 2. Join ductile-iron and special fittings according to AWWA C600 or AWWA M41.
  - 3. Join corrugated steel sewer piping according to ASTM A 798/A 798M.
  - 4. Join corrugated aluminum sewer piping according to ASTM B 788/B 788M.
  - 5. Join corrugated PE piping according to CPPA 100 and the following:
    - a. Use silttight couplings for Type 1, silttight joints.
  - 6. Join PVC cellular-core piping according to ASTM D 2321 and ASTM F 891 for solventcement joints.
  - 7. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomericseal joints or ASTM D 3034 for elastomeric gasket joints.
  - 8. Join PVC profile gravity sewer piping according to ASTM D 2321 for elastomeric-seal joints or ASTM F 794 for gasketed joints.
  - 9. Join nonreinforced-concrete sewer piping according to ASTM C 14and ACPA's "Concrete Pipe Installation Manual" for rubber-gasket joints.
  - 10. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasket joints.
  - 11. Join dissimilar pipe materials with non pressure-type flexible or rigid couplings.
- C. Join dissimilar pipe materials with pressure-type couplings.

### 3.5 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extension from sewer pipe to cleanout at grade. Use same pipe type as sewer line that the cleanout is connected to. Install piping so cleanouts open in direction of flow in sewer pipe.
  - 1. Use light-duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
  - 2. Use medium-duty, top-loading classification cleanouts in paved foot-traffic areas.
  - 3. Use heavy-duty, top-loading classification cleanouts in vehicle-traffic service areas.
  - 4. Use extra-heavy-duty, top-loading classification cleanouts in roads areas.
- B. Set cleanout frames and covers in earth in cast-in-place concrete block, 12 inches around outside of cover. At contractors option, a square block can be used that is at least 12-inches wider that the cover. Set with tops 1 inch above surrounding earth grade.

C. Set cleanout frames and covers in concrete pavement with tops flush with pavement surface.

### 3.6 DRAIN INSTALLATION

- A. Install type of drains in locations indicated.
  - 1. Use light-duty, top-loading classification drains in earth or unpaved foot-traffic areas.
  - 2. Use medium-duty, top-loading classification drains in paved foot-traffic areas.
  - 3. Use heavy-duty, top-loading classification drains in vehicle-traffic service areas.
  - 4. Use extra-heavy-duty, top-loading classification drains in roads areas.
- B. Embed drains in 4-inch minimum depth of concrete around bottom and sides.
- C. Fasten grates to drains if indicated.
- D. Set drain frames and covers with tops flush with pavement surface.
- E. Assemble trench sections with flanged joints.
- F. Embed trench sections in 4-inch minimum concrete around bottom and sides.

#### 3.7 MANHOLE INSTALLATION

- A. General: Install manholes, complete with appurtenances and accessories indicated.
- B. Install precast concrete manhole sections according to ASTM C 891.
- C. Construct cast-in-place manholes as indicated.
- D. Install PE sheeting on earth where cast-in-place-concrete manholes are to be built.
- E. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere, unless otherwise indicated.

#### 3.8 CATCH BASIN INSTALLATION

- A. Construct catch basins to sizes and shapes indicated.
- B. Set frames and grates to elevations indicated.
- C. Align boxes so that frame and grates are square to adjacent sidewalks, curbs or roadways.

### 3.9 STORMWATER INLET AND OUTLET INSTALLATION

- A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.
- B. Construct riprap of broken stone, as indicated.
- C. Install outlets that spill onto grade, anchored with concrete, where indicated.

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- D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.
- E. Construct energy dissipaters at outlets, as indicated.

### 3.10 DRY WELL INSTALLATION

- A. Excavate hole to diameter of at least 24 inches greater than outside of dry well. Do not extend excavation into ground-water table.
  - 1. Install filter fabric as indicated. Provide sufficient filter fabric to lap sliced areas at least 12-inches.
- B. Install precast, concrete-ring dry wells according to the following:
  - 1. Assemble rings to depth indicated.
  - 2. Extend rings to height where top of cover will be approximately 8 inches below finished grade.
  - 3. Backfill bottom of inside of rings with filtering material to level at least as indicated on plans.
  - 4. Extend effluent inlet pipe 12 inches into rings and terminate into side of tee fitting.
  - 5. Backfill around outside of rings with filtering material to top level of rings and to depth indicated.
  - 6. Install cover over top of rings.

#### 3.11 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318/318R.

### 3.12 DRAINAGE SYSTEM INSTALLATION

- A. Assemble and install components according to manufacturer's written instructions.
- B. Install with top surfaces of components, except piping, flush with finished surface.
- C. Assemble channel sections to form slope down toward drain outlets. Use sealants, adhesives, fasteners, and other materials recommended by system manufacturer.
- D. Embed channel sections and drainage specialties in 4-inch minimum concrete around bottom and sides.
- E. Fasten grates to channel sections if indicated.
- F. Assemble channel sections with flanged or interlocking joints.
- G. Embed channel sections in 4-inch minimum concrete around bottom and sides.

#### 3.13 CONNECTIONS

A. Connect non pressure, gravity-flow drainage piping in building's storm building drains specified in Division 22 Section "Facility Storm Drainage Piping."

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- B. Connect force-main pressure piping to building's storm drainage force mains specified in Division 22 Section "Facility Storm Drainage Piping." Terminate piping where indicated.
  - 1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
  - 2. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.
- C. Connect to sediment interceptors specified in Division 22 Section "Sanitary Waste Interceptors."

### 3.14 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

- A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:
  - 1. Close open ends of piping with at least 8-inch-thick, brick masonry bulkheads.
  - 2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.
- B. Abandoned Manholes and Structures: Excavate around manholes and structures as required and use one procedure below:
  - 1. Remove manhole or structure and close open ends of remaining piping.
  - 2. Remove top of manhole or structure down to at least 36 inches below final grade. Fill to within 12 inches of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.
- C. Backfill to grade according to Division 31 Section "Earth Moving."

#### 3.15 IDENTIFICATION

- A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.
  - 1. Use warning tape or detectable warning tape over ferrous piping.
  - 2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

#### 3.16 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
  - 1. Submit separate reports for each system inspection.
  - 2. Defects requiring correction include the following:

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- a. Alignment: Less than full diameter of inside of pipe is visible between structures.
- b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
- c. Crushed, broken, cracked, or otherwise damaged piping.
- d. Infiltration: Water leakage into piping.
- e. Exfiltration: Water leakage from or around piping.
- 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
- 4. Reinspect and repeat procedure until results are satisfactory.
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
  - 1. Do not enclose, cover, or put into service before inspection and approval.
  - 2. Test completed piping systems according to authorities having jurisdiction.
  - 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
  - 4. Submit separate report for each test.
  - 5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
    - a. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
    - b. Option: Test plastic piping according to ASTM F 1417.
    - c. Option: Test concrete piping according to ASTM C 924.
- C. Leaks and loss in test pressure constitute defects that must be repaired.
- D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

### 3.17 CLEANING

A. Clean interior of piping of dirt and superfluous materials.

END OF SECTION 334100



GEOTECHNICAL INVESTIGATION PROPOSED HIGH SCHOOL 4600 WEST 14200 SOUTH HERRIMAN, UTAH

PREPARED FOR:

JORDAN SCHOOL DISTRICT 9150 SOUTH 500 WEST SANDY, UTAH 84070

ATTENTION: KARL PETERSON

PROJECT NO. 1160655

SEPTEMBER 14,2016

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# APPENDIX

PREVIOUS TESTING AT THE SITE

## EXECUTIVE SUMMARY

- 1. The subsurface soil encountered at the site consists of approximately 6 to 8 inches of topsoil typically overlying clay. Silty sand was encountered below the topsoil in Borings B-5, B-11 and B-13. Sandy silt was encountered below the topsoil in Boring B-14. Gravel was encountered below the clay, sand and silt at varying depths and generally extends the full depth investigated.
- 2. No subsurface water was encountered to the maximum depth investigated, approximately  $30\frac{1}{2}$  feet.
- 3. Some of the upper clay was found to be moisture sensitive in which the clay collapses or becomes significantly more compressible when wetted. The clay should be removed from below the proposed building areas. The clay may be reused as site grading fill outside the proposed building areas.
- 4. The proposed buildings may be supported on spread footings bearing on the undisturbed natural gravel or on compacted structural fill extending down to the undisturbed natural gravel and may be designed for a net allowable bearing pressure of 4,000 pounds per square foot.
- 5. The moisture-sensitive soil could be a concern for proposed site improvements that may be sensitive to differential settlement planned for the north side of the property such as the football field, tennis courts, pavement and walkway, particularly where significant fill is placed of the moisture-sensitive soil and storm water is added to the subsurface. Additional field study could be done to better define the areas of concern and quantify the potential settlement. The settlement could be several inches in areas where the moisture-sensitive soil is wetted and could be differential over short distances depending on the wetting conditions. If the moisture-sensitive soil will remain below these site improvements, the storm water disposal areas should be selected to avoid potential problems with the moisture-sensitive soil. The percolation test area of P-4 would be suitable.
- 6. There is clay across much of the site. Construction access difficulties can be expected during times when the upper clay is very moist to wet such as in the winter and spring or at times of prolonged rainfall. Removal of the clay down to the gravel or placement of 1 to 2 feet of gravel will improve construction equipment access when the upper clay is very moist to wet.
- 7. Heavy-duty excavation equipment may be needed in areas of cobbles, boulders and cemented soil.
- 8. Geotechnical information related to foundations, subgrade preparation, seismicity and liquefaction, pavement design and materials is included in the report.



### SCOPE

This report presents the results of a geotechnical investigation for the proposed high school to be constructed at 4600 West 14200 South in Herriman, Utah. The report presents the subsurface conditions encountered, laboratory test results and recommendations for foundations and pavement. The study was conducted in general accordance with our proposal dated August 8, 2016 with the addition of four percolation tests at the approximate locations indicated on Figure 1.

Field exploration was conducted to obtain information on the subsurface conditions. Samples obtained from the field investigation were tested in the laboratory to determine physical and engineering characteristics of the on-site soil. Information obtained from the field and laboratory was used to define conditions at the site for our engineering analysis and to develop recommendations for the proposed foundations and pavement.

This report has been prepared to summarize the data obtained during the study and to present our conclusions and recommendations based on the proposed construction and the subsurface conditions encountered. Design parameters and a discussion of geotechnical engineering considerations related to construction are included in the report.

## SITE CONDITIONS

At the time of our field investigation, there were no permanent structures or pavement on the site. The site consists of undeveloped hillside.

The ground surface at the site slopes gently down toward the north and east as indicated on Figure 1.

Vegetation at the site consists of grass, weeds and some brush.



The is a residential subdivision to the south of the site, Mountain View Corridor to west and fields to the north and east.

## FIELD STUDY

The field study was conducted on August 24, 25, 26, 29 and 30, 2016. Figure 1 indicates approximate locations for 18 borings drilled at the site using 8-inch diameter hollow-stem auger powered by a truck-mounted drill rig. The borings were logged and soil samples obtained by an engineer from AGEC. Logs of the borings are graphically shown on Figures 2, 3 and 4 with legend and notes on Figure 5.

We logged test pits excavated at the site for a previous study. The test pit locations are indicated on Figure 1. Logs, legend and notes for the test pits are in the appendix.

The test pits were backfilled without significant compaction. The backfill in the test pits should be properly compacted where it will support proposed buildings, floor slabs or pavement.

## PERCOLATION TESTING

Four percolation tests were performed at the locations indicated on Figure 1. The tests were performed in borings drilled to 8,  $7\frac{1}{2}$ , 7 and 5 feet for Borings P-1 through P-4, respectively. The borings were filled with water the day prior to testing and then filled with water to about 1 foot above the bottom of each boring. The drop in water was measured at 5 to 10-minute intervals and the tests repeated until a relatively constant drop in water level was measured. Percolation rates of 17, 1,  $\frac{1}{2}$  and 1 minutes per inch were measured for Borings P-1 through P-4, respectively.



## SUBSURFACE CONDITIONS

The subsurface soil encountered at the site consists of approximately 6 to 8 inches of topsoil typically overlying clay. Silty sand was encountered below the topsoil in Borings B- 5, B-11 and B-13. Sandy silt was encountered below the topsoil in Boring B-14. Gravel was encountered below the clay, sand and silt at varying depths and generally extends the full depth investigated.

A description of the various soils encountered in the borings follows:

<u>Topsoil</u> - The topsoil ranges from sandy lean clay to silty sand. It is slightly moist, dark brown and contains roots and organics.

<u>Sandy Lean Clay to Sandy Silty Clay</u> - The clay contains some silt and sand layers. It is medium stiff to hard, slightly moist to moist, brown and slightly porous to porous.

Laboratory tests performed on samples of the clay indicate it has natural moisture contents ranging from 5 to 19 percent and natural dry densities ranging from 85 to 101 pounds per cubic foot (pcf).

Results of consolidation tests performed on samples of the clay indicate it will compress a small to moderate amount with the addition of light to moderate loads. One of the consolidation tests also indicate that the clay is moisture sensitive in which it collapses when wetted. Results of consolidation tests are presented on Figures 6 and 7.

<u>Sandy Silt</u> - The silt contains some sand and clay layers. It is stiff to very stiff, slightly moist and brown.



Laboratory tests performed on a sample of the sandy silt indicate it has a natural moisture content of 17 percent and a natural dry density of 83 pcf.

<u>Silty Sand</u> - The sand contains some silt and clay layers. It is medium dense to dense, slightly moist, brown and contains areas of slightly cemented soil.

Laboratory tests performed on samples of the silty sand indicate it has natural moisture contents ranging from 4 to 5 percent and natural dry densities ranging from 95 to 99 pcf.

<u>Clayey Gravel with Sand</u> - The gravel contains cobbles and occasional boulders. It is medium to very dense, slightly moist and brown.

<u>Silty Gravel with Sand</u> - The gravel contains cobbles, boulders and some sand and clay layers. It is medium to very dense, slightly moist, brown and contains occasional slightly cemented layers.

Laboratory tests performed on samples of the sand within the gravel deposit indicate it has natural moisture contents of 8 and 13 percent and natural dry densities of 93 and 116 pcf. Results of a gradation test performed on a sample of the sand within the gravel deposit is presented on Figure 8.

<u>Poorly-graded Gravel with Silt and Sand</u> - The gravel contains cobbles, occasional boulders and some sand and clay layers. It is medium to very dense, slightly moist and brown.

Laboratory tests performed on a sample of the sand layer within the gravel indicate it has a natural moisture content of 7 percent and a natural dry density of 100 pcf. Results of a gradation test performed on the sand are presented on Figure 8.

A summary of the laboratory test results is presented on Table I and included on the logs of the borings.



## SUBSURFACE WATER

No subsurface water was encountered to the maximum depth investigated, approximately  $30\frac{1}{2}$  feet.

### **GEOLOGIC HAZARD EVALUATION**

### A. Regional Geology

The property is located along the eastern edge of the Basin and Range province. The province is made up of north/south elongated mountain blocks and valleys. Salt Lake Valley is in one of the valleys in the province with the Wasatch Mountains forming the eastern boundary of the valley.

Salt Lake Valley was once occupied by a large lake known as Lake Bonneville during the Wisconsin Glacial Period of the Pleistocene Age. The present-day Great Salt Lake is a remnant of Ancient Lake Bonneville. The highest level of Lake Bonneville is marked by a bench, the Bonneville Shoreline, at approximate elevation 5,200 feet. The lake remained at this high level from 17,000 to 15,000 years before present, until it dropped several hundred feet to the Provo level at approximate elevation 4,850 feet during a catastrophic flood known as the Bonneville Flood (Currey, 1990 and Jarrett & Malde, 1987). The lake dropped to near the modern-day Great Salt Lake level by about 13,000 years before presented, rose to the Gilbert level, approximate elevation 4,250 feet, at about 10,300 years before present and then dropped and remained near the modern Great Salt Lake level to present.

The elevation of the ground in the proposed building area is approximately 4,780 to 4,804 feet. This places the site just below the Provo level of the Lake Bonneville lake cycles.



## B. Tectonic Setting

The site is located in Salt Lake Valley along the Wasatch Front, which is a prominent mountain front escarpment extending approximately 240 miles from southern Idaho to north-central Utah. The prominent west facing steep escarpment of the Wasatch Mountain Front is the result of repeated normal fault displacements which have taken place over the last several million years. The system of normal faults which makes up this escarpment is known collectively as the Wasatch fault. Relatively recent fault movements are evidenced by offsets in Lake Bonneville sediments and more recent alluvial and colluvial deposits.

The Wasatch fault is considered to be made up of several segments, each segment acting relatively independent of each other (Machette et al., 1987). The site is located approximately 8.3 miles west of the Wasatch fault zone, which is considered the closest active fault (Black and others, 2003).

## C. Site Geology

Geologic mapping of the area indicates that the soil at the site is Lake Bonneville clay, sand and gravel (Davis, 1983). No faults are mapped extending through the site and no evidence of faults were identified at the site and vicinity during our geologic review.

## D. Geologic Hazards

The geologic hazards reviewed for this study consist of debris flow, landslide, rockfall, earthquake ground shaking, surface fault rupture, liquefaction and tectonic subsidence.



# 1. <u>Debris Flow</u>

The site is not located near a source for debris flow. Debris flow is not considered a hazard at the site.

# 2. Landslide

The site and vicinity slopes gently down toward the north and east. Landslide is not considered a hazard at the site.

# 3. <u>Rockfall</u>

There is no source of rock on or near the property that would represent a rockfall hazard at the site.

# 4. Seismic Ground Shaking

Listed below is a summary of the site parameters for the 2015 International Building Code.

- a. Site Class D\*
- b. Short Period Spectral Response Acceleration, S<sub>s</sub> 1.14g
- c. One Second Period Spectral Response Acceleration,  $S_1 = 0.38g$

\* Deeper subsurface investigation may find the site class to be "C".

# 5. <u>Surface Fault Rupture</u>

There are no active faults mapped as extending through the site. The closest mapped trace of an active fault is the Wasatch fault zone located approximately 8.3 miles to the east of the site (Black and others, 2003).

# 6. <u>Liquefaction</u>

ied GeoTech

The site is located in an area mapped as having a "very low" liquefaction potential (Salt Lake County, 1995). Based on our understanding of the geology of the area and the subsurface conditions encountered to the depth investigated, liquefaction is not a hazard at the site.

## 7. <u>Tectonic Subsidence</u>

Seismically-induced settlement would be insignificant at the site since there are no faults close to the site.

# PROPOSED CONSTRUCTION

We understand that the building will be a one to two-story, masonry structure with a slabon-grade floor. We have assumed building loads will consist of column loads of up to 200 kips and wall loads of up to 7 kips per lineal foot.

We anticipate that paved parking areas will be constructed for the proposed project. We have assumed three traffic conditions, one consisting predominantly of car traffic, one with 10 loaded buses per day and the other consisting of 30 loaded buses per day.

If the proposed construction, building loads, or traffic is significantly different from what is described above, we should be notified so that we can reevaluate the recommendations given.

# RECOMMENDATIONS

Based on the subsoil conditions encountered, laboratory test results, and the proposed construction, the following recommendations are given:

## A. Site Grading

We understand that the southwestern portion of the site may be cut down and the north and east areas filled. This will result in cuts up to approximately 30 feet and fills up to approximately 20 feet. Fill placed for the project should be placed as soon as practical prior to building construction.

## 1. <u>Moisture-sensitive Soil Concerns</u>

The moisture-sensitive soil could be a concern for proposed site improvements that may be sensitive to differential settlement planned for the north side of the property such as the football field, tennis courts, pavement and walkway, particularly where significant fill is placed of the moisturesensitive soil and storm water is added to the subsurface. Additional field study could be done to better define the areas of concern and quantify the potential settlement. The settlement could be several inches in areas where the moisture-sensitive soil is wetted and could be differential over short distances depending on the wetting conditions. If the moisture-sensitive soil will remain below these site improvements, the storm water disposal areas should be selected to avoid potential problems with the moisture-sensitive soil. The percolation test area of P-4 would be suitable.

## 2. Cut and Fill Slopes

Temporary, unretained cuts may be constructed at 1½ horizontal to 1 vertical or flatter. Permanent, unretained cut and fill slopes may be constructed at 2 horizontal to 1 vertical or flatter.

Good surface drainage should be provided up slope of cut and fill slopes to direct surface runoff away from the face of the slopes. The slopes should be protected from erosion by revegetation or other methods.

# 3. <u>Subgrade Preparation</u>

Prior to placing grading fill or base course, existing fill, organics, topsoil, debris and other deleterious material should be removed. The upper soil consists predominantly of clay. The clay, when very moist to wet, can result in construction equipment access difficulties. Removal of the clay down to the gravel or placement of 1 to 2 feet of gravel will improve construction equipment access when the upper clay is very moist to wet.



# 4. Excavation

We anticipate that excavation at the site can be accomplished with typical excavation equipment. Heavy-duty excavation equipment may be needed in areas of cobbles, boulders and cemented soil.

# 5. <u>Compaction</u>

Compaction of materials placed at the site should equal or exceed the minimum densities as indicated below when compared to the maximum dry density as determined by ASTM D-1557.

| Fill To Support                | Compaction |
|--------------------------------|------------|
| Foundations                    | $\geq$ 95% |
| Concrete Flatwork and Pavement | $\geq$ 90% |
| Landscaping                    | $\geq$ 85% |
| Retaining Wall Backfill        | 85 - 90%   |

To facilitate the compaction process, the fill should be compacted at a moisture content within 2 percent of the optimum moisture content. Fill should be placed in thin enough lifts to allow for proper compaction.

Base course should be compacted to at least 95 percent of the maximum dry density as determined by ASTM D-1557.

Fill and pavement materials placed for the project should be frequently tested for compaction.

# 6. <u>Materials</u>

Material placed as fill to support foundations should be non-expansive granular soil. The clay and silt are not recommended for use as fill below the buildings, but may be considered as fill below pavement areas, or as utility trench backfill, if the topsoil, organics and other deleterious materials are removed, or they may be used in landscaping areas. The sand and gravel, exclusive of topsoil, organics, over-sized particles and other deleterious materials, may be used as fill below the proposed buildings, parking and as utility trench and retaining wall backfill.

The on-site soil may require drying or wetting prior to use as fill to facilitate compaction. Drying of the soil may not be practical during cold or wet periods of the year.

| Fill to Support                | Recommendations   |  |
|--------------------------------|---|--|
| Footings                       | Non-expansive granular soil<br>Passing No. 200 Sieve < 35%<br>Liquid Limit < 30%<br>Maximum size 4 inches |  |
| Floor Slab<br>(Upper 4 inches) | Sand and/or Gravel<br>Passing No. 200 Sieve < 5%<br>Maximum size 2 inches                                 |  |
| Slab Support                   | Non-expansive granular soil<br>Passing No. 200 Sieve < 50%<br>Liquid Limit < 30%<br>Maximum size 6 inches |  |

Listed below are materials recommended for imported structural fill.

# 7. <u>Drainage</u>

The ground surface surrounding the proposed buildings should be sloped away from the buildings in all directions. Roof down spouts and drains should discharge beyond the limits of backfill.

The collection and diversion of drainage away from the pavement surface is important to the satisfactory performance of the pavement section. Proper drainage should be provided.



## B. Foundations

## 1. <u>Bearing Material</u>

With the proposed construction and the subsurface conditions encountered, the proposed buildings may be supported on spread footings bearing on the undisturbed natural gravel or on compacted structural fill extending down to the undisturbed natural gravel. The upper clay and silt should be removed from below proposed foundations.

Structural fill should extend out away from the edge of the footings at least a distance equal to the depth of fill beneath footings.

Topsoil, moisture-sensitive soil, unsuitable fill, organics, debris and other deleterious materials should be removed from below proposed foundation areas.

## 2. <u>Bearing Pressure</u>

Spread footings bearing on the undisturbed gravel or on structural fill extending down to the gravel may be designed using an allowable net bearing pressure of 4,000 psf.

Footings should have a minimum width of 2 feet and a minimum depth of embedment of 1 foot.

# 3. <u>Temporary Loading Conditions</u>

The allowable bearing pressure may be increased by one-half for temporary loading conditions such as wind or seismic loads.



# 4. <u>Settlement</u>

Based on the subsoil conditions encountered and the assumed building loads, we estimate that total and differential settlement for foundations designed as indicated above will be less than 1 and <sup>3</sup>/<sub>4</sub> inch, respectively.

Care will be required to not disturb the natural soil at the base of the foundation excavations in order to maintain settlement within tolerable limits.

# 5. Frost Depth

Exterior footings and footings beneath unheated areas should be placed at least 30 inches below grade for frost protection.

# 6. <u>Foundation Base</u>

The base of footing excavations should be cleared of loose or deleterious material prior to structural fill or concrete placement.

# 7. <u>Construction Observation</u>

A representative of the geotechnical engineer should observe footing excavations prior to structural fill or concrete placement.

## C. Concrete Slab-on-Grade

# 1. Slab Support

Concrete slabs may be supported on the undisturbed natural gravel or on compacted structural fill extending down to the undisturbed natural gravel. Unsuitable fill, moisture-sensitive soil, topsoil, organics and other deleterious material should be removed from below floor slab areas.



## 2. Underslab Sand and/or Gravel

A 4-inch layer of free draining sand and/or gravel (less than 5 percent passing the No. 200 sieve) should be placed below the concrete slabs for ease of construction and to promote even curing of the slab concrete.

# 3. Vapor Barrier

A vapor barrier should be placed under the concrete floor if the floor will receive an impermeable floor covering. The barrier will reduce the amount of water vapor passing from the slab to the floor covering.

## D. Lateral Earth Pressures

# 1. Lateral Resistance for Footings

Lateral resistance for spread footings placed on the natural soil or on compacted structural fill is controlled by sliding resistance between the footing and the foundation soils. A friction value of 0.45 may be used in design for ultimate lateral resistance.

# 2. Subgrade Walls and Retaining Structures

The following equivalent fluid weights are given for design of subgrade walls and retaining structures. The active condition is where the wall moves away from the soil. The passive condition is where the wall moves into the soil and the at-rest condition is where the wall does not move. The values listed below assume a horizontal surface adjacent the top and bottom of the wall.

| Soil Type     | Active | At-Rest | Passive |
|---------------|--------|---------|---------|
| Clay & Silt   | 50 pcf | 65 pcf  | 250 pcf |
| Sand & Gravel | 40 pcf | 55 pcf  | 300 pcf |



## 3. <u>Seismic Conditions</u>

Under seismic conditions, the equivalent fluid weight should be increased by 29 pcf for the active condition, increased by 14 pcf for the at-rest condition and decreased by 29 pcf for the passive condition. This assumes a peak ground acceleration of 0.46g for a 2 percent probability of exceedance in a 50-year period (IBC 2015).

# 4. Safety Factors

The values recommended above assume mobilization of the soil to achieve the assumed soil strength. Conventional safety factors used for structural analysis for such items as overturning and sliding resistance should be used in design.

## E. Water Soluble Sulfates

Two samples of the natural soil were tested in the laboratory for water soluble sulfate content. The test results indicate there is less than 0.1 percent water soluble sulfate in the samples tested. Based on the results of the tests and published literature, the natural soil possesses negligible sulfate attack potential on concrete. The concentration of water soluble sulfates present in the soil at the site indicates that sulfate resistant cement is not needed for concrete placed in contact with the natural soil. Other conditions may dictate the type of cement to be used in concrete for the project.

## F. Pavement

Based on the subsoil conditions encountered, laboratory test results and the assumed traffic as indicated in the Proposed Construction section of the report, the following pavement support recommendations are given:


### 1. <u>Subgrade Support</u>

The upper soil consists predominantly of lean clay. Although with site grading, there may be large areas of pavement with gravel subgrade. We have assumed a CBR values of 3 and 20 percent for clay and gravel subgrade areas, respectively.

## 2. <u>Pavement Thickness</u>

Based on the subsoil conditions, assumed traffic, a design life of 20 years for flexible and 30 years for rigid pavement and methods presented by the Utah Department of Transportation, the following pavement sections are calculated for clay subgrade areas.

|                              | Rigid <u>Pavement</u>       | Flexi                 | ble Paver      | ent                |  |
|------------------------------|-----------------------------|-----------------------|----------------|--------------------|--|
| Traffic                      | Portland<br>Cement Concrete | Asphaltic<br>Concrete | Base<br>Course | Granular<br>Borrow |  |
| Predominantly Car<br>Traffic | 5"                          | 3 "                   | 6"             | _                  |  |
| 15 buses per day             | 5½"                         | 3 ½ ″                 | 6"             | 10"                |  |
| 30 buses per day             | 6"                          | 4"                    | 6"             | 12"                |  |

If the subgrade soils are very moist to wet, it may be necessary to place granular borrow below traffic areas as discussed in the Subgrade Preparation section of the report. Granular borrow is not needed where the subgrade consists of at least 12 inches of natural gravel with a CBR of at least 20 percent.

A pavement section consisting of at least 6½ inches of Portland cement concrete over at least 4 inches of base course is recommended for the dumpster approach slab.



#### 3. <u>Pavement Materials and Construction</u>

### a. Flexible Pavement (Asphaltic Concrete)

The pavement materials should meet the material specifications for the applicable jurisdiction. The use of other materials may result in the need for different pavement material thicknesses.

## b. Rigid Pavement (Portland Cement Concrete)

The pavement thicknesses assume that the pavement will have aggregate interlock joints and that a concrete shoulder or curb will be provided.

The pavement materials should meet the material specifications for the applicable jurisdiction. The pavement thicknesses indicated above assume that the concrete will have a 28-day compressive strength of 4,000 pounds per square inch. Concrete should be air entrained with approximately 6 percent air. Maximum allowable slump will depend on the method of placement but should not exceed 4 inches.

## 4. Jointing

Joints for concrete pavement should be laid out in a square or rectangular pattern. Joint spacings should not exceed 30 times the thickness of the slab. The joint spacings indicated should accommodate the contraction of the concrete and under these conditions steel reinforcing will not be required. The depth of joints should be approximately one-fourth of the slab thickness.

#### G. Preconstruction Meeting

A preconstruction meeting should be held with representatives of the owner, project architect, geotechnical engineer, general contractor, earthwork contractor and other members of the design team to review construction plans, specifications, methods and schedule.

#### LIMITATIONS

This report has been prepared in accordance with generally accepted soil and foundation engineering practices in the area for the use of the client for design purposes. The conclusions and recommendations included within the report are based on the information obtained from the borings drilled and test pits excavated and the data obtained from laboratory testing. Variations in the subsurface conditions may not become evident until excavation is conducted. If the subsurface conditions or groundwater level is found to be significantly different from what is described above, we should be notified to reevaluate our recommendations.

APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, INC.



Reviewed by Jay R. McQuivey, P.E.

DRH/rs



#### REFERENCES

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#### LEGEND:

| <b>N</b><br>N<br>N | Topsoil; sandy lean clay to silty sand, slightly moist, dark brown, roots, organics.  |
|--------------------|---|
|                    | Sandy Lean Clay to Sandy Silty Clay(CL to CL-ML); some silt and sand layers, medium stiff to hard, slightly moist to moist, brown, slightly porous to porous. |
|                    | Sandy Silt (ML); some sand and clay layers, stiff to very stiff, slightly moist, brown.   |
|                    | Silty Sand (SM); some silt and clay layers, medium dense to dense, slightly moist, brown, areas of slightly cemented soil.                                    |
|                    | Clayey Gravel with Sand (GC); cobbles, occasional boulders, medium to very dense, slightly moist, brown.  |
|                    | Silty Gravel with Sand (GM); cobbles, boulders, some sand and clay layers, medium to very dense, slightly moist, brown, occasional slightly cemented layers.  |
| No.                | Poorly-graded Gravel with Silt and Sand (GP-GM); cobbles, occasional boulders, some sand and clay layers, medium to very dense, slightly moist, brown.        |
|                    |   |

10/12 California Drive sample taken. The symbol 10/12 indicates that 10 blows from a 140 pound automatic hammer falling 30 inches were required to drive the sampler 12 inches.

#### NOTES:

- 1. The borings were drilled on August 24, 25, 26, 29 and 30, 2016 with 8-inch diameter hollowstem auger.
- 2. Locations of the borings were measured approximately by pacing from features shown on the site plan provided.
- 3. Elevations of the borings were determined by interpolating between contours shown on the site plan provided.
- 4. The boring locations and elevations should be considered accurate only to the degree implied by the method used.
- 5. The lines between materials shown on the boring logs represent the approximate boundaries between material types and the transitions may be gradual.
- 6. No free water was encountered in the borings at the time of drilling.
- 7. WC = Water Content (%); DD = Dry Density (pcf); +4 = Percent Retained on the No. 4 Sieve; -200 = Percent Passing the No. 200 Sieve; LL = Liquid Limit (%); PI = Plasticity Index (%); WSS = Water Soluble Sulfates (%).

AGEC



Project No. 1160655

**CONSOLIDATION TEST RESULTS** 





## APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, INC.

Project No. 1160655

#### **GRADATION TEST RESULTS**

Figure 8

## APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, INC.

TABLE I SUMMARY OF LABORATORY TEST RESULTS

PROJECT NUMBER 1160655

| SAMPLE<br>LOCATION |                 | NATURAL        | NATURAL                 | GRADATION     |             |                      | ATTERBERG LIMITS       |                            | UNCONFINED                           | WATER                     | 0.000                                    |
|--------------------|-----------------|----------------|-------------------------|---------------|-------------|----------------------|------------------------|----------------------------|--------------------------------------|---------------------------|--|
| BORING             | DEPTH<br>(FEET) | CONTENT<br>(%) | DRY<br>DENSITY<br>(PCF) | GRAVEL<br>(%) | SAND<br>(%) | SILT/<br>CLAY<br>(%) | LIQUID<br>LIMIT<br>(%) | PLASTICITY<br>INDEX<br>(%) | COMPRESSIVE S<br>STRENGTH S<br>(PSF) | SOLUBLE<br>SULFATE<br>(%) | SAMPLE<br>CLASSIFICATION                 |
| B-1                | 4               | 14             | 87                      |               |             | 57                   |                        |                            |                                      |                           | Sandy Lean Clay                          |
|                    |                 |                |                         |               |             |                      |                        |                            |                                      |                           |  |
| B-2                | 4               | 7              | 85                      |               |             | 60                   |                        |                            |                                      |                           | Sandy Lean Clay                          |
|                    |                 |                |                         |               |             |                      |                        |                            |                                      |                           |  |
| B-4                | 0               | 13             | 93                      |               |             | 38                   |                        |                            |                                      | 0.006                     | Clayey Sand                              |
|                    | 14              | 8              | 116                     | 34            | 52          | 14                   |                        |                            |                                      |                           | Silty Sand with Gravel                   |
|                    |                 |                |                         |               |             |                      |                        |                            |                                      |                           |  |
| B-7                | 0               | 5              | 98                      |               |             | 57                   | 20                     | 5                          |                                      |                           | Sandy Silty Clay                         |
|                    |                 |                |                         |               |             |                      |                        |                            |                                      |                           |  |
| B-9                | 0               | 7              | 101                     |               |             | 55                   |                        |                            |                                      |                           | Sandy Silty Clay                         |
|                    | 4               | 4              | 99                      |               |             | 37                   |                        |                            |                                      |                           | Silty Sand                               |
|                    |                 |                |                         |               |             |                      |                        |                            |                                      |                           |  |
| B-10               | 0               | 5              | 95                      |               |             | 51                   |                        |                            |                                      |                           | Sandy Silty Clay                         |
|                    |                 |                |                         |               |             |                      |                        |                            |                                      |                           |  |
| B-11               | 0               | 5              | 95                      |               |             | 41                   |                        |                            |                                      |                           | Silty Sand                               |
|                    |                 |                |                         |               |             |                      |                        |                            |                                      |                           |  |
| B-14               | 0               |                |                         |               |             |                      |                        |                            |                                      | < 0.001                   | Sandy Silt                               |
|                    | 2               | 17             | 83                      |               |             | 70                   |                        |                            |                                      |                           | Sandy Silt                               |
|                    |                 |                |                         |               |             |                      |                        |                            |                                      |                           |  |
| B-16               | 4               | 12             | 91                      |               |             | 55                   |                        |                            |                                      |                           | Sandy Silty Clay                         |
|                    | 19              | 19             | 85                      |               |             | 74                   |                        |                            |                                      |                           | Lean Clay with Sand                      |
|                    |                 |                |                         |               |             |                      |                        |                            |                                      |                           |  |
| B-17               | 9               | 7              | 100                     | 28            | 62          | 10                   |                        |                            |                                      |                           | Well-graded Sand with Silt<br>and Gravel |
|                    |                 |                |                         |               |             |                      |                        |                            |                                      |                           |  |

# APPENDIX

## PREVIOUS TESTING AT THE SITE

Project No. 1160655



|         | Topsoil; silty and clayey sand, small to moderate amounts of gravel, cobbles and boulders at the ground surface, slightly moist to moist, brown to dark brown, roots and organics.                            |     |  |
|---------|---|-----|--|
|         | Lean Clay (CL); low to moderate plasticity, small to moderate amounts of sand, occasional   | NOT | 'ES:   |
|         | gravel, stiff to very stiff, slightly moist, brown to dark brown.   | 1.  | Test pits were excavated on November 5, 6, 7 and 8, 2007   |
|         | Fat Clay (CH); moderate to high plasticity, small to moderate amounts of sand, occasional gravel, stiff to very stiff, slightly moist to moist, brown to dark brown.  | 2.  | Locations and elevations of test pits were established by G representatives of Rosecrest, Inc.   |
|         | Clayey Sand (SC); small to moderate amounts of clay and gravel, occasional cobbles, medium  | 3.  | The test pit locations and elevations should be considered a implied by the method used.   |
|         | dense to dense, slightly moist to moist, light brown to brown.  | 4.  | The lines between the materials shown on the test pit logs<br>boundaries between material types and the transitions may                  |
|         | Silt (ML and MH); low to high plastic (elastic) silts, occasional pinhole structure, small to moderate<br>amounts of sand, occasional sand layers, stiff to very stiff, slightly moist to moist, light brown. | 5.  | No free water was encountered in the test pits at the time of  |
|         | Silty Sand (SM); small to large amounts of silt, occasional silt layers and gravel, occasional cemented layers, medium dense to dense, slightly moist, brown to reddish brown and yellowish gray.             | 6.  | WC = Water Content (%);<br>DD = Dry Density (pcf);<br>+4 = Percent Retained on the No. 4 Sieve;<br>-200 = Percent Passing No. 200 Sieve; |
|         | Poorly Graded Sand (SP); small amounts of silt and gravel, loose to dense, slightly moist, brown to dark gray.  |     | PI = Plasticity Index (%);<br>UC = Unconfined Compressive Strength (psf);<br>WSS = Water Soluble Sulfates (ppm).                         |
|         | Clayey Gravel (GC); small to moderate amounts of clay and sand, cobbles and occasional boulders<br>up to approximately 3 feet in size, dense to very dense, slightly moist to moist, brown to light<br>brown. |     |  |
|         | Silty Gravel (GM); small to moderate amounts of silt and sand, cobbles and occasional boulders up to approximately 3 feet in size, dense to very dense, slightly moist to moist, brown.                       |     |  |
|         | Poorly Graded Gravel (GP); small amounts of silt, clay and sand, cobbles and boulders up to approximately 5 feet in size, dense to very dense, slightly moist to moist, brown to reddish brown and gray.      |     |  |
| S Ind   | icates relatively undisturbed hand drive sample taken.  |     |  |
| Ind     | icates relatively undisturbed block sample taken.   |     |  |
| Ind     | icates disturbed sample taken.  |     |  |
| Inc     | licates slotted 1 $\frac{1}{2}$ inch PVC pipe installed in the test pit to the depth shown.   |     |  |
| Inc     | licates practical excavation refusal.   |     |  |
| 1071288 | Legend and Notes of Test Pits   |     |  |

- 7, with a tracked excavator.
- GPS survey performed by
- accurate only to the degree
- represent the approximate v be gradual.
- of excavation.



Project No. 1071288

**CONSOLIDATION TEST RESULTS** 



AVES



