NORTH OGDEN CITY

SETTLED 1851

4050 NORTH 100 EAST STORM DRAIN DESIGN

BIDDING DOCUMENTS

ESI Project No. 23-093

ESI Engineering, Inc.
3500 South Main, Suite 206
Salt Lake City, Utah 84115
(801) 263-1752
(801) 263-1780 fax
www.esieng.com

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ADVERTISEMENT FOR BID

4050 NORTH 100 EAST STORM DRAIN DESIGN PROJECT

North Ogden City Corporation

RECEIPT OF BIDS: Sealed bids will be accepted at the Office of the City Recorder North Ogden City, 505 E 2600 N, North Ogden City, Utah, 84414, until 2:00pm on Wednesday, July 26th, 2023, for the 4050 North 100 East Storm Drain Design project for North Ogden City Corporation.

DESCRIPTION OF WORK: The work consists of the installation of a storm drain (approximately 315 feet), 3 new gutter inlet boxes, 2 manholes, road rebuild and regrading of the intersection and replacement of curb and gutter, sidewalk, and a pedestrian ramp as shown in the design drawings.

LOCATION OF WORK: The work is located at 4050 North and 100 East in North Ogden, Utah, as indicated in the project drawings.

COMPLETION OF WORK: All work specified in the contract documents shall be substantially completed within 60 days from the date specified in the Notice to Proceed.

OPENING OF BIDS: Bids will be publicly opened at 2:00pm on Wednesday, July 26th, 2023, at the aforementioned office of the City Recorder North Ogden City.

OBTAINING CONTRACT DOCUMENTS: Contract Documents may be obtained at North Ogden City's website. Bid documents will be available online at https://www.northogdencity.com/

BID SECURITY: Each bid shall be accompanied by a certified check, cashier's check or bid bond in the amount of five percent of the total bid price, made payable to North Ogden City Corporation as guarantee that the bidder, if his bid is accepted, will promptly execute the Contract, secure payment of Worker's Compensation insurance and furnish a satisfactory, faithful performance bond in the amount of one hundred percent of the contract price and a payment bond in the amount of one hundred percent of the contract price.

PROJECT ADMINISTRATION: All questions relative to this project prior to opening of bids shall be directed to the Engineer. No specification interpretations will be made by telephone, nor will any "or equal" products be considered for approval prior to award of contract.

OWNER'S RIGHTS RESERVED: North Ogden City Corporation reserves the right to reject any or all bids, to waive any informalities in a bid, and to make awards in the interest of the City. If North Ogden City awards the contract for the Work, such award shall be to the responsible Bidder based on the "Choosing by Advantages" (CBA) decision making evaluation.

Dated: July 13th, 2023

By:

North Ogden City Engineer
Eric Casperson

SECTION 00 21 13

INSTRUCTIONS TO BIDDERS

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ARTICLE 1 – DEFINED TERMS

1.01 Terms used in these Instructions to Bidders have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below:

A. Bidder. One who submits a Bid for Work directly to the Owner, distinct from a sub-bidder who submits a bid to a Bidder.

B. Successful Bidder. If Owner awards the contract for the Work, such award shall be to the responsible Bidder based on the "Choosing by Advantages" (CBA) decision making evaluation.

C. Bidding Documents. Documents include the Invitation to Bid, Instructions to Bidders, Bid Form, and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids).

D. OWNER. The Owner is North Ogden City located at 505 E. 2600 North, North Ogden, Utah 84414.

E. ENGINEER. The Engineer is ESI Engineering located at 4141 W 2100 S Suite 100, West Valley City, UT 84120.

F. All other terms used in these Instructions to Bidders are defined in the Standard General Conditions of the Construction Contract, EJCDC C-700 Copyright 2007 NSPE for EJCDC - Reference Number 00 72 00.

ARTICLE 2 – COPIES OF BIDDING DOCUMENTS

2.01 Complete sets of Bidding Documents shall be used in preparing Bids; neither Owner nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

2.02 Owner and Engineer, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids for the Work and do not authorize or confer a license for any other use.

ARTICLE 3 – QUALIFICATIONS OF BIDDERS

3.01 To demonstrate Bidder's qualifications to perform the Work, within seven (7) days of Owner's request, Bidder shall submit written evidence such as financial data, previous experience, present commitments, and such other data as may be called for below.

A. Evidence of Bidder's authority to do business in the state where the Project is located.

B. Bidder's state contractor license number.

C. A current financial statement for the Work (as provided to bonding company);

D. A chronological list of "in progress" and "completed" construction work done by Bidder during the last two (2) years; including project name, address, owner, contract name, and current telephone number;

E. Present construction commitments other than items listed in paragraph D. above;

F. Proposed organizational structure such as firm ownership, project manager, progress scheduler, and superintendent for the Work for this Project;

G. Owned and rented equipment which is to be used to do the Work;

H. Investigations, arbitration, litigation or claims which are pending, threatened, settled or otherwise disposed of within the last three (3) years;

I. Evidence of ability to perform and complete the Work in a manner and within the time limit specified. As a minimum, identify specific experience on projects similar to the Work in physical size, cost, and nature. If the work experiences of the project manager and superintendent designated to construct this project are different than that of the Bidder, provide resumes of their work history. Include their actual project titles and indicate their actual responsibilities on each given project;

J. All matters consistent with federal, state and local laws and regulations; and

K. Such other data as may be requested by the Engineer.

L. If Bidder believes any information should be held confidential for business reasons, Bidder must submit a written claim of business confidentiality for that particular information and include a specific statement of the reasons supporting the claim pursuant to Utah Code Ann. 63-2-308.

M. Untimely response or failure to provide the requested information by Bidder will release Owner of any obligation to further consider the Bidder's Bid.

3.02 Bidder is advised to carefully review those portions of the Bid Form requiring Bidder's representations and certifications.

3.03 The submission of a Bid will constitute an incontrovertible representation by Bidder that their Bid is genuine and no collusion is connected herewith.

ARTICLE 4 – EXAMINATION OF BIDDING DOCUMENTS, OTHER RELATED DATA, AND SITE

4.01 *Subsurface and Physical Conditions* – In general, prior to submitting a Bid, each Bidder shall review all available explorations, tests and data concerning surface conditions, subsurface conditions and Underground Facilities at or contiguous to the site, or otherwise, which may

affect cost, progress, performance or furnishing of the Work in accordance with the time, price and other terms and conditions of the Contract Documents. A soils report has not been prepared for the proposed site. Soil conditions have not been assessed. All excavations will be in un-classified soil. Contractor shall be responsible to perform excavation work in wet conditions, if encountered. Tracked equipment may be required for all excavation. Bid amounts will not be altered due to wet conditions.

A. The Supplementary Conditions identify:

1. Those reports known to Owner of explorations and tests of subsurface conditions at or contiguous to the Site.

2. Those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).

B. Copies of reports and drawings referenced in Paragraph 4.01.A will be made available by Owner to any Bidder on request. Those reports and drawings are not part of the Contract Documents, but the "technical data" contained therein upon which Bidder is entitled to rely as provided in Paragraph 4.02 of the General Conditions has been identified and established in Paragraph 4.02 of the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any "technical data" or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

4.02 *Underground Facilities*

A. Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or contiguous to the Site is based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities, including Owner, or others. The Owner and Engineer do not assume responsibility for the accuracy or completeness thereof.

4.03 *Hazardous Environmental Condition*

A. The Supplementary Conditions identify any reports and drawings known to Owner relating to a Hazardous Environmental Condition identified at the Site.

B. Copies of reports and drawings referenced in Paragraph 4.03.A will be made available by Owner to any Bidder on request. Those reports and drawings are not part of the Contract Documents, but the "technical data" contained therein upon which Bidder is entitled to rely as provided in Paragraph 4.06 of the General Conditions has been identified and established in Paragraph 4.06 of the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any "technical data" or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

4.04 Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions, and Underground Facilities, and possible changes in the Bidding Documents due to differing or unanticipated subsurface or physical conditions appear in Paragraphs 4.02, 4.03, and 4.04 of the General Conditions. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders

with respect to a Hazardous Environmental Condition at the Site, if any, and possible changes in the Contract Documents due to any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work, appear in Paragraph 4.06 of the General Conditions.

4.05 On request, Owner will provide Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies as Bidder deems necessary for submission of a Bid. Bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies. Bidder shall comply with all applicable Laws and Regulations relative to excavation and utility locates.

4.06 A. Reference is made to Article 7 of the Supplementary Conditions for the identification of the general nature of other work that is to be performed at the Site by Owner or others (such as utilities and other prime contractors) that relates to the Work contemplated by these Bidding Documents. On request, Owner will provide to each Bidder for examination access to or copies of contract documents (other than portions thereof related to price) for such other work.

B. Paragraph 6.13.C of the General Conditions indicates that if an Owner safety program exists, it will be noted in the Supplementary Conditions.

4.07 It is the responsibility of each Bidder before submitting a Bid to:

A. Examine and carefully study the Bidding Documents, and the other related data identified in the Bidding Documents;

B. Visit the Site and become familiar with and satisfy Bidder as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;

C. Become familiar with and satisfy Bidder as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work;

D. Carefully study all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) that have been identified in Paragraph 4.02 of the Supplementary Conditions as containing reliable "technical data," and (2) reports and drawings of Hazardous Environmental Conditions, if any, at the Site that have been identified in the Paragraph 4.06 of the Supplementary Conditions as containing reliable "technical data";

E. Consider the information known to Bidder; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents; and (3) Bidder’s safety precautions and programs;

F. Agree at the time of submitting its Bid that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price(s) bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents;

G. Become aware of the general nature of the work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents;

H. Promptly give Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Engineer is acceptable to Bidder; and

I. Determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work.

4.08 The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 4, that without exception the Bid is premised upon performing and furnishing the Work required by the Bidding Documents and applying any specific means, methods, techniques, sequences, and procedures of construction that may be shown or indicated or expressly required by the Bidding Documents, that Bidder has given Engineer written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in the Bidding Documents and the written resolutions thereof by Engineer are acceptable to Bidder, and that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.

ARTICLE 5 – PRE-BID CONFERENCE

No pre-bid conference will be held for this project.

ARTICLE 6 – SITE AND OTHER AREAS

The Site is identified in the Bidding Documents. Easements for permanent structures or permanent changes in existing facilities are to be obtained and paid for by Owner unless otherwise provided in the Bidding Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment, or storage of materials and equipment to be incorporated in the Work are to be obtained and paid for by Contractor.

ARTICLE 7 – INTERPRETATIONS AND ADDENDA

7.01 All questions about the meaning or intent of the Bidding Documents are to be submitted to Engineer in writing. Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda mailed or delivered to all parties recorded by Engineer as having received the Bidding Documents. Questions received less than seven days prior to the date for opening of Bids may not be answered. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

7.02 Addenda may be issued to clarify, correct, or change the Bidding Documents as deemed advisable by Owner or Engineer.

7.03 Owner will not accept any deviations from the printed terms of the Agreement and Contract Documents, except by Addendum or Change Order.

ARTICLE 8 – BID SECURITY

8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of 5% percent of Bidder's maximum Bid price and in the form of a certified check, bank money order, or a Bid bond issued by a surety meeting the requirements of Paragraphs 5.01 and 5.02 of the General Conditions.

8.02 The Bid security of the Successful Bidder will be retained until such Bidder has executed the Contract Documents, furnished the required contract security and met the other conditions of the Notice of Award, whereupon the Bid security will be returned. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within 15 days after the Notice of Award, Owner may consider Bidder to be in default, annul the Notice of Award, and the Bid security of that Bidder will be forfeited. Such forfeiture shall be Owner's exclusive remedy if Bidder defaults. The Bid security of other Bidders whom Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of seven days after the Effective Date of the Agreement or 61 days after the Bid opening, whereupon Bid security furnished by such Bidders will be returned.

8.03 Bid security of other Bidders whom Owner believes do not have a reasonable chance of receiving the award will be returned within seven days after the Bid opening.

ARTICLE 9 – CONTRACT TIMES

The number of days within which, or the dates by which, the Work is to be substantially completed and ready for final payment are set forth in the Bid Agreement. See Article 6 of the Bid Documents

ARTICLE 10 – LIQUIDATED DAMAGES

10.01 Provisions for liquidated damages, if any, are set forth in the Agreement.

ARTICLE 11 – SUBSTITUTE AND "OR-EQUAL" ITEMS

11.01 The Contract, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents without consideration of possible substitute or "or-equal" items. Whenever it is specified or described in the Bidding Documents that a substitute or "or-equal" item of material or equipment may be furnished or used by Contractor if acceptable to Engineer, application for such acceptance will not be considered by Engineer until after the Effective Date of the Agreement.

ARTICLE 12 – SUBCONTRACTORS, SUPPLIERS AND OTHERS

12.01 If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, individuals, or entities to be submitted to Owner in advance of a specified date prior to the Effective Date of the Agreement, the apparent Successful Bidder, and any other Bidder so requested, shall within five days after Bid opening, submit to Owner a list of all such Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work for which such identification is required. Such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, individual, or entity if requested by Owner. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit a substitute, without an increase in the Bid.

12.02 If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers, individuals, or entities. Declining to make requested substitutions will not constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which Owner or Engineer makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to revocation of such acceptance after the Effective Date of the Agreement as provided in Paragraph 6.06 of the General Conditions.

ARTICLE 13 – PREPARATION OF BID

13.01 The Bid Form is included with the Bidding Documents. Additional copies may be obtained from Engineer.

13.02 All blanks on the Bid Form shall be completed in ink and the Bid Form signed in ink. Erasures or alterations shall be initialed in ink by the person signing the Bid Form. A Bid price shall be indicated for each Bid item listed therein.

13.03 A Bid by a corporation shall be executed in the corporate name by the president or a vice-president or other corporate officer accompanied by evidence of authority to sign. The corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown.

13.04 A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership shall be shown.

13.05 A Bid by a limited liability company shall be executed in the name of the firm by a member and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm shall be shown.

13.06 A Bid by an individual shall show the Bidder's name and official address.

13.07 A Bid by a joint venture shall be executed by each joint venturer in the manner indicated on the Bid Form. The official address of the joint venture shall be shown.

13.08 All names shall be printed in ink below the signatures**.**

13.09 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid Form.

13.10 Postal and e-mail addresses and telephone number for communications regarding the Bid shall be shown.

13.11 The Bid shall contain evidence of Bidder's authority and qualification to do business in the state where the Project is located, or Bidder shall covenant in writing to obtain such authority and qualification prior to award of the Contract and attach such covenant to the Bid. Bidder's state contractor license number, if any, shall also be shown on the Bid Form.

ARTICLE 14 – BASIS OF BID; COMPARISON OF BIDS

14.01 *Lump Sum*

A. Bidders shall submit a Bid on a lump sum basis as set forth in the Bid Form.

14.02 *Unit Price*

A. Bidders shall submit a Bid on a unit price basis for each item of Work listed in the Bid schedule.

B. The total of all estimated prices will be the sum of the products of the estimated quantity of each item and the corresponding unit price. The final quantities and Contract Price will be determined in accordance with Paragraph 11.03 of the General Conditions.

C. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

14.03 *Allowances*

A. For cash allowances the Bid price shall include such amounts as the Bidder deems proper for Contractor's overhead, costs, profit, and other expenses on account of cash allowances, if any, named in the Contract Documents, in accordance with Paragraph 11.02.B of the General Conditions.

ARTICLE 15 – SUBMITTAL OF BID

15.01 A bound or unbound copy of the Bid Form is to be completed and submitted with the Bid security.

15.02 A Bid shall be submitted no later than the date and time prescribed and at the place indicated in the advertisement or invitation to bid and shall be accompanied by the Bid security and other required documents. Bids will be received by North Ogden City at 505 E 2600 N. North Ogden City, UT, 84414. Bids shall be clearly marked on the outside of sealed packaging "4050 NORTH 100 EAST STORM DRAIN DESIGN PROJECT".

ARTICLE 16 – MODIFICATION AND WITHDRAWAL OF BID

16.01 A Bid may be modified or withdrawn by an appropriate document duly executed in the same manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids.

16.02 If within 24 hours after Bids are opened any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, that Bidder may withdraw its Bid, and the Bid security will be returned. Thereafter, if the Work is rebid, that Bidder will be disqualified from further bidding on the Work.

ARTICLE 17 – OPENING OF BIDS

17.01 Bids will be opened at 2:00pm on Wednesday July 26th, 2023 the time and read aloud publicly. An abstract of the amounts of the base Bids and major alternates, if any, will be made available to Bidders after the opening of Bids.

ARTICLE 18 – BIDS TO REMAIN SUBJECT TO ACCEPTANCE

18.01 All Bids will remain subject to acceptance for the period of time stated in the Bid Form, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

ARTICLE 19 – EVALUATION OF BIDS AND AWARD OF CONTRACT

19.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, non-responsive, unbalanced, or conditional Bids. Owner further reserves the right to reject the Bid of any Bidder whom it finds, after reasonable inquiry and evaluation, to not be responsible. Owner may also reject the Bid of any Bidder if Owner believes that it would not be in the best interest of the Project to make an award to that Bidder. Owner also reserves the right to waive all informalities not involving price, time, or changes in the Work and to negotiate contract terms with the Successful Bidder.

19.02 More than one Bid for the same Work from an individual or entity under the same or different names will not be considered. Reasonable grounds for believing that any Bidder has an interest in more than one Bid for the Work may be cause for disqualification of that Bidder and the rejection of all Bids in which that Bidder has an interest.

19.03 In evaluating Bids, Owner will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices and other data, as may be requested in the Bid Form or prior to the Notice of Award.

19.04 In evaluating Bidders, Owner will consider the qualifications of Bidders and may consider the qualifications and experience of Subcontractors, Suppliers, and other individuals or entities proposed for those portions of the Work for which the identity of Subcontractors, Suppliers, and other individuals or entities must be submitted as provided in the Supplementary Conditions.

19.05 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders, proposed Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work in accordance with the Contract Documents.

19.06 After a review of responsible bidders, the Owner will conduct the “Choosing by Advantages” (CBA) decision making evaluation. Choosing by Advantages “CBA” is the process adopted by the Owner to aid in awarding contracts. CBA is based on the fundamental rule of decision

making that "Decision must be based on the importance of advantages". An advantage is defined as a positive difference between two alternatives. The advantages of a proposal are compared to the advantages found in other proposals to determine which is preferred.

19.07 CBA weighs the advantage of the preferred proposal to the additional cost when awarding contracts. Consequently, the CBA analysis may result in awarding the project to a contractor other than the low Bidder. In the evaluation, the lowest Bidder's qualifications and proposal will be compared to the other Bidder's qualifications and proposals. The project will be awarded independently of the cost when distinct advantages in the proposal are found to be of significance by the evaluation committee. This occurs when the cost to gain the advantage is considered appropriate. Predetermined factors listed in the Choosing by Advantages Decision Making Form will govern the evaluation process and selection of the successful Bidder. Some Factors may be more important than others and will carry more weight in the decision-making process.

ARTICLE 20 – CONTRACT SECURITY AND INSURANCE

20.01 Article 5 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment bonds and insurance. When the Successful Bidder delivers the executed Agreement to Owner, it shall be accompanied by such bonds.

ARTICLE 21 – SIGNING OF AGREEMENT

21.01 When Owner issues a Notice of Award to the Successful Bidder, it shall be accompanied by the required number of unsigned counterparts of the Agreement along with the other Contract Documents which are identified in the Agreement as attached thereto. Within 15 days thereafter, Successful Bidder shall sign and deliver the required number of counterparts of the Agreement and attached documents to Owner. Within ten days thereafter, Owner shall deliver one fully signed counterpart to Successful Bidder with a complete set of the Drawings with appropriate identification.

SECTION 00 41 00

BID FORM

4050 North 100 East

Storm Drain Design Project

PROJECT #23-093

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ARTICLE 1 – BID RECIPIENT

1.01 This Bid is submitted to: North Ogden City

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2 – BIDDER'S ACKNOWLEDGEMENTS

2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 90 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner. Anticipated NTP is July 2023.

ARTICLE 3 – BIDDER'S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

A. Bidder has examined and carefully studied the Bidding Documents, other related data identified in the Bidding Documents, and the following Addenda, receipt of which is hereby acknowledged:

Addendum No.	Addendum Date
_____	_____
_____	_____
_____	_____

B. Bidder has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Bidder is familiar with and is satisfied as to all Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) that have been identified in SC-4.02 as containing reliable "technical data," and (2) reports and drawings of Hazardous Environmental Conditions, if any, at the Site that have been identified in SC-4.06 as containing reliable "technical data."

E. Bidder has considered the information known to Bidder; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the

means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents; and (3) Bidder's safety precautions and programs.

F. Based on the information and observations referred to in Paragraph 3.01.E above, Bidder does not consider that further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.

G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.

H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by Engineer is acceptable to Bidder.

I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.

ARTICLE 4 – BIDDER'S CERTIFICATION

4.01 Bidder certifies that:

A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;

B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;

C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and

D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:

1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process;

2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;

3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels; and

4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

4.02 For public work, relevant requirements of Laws and Regulations in the jurisdiction where Work is to be performed should be coordinated with the language of this paragraph.

ARTICLE 5 – BASIS OF BID

5.01 Bidder will complete the Work in accordance with the Contract Documents for the following prices:

5.02 **UNIT PRICE BID**

BID SCHEDULE

NORTH Ogden Storm Drain Design
Project # 23-093

Bid Schedule - North Ogden Storm Drain

Item	Description	Total Amount	Units	Unit Price	Total
1	Mobilization & Traffic Control	1	LS		
2	Pothole existing utilities as needed	2	EA		
3	Sawcut and remove existing asphalt. Haul away and dispose of in a safe and legal manner. Asphalt is approximately 3" - 4" in depth.	680	SY		
4	Remove existing base material (approximately 8" deep)	680	SY		
5	Excavate and haul away native material (including rocks over 4" dia.)	90	CY		
6	Excavate, stockpile, and backfill with granular native material (4" minus)	150	CY		
7	Over-excavate soft spots 12" deep as directed by engineer.	150	CY		
8	Furnish and install 12" thick layer of 3" minus A-1-a granular backfill compacted to 95% modified proctor (for soft spot repair see special conditions)	270	TN		
9	Furnish and install gravel bedding for new storm drain	165	TN		
10	Furnish and install new perforated 15" HDPE pipe	38	LF		

11	Furnish and install new 15" RCP storm drain	275	LF		
12	Furnish and install new gutter inlet box	3	EA		
13	Furnish and install new 4' diameter storm drain manhole	1	EA		
14	Furnish and install new 5' diameter storm drain manhole	1	EA		
15	Furnish and install untreated base course (8" deep) including compaction and grading	325	TN		
16	Furnish and install new asphalt including trench patching. (3" deep, PG-58-28, DM 1/2", 50 gyrations, 15% max. RAP)	130	TN		
17	Remove and replace curb and gutter, recompact base material as per engineer	85	LF		
18	Remove & replace ADA pedestrian ramp and sidewalk as shown on plan	1	LS		
	Subtotal (Items 1-18)				

Unit Prices have been computed in accordance with Paragraph 11.03.B of the General Conditions.

Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all unit price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

5.03 MEASUREMENT AND PAYMENT

Bid Item 1 – Mobilization & Traffic Control:

Measurement shall be per lump sum. Payment will be made according to the percentage of the total contract work completed (i.e., 50% paid when 50% of the work is completed). Payment includes the following work and items:

A. Secure permits, bonds, and insurance;
B. Move equipment and personnel to and from the job site;
C. Provide traffic control plan, barricades, signs and devices; and
D. Complete all other miscellaneous responsibilities and operations not generally attributed to any other single bid item.

Bid Item 2 – Pothole Existing Utilities as Needed:

Measurement shall be per pothole. Payment shall be full compensation for all labor, material, and equipment necessary to pothole. Payment includes the following items and tasks:

A. Pothole and excavate to determine utility location, and backfill as necessary;
B. Provide dust control and daily cleanup; and
C. All appurtenant activities and devices necessary to provide the above listed items complete.

Bid Item 3 – Sawcut and Remove Existing Asphalt. Haul Away and Dispose of in a Safe and Legal Manner:

Measurement shall be per square yard. Payment shall be full compensation for all labor, material, and equipment necessary to sawcut and remove existing asphalt over intersection and storm drain trenches. Payment includes the following items and tasks:

A. Locate and protect existing utilities, concrete, and storm drain inlets to remain in place;
B. Sawcut trench areas and pavement cut lines as indicated on design drawings;
C. Mill and excavate asphalt (approximately 3”-4” depth);
D. Haul away asphalt and dispose of in a safe and legal manner;
E. Provide dust control and daily cleanup; and
F. All other appurtenant activities and devices necessary to provide the above listed items complete.

Bid Item 4 – Remove Existing Base Material:

Measurement shall be per square yard. Payment shall be full compensation for all labor, material, and equipment necessary to remove base material from intersection and trench areas.

A. Locate and protect existing utilities;
B. Excavate existing base material (approximately 8” depth) from intersection are and trenches;
C. Haul away and dispose of in a safe and legal manner;
D. Provide dust control and daily cleanup; and
E. All other appurtenant activities and devices necessary to provide the above listed items complete.

Bid Item 5 – Excavate and Haul Away Native Material:

Measurement shall be per cubic yard. Payment shall be full compensation for all labor, material, and equipment necessary to excavate and haul away native material. Payment includes the following items and tasks:

A. Excavation and disposal of native material
B. Provide dust control and daily cleanup; and

C. All other appurtenant activities and devices necessary to provide the above listed items complete.

Bid Item 6 – Excavate, Stockpile, and Backfill with Granular Native Material:

Measurement shall be per cubic yard. Payment shall be full compensation for all labor, material, and equipment necessary to excavate native material from trench areas, store on-site, and backfill trenches.

A. Locate and protect existing utilities;
B. Excavate native material from trench areas
C. Place and compact trench backfill material;
D. Provide dust control and daily cleanup; and
E. All other appurtenant activities and devices necessary to provide the above listed items complete.

Bid Item 7 – Over-Excavate Soft Spots 12" Deep as Directed by Engineer.:

Measurement shall be per cubic yard. Payment shall be full compensation for all labor, material, and equipment necessary to excavate native material from intersection and trench areas, store on-site, and backfill.

A. Locate and protect existing utilities;
B. Excavate soft spots in intersection area as instructed by engineer;
C. Haul away and dispose of native material in a safe and legal manner;
F. Provide dust control and daily cleanup; and
G. All other appurtenant activities and devices necessary to provide the above listed items complete.

Bid Item 8 – Furnish and Install 12" Thick Layer of 3" Minus A-1-a Granular Backfill Compacted to 95% Modified Proctor

Measurement shall be per ton as measured from weigh tickets. Weigh tickets must include date, time, material type, source, destination, loaded weight, empty weight, and tare weight. Payment shall be full compensation for all labor, material, and equipment necessary to furnish and place granular backfill. Payment includes the following items and tasks:

A. Import granular backfill and store on-site;
B. Infill excavated areas for soft spot repairs, and perform compaction necessary to achieve 95% by modified proctor test;
C. Provide dust control and daily cleanup; and
D. All other appurtenant activities and devices necessary to provide the above listed items complete

Bid Item 9 – Furnish and Install Gravel Bedding for New Storm Drain:

Measurement shall be per ton as measured from weigh tickets. Weigh tickets must include date, time, material type, source, destination, loaded weight, empty weight, and tare weight. Payment shall be full compensation for all labor, material, and equipment necessary to furnish and place gravel bedding. Payment includes the following items and tasks:

A. Import gravel bedding and store on-site;
B. Install gravel bedding in trench areas no less than 6" deep prior to placement of storm drain lines;
C. Install gravel with no less than 12" of cover over new storm drain;
D. All other appurtenant activities and devices necessary to provide the above listed items complete.

Bid Item 10, 11 – Furnish and install new perforated 15" HDPE Pipe, and 15" RCP Storm Drain:

Measurement shall be per lineal foot. Payment shall be full compensation for all labor, material, and equipment to provide the work specified and includes:

A. Install the storm drain pipe line with manufacturer approved bedding material and methods, joints, and connections;
B. All other appurtenant activities and devices necessary to provide the above listed items complete.

Bid Item 12 – Furnish and install new gutter inlet box:

Measurement shall be per unit. Payment shall be full compensation for all labor, material, and equipment to provide the work specified and includes:

A. Excavate and remove native material;
B. Install gravel bedding and new gutter inlet box. Perform tie-ins to new storm drain;
B. All other appurtenant activities and devices necessary to provide the above listed items complete.

Bid Item 13, 14 – Furnish and install new 4' and 5' diameter storm drain manholes:

Measurement shall be per unit. Payment shall be full compensation for all labor, material, and equipment to provide the work specified and includes:

A. Excavate and remove native material;
B. Install new gravel bedding and manholes. Perform tie-ins to new storm drain; and

C. All other appurtenant activities and devices necessary to provide the above listed items complete.

Bid Item 15 – Furnish and install untreated base course (8" deep) including compaction and grading:

Measurement shall be per ton as measured from weigh tickets. Weigh tickets must include date, time, material type, source, destination, loaded weight, empty weight, and tare weight. Payment shall be full compensation for all labor, material, and equipment necessary to furnish and place untreated base course. Payment includes the following items and tasks:

A. Install (8" deep) untreated base course in intersection area and trench areas;
B. Grade intersection as indicated on design drawings
C. All other appurtenant activities and devices necessary to provide the above listed items complete.

Bid Item 16 – Furnish and install new asphalt including trench patching.:

Measurement shall be per ton as measured from weigh tickets. Weigh tickets must include date, time, material type, source, destination, loaded weight, empty weight, and tare weight. Payment shall be full compensation for all labor, material, and equipment necessary to furnish and place asphalt. Payment includes the following items and tasks:

A. Place and compact hot mix asphalt to the design thickness as indicated on the design drawings;
B. Provide dust control and daily cleanup; and
C. Complete all other items and operations necessary for new asphalt

Bid Item 17 – Remove and replace curb and gutter, recompact base material as per engineer:

Measurement shall be per lineal foot. Payment shall be full compensation for all labor, material, and equipment to provide the work specified and includes:

A. Remove existing curb and gutter on the northwest and southwest corners of intersection;
B. Placement and compaction of 8" untreated base course under curb and gutter;
C. Concrete, forming, placement, reinforcing, scoring, finishing, curing, sealing;
D. Provide dust control and daily cleanup; and
E. All other appurtenant activities and devices necessary to provide the above listed items complete.

Bid Item 18 – Remove & replace ADA pedestrian ramp and sidewalk as shown on plan:

Measurement shall be as lump sum. Payment shall be full compensation for all labor, material, and equipment to provide the work specified and includes:

A. Remove existing pedestrian ramp;
B. Remove approximately 18' of concrete walk north of existing pedestrian ramp and approximately 14' west of ramp;
C. Placement and compaction of 8" untreated base course under new sidewalk and pedestrian ramp;
D. Install new ADA pedestrian ramp and approximately 18' of new sidewalk north, and approximately 14' of sidewalk west, as indicated on the design drawings, including all concrete, forming, placement, reinforcing, scoring, finishing, curing, and sealing
E. Provide dust control and daily cleanup; and
F. All other appurtenant activities and devices necessary to provide the above listed items complete.

ARTICLE 6 – TIME OF COMPLETION

6.01 Bidder agrees that the Work will be substantially complete within 60 calendar days after the date when the Contract Times commence to run as provided in Paragraph 2.03 of the General Conditions, and will be completed and ready for final payment in accordance with Paragraph 14.07 of the General Conditions within 75 calendar days after the date when the Contract Times commence to run. Anticipated NTP is July 2023.

6.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 7 – ATTACHMENTS TO THIS BID

7.01 The following documents are submitted with and made a condition of this Bid:

A. Required Bid security in the form of Bid Bond or Cashier Check;

B. List of Proposed Subcontractors;

C. List of Proposed Suppliers;

D. List of Project References;

E. Evidence of authority to do business in the state of the Project; or a written covenant to obtain such license within the time for acceptance of Bids;

F. Contractor's License No.: _____ *or* Evidence of Bidder's ability to obtain a State Contractor's License and a covenant by Bidder to obtain said license within the time for acceptance of Bids;

7.02 Required Bidder Qualification Statement and Choosing by Advantage (CBA) form with Supporting Data.

ARTICLE 8 – DEFINED TERMS

8.01 The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 9 – BID SUBMITTAL

9.01 This Bid is submitted by:

If Bidder is:

An Individual

Name (typed or printed): _____

By: _____
(Individual's signature)

Doing business as: _____

A Partnership

Partnership Name: _____

By: _____
(Signature of general partner -- attach evidence of authority to sign)

Name (typed or printed): _____

A Corporation

Corporation Name: _____ (SEAL)

State of Incorporation: _____
Type (General Business, Professional, Service, Limited Liability):_____

By: _____
(Signature -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____
(CORPORATE SEAL)

Attest _____

Date of Qualification to do business in _____ is ____/____/____.

A Joint Venture

Name of Joint Venture: _____

First Joint Venturer Name: _____ (SEAL)

By: _____
(Signature of first joint venture partner -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

Second Joint Venturer Name: _____(SEAL)

By: _____
(Signature of second joint venture partner -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

(Each joint venturer must sign. The manner of signing for each individual, partnership, and corporation that is a party to the joint venture should be in the manner indicated above.)

Bidder's Business Address _____

_____

Phone No. _____ Fax No. _____

E-mail _____ _____

SUBMITTED on _____, 20____.

State Contractor License No. _____.

Section 00 51 00 Notice of Award

Date: _____

Project: 4050 North 100 East Storm Drain Design Project	
Owner: North Ogden City	Owner Contract No.:
Contract: 4050 North 100 East Storm Drain Design Project	Engineer Project No.: 23-093
Bidder:	
Bidder's Address:	

You are notified that your Bid dated _____ for the above Contract has been considered. You are the apparent Successful Bidder and are awarded a Contract for Bid Schedule Items 1-18.

The Contract Price of your Contract is _____ Dollars 00/100 Dollars ($_____).

3 copies of the proposed Contract Documents (except Drawings) accompany this Notice of Award.

3 sets of the Drawings will be delivered separately or otherwise made available to you immediately.

You must comply with the following conditions precedent within [5] days of the date you receive this Notice of Award.

1. Deliver to the Owner [3] fully executed counterparts of the Contract Documents.
2. Deliver with the executed Contract Documents the Contract security [Bonds] as specified in the Instructions to Bidders (Article 20), General Conditions (Paragraph 5.01), and Supplementary Conditions (Paragraph SC-5.01).
3. Other conditions precedent:
   None

Failure to comply with these conditions within the time specified will entitle Owner to consider you in default, annul this Notice of Award, and declare your Bid security forfeited.

Within ten days after you comply with the above conditions, Owner will return to you one fully executed counterpart of the Contract Documents.

_____
Owner

By: _____
Authorized Signature

_____
Title

Copy to Engineer

SECTION 00 52 00

CONSTRUCTION CONTRACT

THIS AGREEMENT is by and between NORTH OGDEN CITY ("Owner") and _____ ("Contractor").

Owner and Contractor hereby agree as follows:

ARTICLE 1 - WORK

1.01 *Contractor shall complete all Work as specified or indicated in the Contract Documents.*

ARTICLE 2 - THE PROJECT

2.01 The Project for which the Work under the Contract Documents may be the whole or only a part is generally described as follows: 4050 North 100 East Storm Drain Design Project – Project #23-093.

ARTICLE 3 - ENGINEER

3.01 The Project has been designed by ESI Engineering, Inc which is to act as Owner's representative, assume duties and responsibilities as agreed upon, and have the rights and authority assigned to Engineer in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

ARTICLE 4 - CONTRACT TIMES

4.01 *Time of the Essence*

A. All time limits for Substantial Completion and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

4.02 *Liquidated Damages*

A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial loss if the Work is not completed within the times specified in Paragraph 4.02 above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty),

Contractor shall pay Owner $500.00 for each day that expires after the time specified in Paragraph 4.02 above for Substantial Completion until the Work is substantially complete. After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Time or any proper extension thereof granted by Owner, Contractor shall pay Owner $500.00 for each day that expires after the time specified in Paragraph 4.02 above for completion and readiness for final payment until the Work is completed and ready for final payment.

ARTICLE 5 - CONTRACT PRICE

5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents an amount in current funds equal to the sum of the amounts determined pursuant to Paragraphs 5.01.A, 5.01.B, and 5.01.C below:

A. For all Unit Price Work, an amount equal to the sum of the established unit price for each separately identified item of Unit Price Work times the actual quantity of that item:

The Bid prices for Unit Price Work set forth as of the Effective Date of the Agreement are based on estimated quantities. As provided in Paragraph 11.03 of the General Conditions, estimated quantities are not guaranteed, and determinations of actual quantities and classifications are to be made by Engineer as provided in Paragraph 9.07 of the General Conditions.

ARTICLE 6 – PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

A. Contractor shall submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

6.02 *Progress Payments; Retainage*

A. Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment on or about the last day of each month during performance of the Work as provided in Paragraph 6.02.A.1 below. All such payments will be measured by the schedule of values established as provided in Paragraph 2.07.A of the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no schedule of values, as provided in the General Requirements.

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Engineer may determine or Owner may withhold, including

but not limited to liquidated damages, in accordance with Paragraph 14.02 of the General Conditions.

a. 95 percent of Work completed (with the balance being retainage). If the Work has been 50 percent completed as determined by Engineer, and if the character and progress of the Work have been satisfactory to Owner and Engineer, then as long as the character and progress of the Work remain satisfactory to Owner and Engineer, there will be no additional retainage; and

b. 25 percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).

B. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 100 percent of the Work completed, less such amounts as Engineer shall determine in accordance with Paragraph 14.02.B.5 of the General Conditions and less 100 percent of Engineer's estimate of the value of Work to be completed or corrected as shown on the tentative list of items to be completed or corrected attached to the certificate of Substantial Completion.

6.03 *Final Payment*

A. Upon final completion and acceptance of the Work in accordance with Paragraph 14.07 of the General Conditions, Owner shall pay the remainder of the Contract Price as recommended by Engineer as provided in said Paragraph 14.07.

ARTICLE 7 – INTEREST

7.01 All moneys not paid when due as provided in Article 14 of the General Conditions shall bear interest at the rate of 0 percent per annum.

ARTICLE 8 – CONTRACTOR'S REPRESENTATIONS

8.01 In order to induce Owner to enter into this Agreement, Contractor makes the following representations:

A. Contractor has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents.

B. Contractor has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Contractor is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Contractor has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities), if any, that have been identified in Paragraph SC-4.02 of the Supplementary Conditions as containing

reliable "technical data," and (2) reports and drawings of Hazardous Environmental Conditions, if any, at the Site that have been identified in Paragraph SC-4.06 of the Supplementary Conditions as containing reliable "technical data."

E. Contractor has considered the information known to Contractor; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Site-related reports and drawings identified in the Contract Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Contract Documents; and (3) Contractor's safety precautions and programs.

F. Based on the information and observations referred to in Paragraph 8.01.E above, Contractor does not consider that further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract Documents.

G. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.

H. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

I. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

ARTICLE 9 – CONTRACT DOCUMENTS

9.01 *Contents*

A. The Contract Documents consist of the following:

1. This Agreement.
2. Performance bond.
3. Payment bond.
4. Other bonds as required.
5. General Conditions.
6. Supplementary Conditions.
7. Specifications as listed in the table of contents of the Project Manual.

8. Drawings

9. Addenda.

10. Exhibits to this Agreement:

    a. Contractor's Bid.

    b. Documentation submitted by Contractor prior to Notice of Award.

11. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:

    a. Notice to Proceed.

    b. Work Change Directives.

    c. Change Orders.

B. The documents listed in Paragraph 9.01.A are attached to this Agreement (except as expressly noted otherwise above).

C. There are no Contract Documents other than those listed above in this Article 9.

D. The Contract Documents may only be amended, modified, or supplemented as provided in Paragraph 3.04 of the General Conditions.

ARTICLE 10 – MISCELLANEOUS

10.01 *Terms*

A. Terms used in this Agreement will have the meanings stated in the General Conditions and the Supplementary Conditions.

10.02 *Assignment of Contract*

A. No assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

10.03 *Successors and Assigns*

A. Owner and Contractor each binds itself, its partners, successors, assigns, and legal representatives to the other party hereto, its partners, successors, assigns, and legal

representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

10.04 *Severability*

A. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Owner and Contractor, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

10.05 *Contractor's Certifications*

Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 10.05:

1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process or in the Contract execution;

2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;

3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and

4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement. Counterparts have been delivered to Owner and Contractor. All portions of the Contract Documents have been signed or have been identified by Owner and Contractor or on their behalf.

This Agreement will be effective on _____, 2023 (which is the Effective Date of the Agreement).

OWNER:	CONTRACTOR
NORTH OGDEN CITY	_____
By: _____	By: _____

Title: _____

Attest
. _____

Title: _____

Address for giving notices:

_____

_____

_____

(If Owner is a corporation, attach evidence of authority to sign. If Owner is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of this Agreement.)

Title: _____

(If Contractor is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest: _____

Title: _____

Address for giving notices:

_____

_____

_____

License No.: _____

Agent for service of process:

_____

SECTION 00 43 13

BID SECURITY

Section 00 55 00 Notice to Proceed

Date:_____

Project: 4050 North 100 East Storm Drain Design Project	
Owner: North Ogden City	Owner's Contract No.:
Contract: 4050 North 100 East Storm Drain Design Project	Engineer's Project No.: 23-093
Contractor:	
Contractor's Address:	

You are notified that the Contract Times under the above Contract will commence to run on_____. On or before that date, you are to start performing your obligations under the Contract Documents. In accordance with Article 4 of the Agreement, the date of Substantial Completion is_____, and the date of readiness for final payment is _____ [(or) the number of days to achieve Substantial Completion is 60, and the number of days to achieve readiness for final payment is 75].

Before you may start any Work at the Site, Paragraph 2.01.B of the General Conditions provides that you and Owner must each deliver to the other (with copies to Engineer and other identified additional insured and loss payees) certificates of insurance which each is required to purchase and maintain in accordance with the Contract Documents.

Also, before you may start any Work at the Site, you must: Contact Brian Campbell with ESI Engineering at (801) 953-4814 and Eric Casperson with North Ogden City at (801) 737-3308.

North Ogden City

Owner	Contractor
Given by:	Given by:
Authorized Signature	Authorized Signature
Title	Title
Date	Date

Copy to Engineer

SECTION 00 61 13.13

PERFORMANCE BOND

Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

CONTRACTOR (*Name and Address*):

SURETY (*Name, and Address of Principal Place of Business*):

OWNER:
North Ogden City
505 E 2600 N, North Ogden City,
UT 84414

CONTRACT
Effective Date of Agreement:
Amount:
Description (*Name and Location*):

BOND
Bond Number:
Date (*Not earlier than Effective Date of Agreement*):
Amount:
Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

_____ (Seal)
Contractor's Name and Corporate Seal

By: _____
Signature

_____
Print Name

_____
Title

Attest: _____
Signature

_____
Title

SURETY

_____ (Seal)
Surety's Name and Corporate Seal

By: _____
Signature (Attach Power of Attorney)

_____
Print Name

_____
Title

Attest: _____
Signature

_____
Title

Note: Provide execution by additional parties, such as joint venturers, if necessary.

Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to Owner for the performance of the Contract, which is incorporated herein by reference.

1. If Contractor performs the Contract, Surety and Contractor have no obligation under this Bond, except to participate in conferences as provided in Paragraph 2.1.
2. If there is no Owner Default, Surety's obligation under this Bond shall arise after:
   2.1. Owner has notified Contractor and Surety, at the addresses described in Paragraph 9 below, that Owner is considering declaring a Contractor Default and has requested and attempted to arrange a conference with Contractor and Surety to be held not later than 15 days after receipt of such notice to discuss methods of performing the Contract. If Owner, Contractor, and Surety agree, Contractor shall be allowed a reasonable time to perform the Contract, but such an agreement shall not waive Owner's right, if any, subsequently to declare a Contractor Default; and
   2.2. Owner has declared a Contractor Default and formally terminated Contractor's right to complete the Contract. Such Contractor Default shall not be declared earlier than 20 days after Contractor and Surety have received notice as provided in Paragraph 2.1; and
   2.3. Owner has agreed to pay the Balance of the Contract Price to:
      1. Surety in accordance with the terms of the Contract; or
      2. Another contractor selected pursuant to Paragraph 3.3 to perform the Contract.
3. When Owner has satisfied the conditions of Paragraph 2, Surety shall promptly, and at Surety's expense, take one of the following actions:
   3.1. Arrange for Contractor, with consent of Owner, to perform and complete the Contract; or
   3.2. Undertake to perform and complete the Contract itself, through its agents or through independent contractors; or
   3.3. Obtain bids or negotiated proposals from qualified contractors acceptable to Owner for a contract for performance and completion of the Contract, arrange for a contract to be prepared for execution by Owner and contractor selected with Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Contract, and pay to Owner the amount of damages as described in Paragraph 5 in excess of the Balance of the Contract Price incurred by Owner resulting from Contractor Default; or
   3.4. Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:
      1. After investigation, determine the amount for which it may be liable to Owner and, as soon as practicable after the amount is determined, tender payment therefor to Owner; or
      2. Deny liability in whole or in part and notify Owner citing reasons therefor.
4. If Surety does not proceed as provided in Paragraph 3 with reasonable promptness, Surety shall be deemed to be in default on this Bond 15 days after receipt of an additional written notice from Owner to Surety demanding that Surety perform its obligations under this Bond, and Owner shall be entitled to enforce any remedy available to Owner. If Surety proceeds as provided in Paragraph 3.4, and Owner refuses the payment tendered or Surety has denied liability, in whole or in part, without further notice Owner shall be entitled to enforce any remedy available to Owner.
5. After Owner has terminated Contractor's right to complete the Contract, and if Surety elects to act under Paragraph 3.1, 3.2, or 3.3 above, then the responsibilities of Surety to Owner shall not be greater than those of Contractor under the Contract, and the responsibilities of Owner to Surety shall not be greater than those of Owner under the Contract. To the limit of the amount of this Bond, but subject to commitment by Owner of the Balance of the Contract Price to mitigation of costs and damages on the Contract, Surety is obligated without duplication for:
   5.1. The responsibilities of Contractor for correction of defective Work and completion of the Contract;
   5.2. Additional legal, design professional, and delay costs resulting from Contractor's Default, and resulting from the actions of or failure to act of Surety under Paragraph 3; and
   5.3. Liquidated damages, or if no liquidated damages are specified in the Contract, actual damages caused by delayed performance or non-performance of Contractor.
6. Surety shall not be liable to Owner or others for obligations of Contractor that are unrelated to the Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than Owner or its heirs, executors, administrators, or successors.
7. Surety hereby waives notice of any change, including changes of time, to Contract or to related subcontracts, purchase orders, and other obligations.
8. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the Work or part of the Work is located, and shall be instituted within two years after Contractor Default or within two years after Contractor ceased working or within two years after Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.
9. Notice to Surety, Owner, or Contractor shall be mailed or delivered to the address shown on the signature page.
10. When this Bond has been furnished to comply with a statutory requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory requirement shall be deemed deleted herefrom and provisions conforming to such statutory requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory bond and not as a common law bond.
11. Definitions.
    11.1. Balance of the Contract Price: The total amount payable by Owner to Contractor under the Contract after all proper adjustments have been made, including allowance to Contractor of any amounts received or to be received by Owner in settlement of insurance or other Claims for damages to which Contractor is entitled, reduced by all valid and proper payments made to or on behalf of Contractor under the Contract.
    11.2. Contract: The agreement between Owner and Contractor identified on the signature page, including all Contract Documents and changes thereto.
    11.3. Contractor Default: Failure of Contractor, which has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Contract.
    11.4. Owner Default: Failure of Owner, which has neither been remedied nor waived, to pay Contractor as required by the Contract or to perform and complete or otherwise comply with the other terms thereof.

12. FOR INFORMATION ONLY – (*Name, Address and Telephone*)
    Surety Agency or Broker:
    Owner's Representative (*Engineer or other party*):

SECTION 00 61 13.16

PAYMENT BOND

Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

CONTRACTOR (*Name and Address*):

SURETY (*Name, and Address of Principal Place of Business*):

OWNER (*Name and Address*):
North Ogden City
505 E 2600 N, North Ogden City,
UT 84414

CONTRACT
Effective Date of Agreement:
Amount:
Description *(Name and Location)*:

BOND
Bond Number:
Date (*Not earlier than Effective Date of Agreement*):
Amount:
Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

_____ (Seal)
Contractor's Name and Corporate Seal

By: _____
Signature

_____
Print Name

_____
Title

Attest: _____
Signature

_____
Title

SURETY

_____ (Seal)
Surety's Name and Corporate Seal

By: _____
Signature (Attach Power of Attorney)

_____
Print Name

_____
Title

Attest: _____
Signature

_____
Title

Note: Provide execution by additional parties, such as joint venturers, if necessary.

1. Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to Owner to pay for labor, materials, and equipment furnished by Claimants for use in the performance of the Contract, which is incorporated herein by reference.
2. With respect to Owner, this obligation shall be null and void if Contractor:
   2.1. Promptly makes payment, directly or indirectly, for all sums due Claimants, and
   2.2. Defends, indemnifies, and holds harmless Owner from all claims, demands, liens, or suits alleging non-payment by Contractor by any person or entity who furnished labor, materials, or equipment for use in the performance of the Contract, provided Owner has promptly notified Contractor and Surety (at the addresses described in Paragraph 12) of any claims, demands, liens, or suits and tendered defense of such claims, demands, liens, or suits to Contractor and Surety, and provided there is no Owner Default.
3. With respect to Claimants, this obligation shall be null and void if Contractor promptly makes payment, directly or indirectly, for all sums due.
4. Surety shall have no obligation to Claimants under this Bond until:
   4.1. Claimants who are employed by or have a direct contract with Contractor have given notice to Surety (at the address described in Paragraph 12) and sent a copy, or notice thereof, to Owner, stating that a claim is being made under this Bond and, with substantial accuracy, the amount of the claim.
   4.2. Claimants who do not have a direct contract with Contractor:
      1. Have furnished written notice to Contractor and sent a copy, or notice thereof, to Owner, within 90 days after having last performed labor or last furnished materials or equipment included in the claim stating, with substantial accuracy, the amount of the claim and the name of the party to whom the materials or equipment were furnished or supplied, or for whom the labor was done or performed; and
      2. Have either received a rejection in whole or in part from Contractor, or not received within 30 days of furnishing the above notice any communication from Contractor by which Contractor had indicated the claim will be paid directly or indirectly; and
      3. Not having been paid within the above 30 days, have sent a written notice to Surety (at the address described in Paragraph 12) and sent a copy, or notice thereof, to Owner, stating that a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to Contractor.
5. If a notice by a Claimant required by Paragraph 4 is provided by Owner to Contractor or to Surety, that is sufficient compliance.
6. Reserved.
7. Surety's total obligation shall not exceed the amount of this Bond, and the amount of this Bond shall be credited for any payments made in good faith by Surety.
8. Amounts owed by Owner to Contractor under the Contract shall be used for the performance of the Contract and to satisfy claims, if any, under any performance bond. By Contractor furnishing and Owner accepting this Bond, they agree that all funds earned by Contractor in the performance of the Contract are dedicated to satisfy obligations of Contractor and Surety under this Bond, subject to Owner's priority to use the funds for the completion of the Work.
9. Surety shall not be liable to Owner, Claimants, or others for obligations of Contractor that are unrelated to the Contract. Owner shall not be liable for payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligations to make payments to, give notices on behalf of, or otherwise have obligations to Claimants under this Bond.
10. Surety hereby waives notice of any change, including changes of time, to the Contract or to related subcontracts, purchase orders, and other obligations.
11. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the location in which the Work or part of the Work is located or after the expiration of one year from the date (1) on which the Claimant gave the notice required by Paragraph 4.1 or Paragraph 4.2.3, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.
12. Notice to Surety, Owner, or Contractor shall be mailed or delivered to the addresses shown on the signature page. Actual receipt of notice by Surety, Owner, or Contractor, however accomplished, shall be sufficient compliance as of the date received at the address shown on the signature page.
13. When this Bond has been furnished to comply with a statutory requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory requirement shall be deemed deleted herefrom and provisions conforming to such statutory requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory Bond and not as a common law bond.
14. Upon request of any person or entity appearing to be a potential beneficiary of this Bond, Contractor shall promptly furnish a copy of this Bond or shall permit a copy to be made.
15. Definitions
   15.1. Claimant: An individual or entity having a direct contract with Contractor, or with a first-tier subcontractor of Contractor, to furnish labor, materials, or equipment for use in the performance of the Contract. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Contract, architectural and engineering services required for performance of the Work of Contractor and Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.
   15.2. Contract: The agreement between Owner and Contractor identified on the signature page, including all Contract Documents and changes thereto.
   15.3. Owner Default: Failure of Owner, which has neither been remedied nor waived, to pay Contractor as required by the Contract, or to perform and complete or otherwise comply with the other terms thereof.

16. FOR INFORMATION ONLY – (*Name, Address, and Telephone*)
17. Surety Agency or Broker:
    Owner's Representative (*Engineer or other*):

SECTION 00 62 16

CERTIFICATE OF INSURANCE

ARTICLE 1 - PROCEDURE

1.01 For filing purposes, add Certificates of Insurance to the Contract Documents following this page.

SECTION 00 62 76

Contractor's Application for Payment No.

	Application Period:	Application Date:
To (Owner): North Ogden City	From (Contractor):	Via (Engineer): ESI Engineering, INC.
Project: 4050 North 100 East Storm Drain Design	Contract:	
Owner's Contract No.:	Contractor's Project No.:	Engineer's Project No.: 23-093

Application For Payment

Change Order Summary

Approved Change Orders		
Number	Additions	Deductions
TOTALS		
NET CHANGE BY CHANGE ORDERS		

1. ORIGINAL CONTRACT PRICE	**$**
2. Net change by Change Orders	**$**
3. Current Contract Price (Line 1 ± 2)	**$**
4. TOTAL COMPLETED AND STORED TO DATE (Column F on Progress Estimate)	**$**
5. RETAINAGE:	
a. X _____ Work Completed	**$**
b. X _____ Stored Material	**$**
c. Total Retainage (Line 5a + Line 5b)	**$**
6. AMOUNT ELIGIBLE TO DATE (Line 4 - Line 5c)	**$**
7. LESS PREVIOUS PAYMENTS (Line 6 from prior Application)	**$**
8. AMOUNT DUE THIS APPLICATION	**$**
9. BALANCE TO FINISH, PLUS RETAINAGE (Column G on Progress Estimate + Line 5 above)	**$**

Contractor's Certification

The undersigned Contractor certifies that to the best of its knowledge: (1) all previous progress payments received from Owner on account of Work done under the Contract have been applied on account to discharge Contractor's legitimate obligations incurred in connection with Work covered by prior Applications for Payment; (2) title of all Work, materials and equipment incorporated in said Work or otherwise listed in or covered by this Application for Payment will pass to Owner at time of payment free and clear of all Liens, security interests and encumbrances (except such as are covered by a Bond acceptable to Owner indemnifying Owner against any such Liens, security interest or encumbrances); and (3) all Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective.

By:	Date:

Payment of: $ _____
(Line 8 or other - attach explanation of the other amount)

is recommended by: ESI Engineering, INC _____
(Engineer) (Date)

Payment of: $ _____
(Line 8 or other - attach explanation of the other amount)

is approved by: North Ogden City _____
(Owner) (Date)

Approved by: _____ _____
Funding Agency (if applicable) (Date)

Endorsed by the Construction Specifications Institute.

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Section 00 63 63

Change Order

No. _____

Date of Issuance: _____ Effective Date: _____

Project:	Owner: North Ogden City	Owner's Contract No.:
Contract:		Date of Contract:
Contractor:		Engineer's Project No.: 23-093

The Contract Documents are modified as follows upon execution of this Change Order:

Description:

Attachments (list documents supporting change):

CHANGE IN CONTRACT PRICE:	CHANGE IN CONTRACT TIMES:
Original Contract Price: $_____	Original Contract Times: ☐ Working days ☐ Calendar days Substantial completion (days or date): _____ Ready for final payment (days or date): _____
[Increase] [Decrease] from previously approved Change Orders No. _____ to No. _____: $_____	[Increase] [Decrease] from previously approved Change Orders No. _____ to No. _____: Substantial completion (days): _____ Ready for final payment (days): _____
Contract Price prior to this Change Order: $_____	Contract Times prior to this Change Order: Substantial completion (days or date): _____ Ready for final payment (days or date): _____
[Increase] [Decrease] of this Change Order: $_____	[Increase] [Decrease] of this Change Order: Substantial completion (days or date): _____ Ready for final payment (days or date): _____
Contract Price incorporating this Change Order: $_____	Contract Times with all approved Change Orders: Substantial completion (days or date): _____ Ready for final payment (days or date): _____

RECOMMENDED:

By: _____
Engineer (Authorized Signature)

Date: _____

ACCEPTED:

By: _____
Owner (Authorized Signature)

Date: _____

ACCEPTED:

By: _____
Contractor (Authorized

Date: _____

Approved by Funding Agency (if applicable):

_____

Date: _____

Section 00 63 63 Change Order

Instructions

A. GENERAL INFORMATION

This document was developed to provide a uniform format for handling contract changes that affect Contract Price or Contract Times. Changes that have been initiated by a Work Change Directive must be incorporated into a subsequent Change Order if they affect Price or Times.

Changes that affect Contract Price or Contract Times should be promptly covered by a Change Order. The practice of accumulating Change Orders to reduce the administrative burden may lead to unnecessary disputes.

If Milestones have been listed in the Agreement, any effect of a Change Order thereon should be addressed.

For supplemental instructions and minor changes not involving a change in the Contract Price or Contract Times, a Field Order should be used.

B. COMPLETING THE CHANGE ORDER FORM

Engineer normally initiates the form, including a description of the changes involved and attachments based upon documents and proposals submitted by Contractor, or requests from Owner, or both.

Once Engineer has completed and signed the form, all copies should be sent to Owner or Contractor for approval, depending on whether the Change Order is a true order to the Contractor or the formalization of a negotiated agreement for a previously performed change. After approval by one contracting party, all copies should be sent to the other party for approval. Engineer should make distribution of executed copies after approval by both parties.

If a change only applies to price or to times, cross out the part of the tabulation that does not apply.

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

SECTION 00 72 00
STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

Issued and Published Jointly by

ACEC
American Council of Engineering Companies

ASCE American Society of Civil Engineers

National Society of Professional Engineers
Professional Engineers in Private Practice

AMERICAN COUNCIL OF ENGINEERING COMPANIES

_____

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A Practice Division of the
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Endorsed by

CONSTRUCTION SPECIFICATIONS INSTITUTE

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These General Conditions have been prepared for use with the Suggested Forms of Agreement Between Owner and Contractor (EJCDC C-520 or C-525, 2007 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other. Comments concerning their usage are contained in the Narrative Guide to the EJCDC Construction Documents (EJCDC C-001, 2007 Edition). For guidance in the preparation of Supplementary Conditions, see Guide to the Preparation of Supplementary Conditions (EJCDC C-800, 2007 Edition).

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1420 King Street, Alexandria, VA 22314-2794
(703) 684-2882
www.nspe.org

American Council of Engineering Companies
1015 15th Street N.W., Washington, DC 20005
(202) 347-7474
www.acec.org

American Society of Civil Engineers
1801 Alexander Bell Drive, Reston, VA 20191-4400
(800) 548-2723
www.asce.org

Associated General Contractors of America
2300 Wilson Boulevard, Suite 400, Arlington, VA 22201-3308
(703) 548-3118
www.agc.org

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.

2. *Agreement*—The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.

3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. *Asbestos*—Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

5. *Bid*—The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

6. *Bidder*—The individual or entity who submits a Bid directly to Owner.

7. *Bidding Documents*—The Bidding Requirements and the proposed Contract Documents (including all Addenda).

8. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid security of acceptable form, if any, and the Bid Form with any supplements.

9. *Change Order*—A document recommended by Engineer which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.

10. *Claim*—A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.

11. *Contract*—The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

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12. *Contract Documents*—Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.

13. *Contract Price*—The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).

14. *Contract Times*—The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any; (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendation of final payment.

15. *Contractor*—The individual or entity with whom Owner has entered into the Agreement.

16. *Cost of the Work*—See Paragraph 11.01 for definition.

17. *Drawings*—That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.

18. *Effective Date of the Agreement*—The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

19. *Engineer*—The individual or entity named as such in the Agreement.

20. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.

21. *General Requirements*—Sections of Division 1 of the Specifications.

22. *Hazardous Environmental Condition*—The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto.

23. *Hazardous Waste*—The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

24. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

25. *Liens*—Charges, security interests, or encumbrances upon Project funds, real property, or personal property.

26. *Milestone*—A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

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27. *Notice of Award*—The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.

28. *Notice to Proceed*—A written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.

29. *Owner*—The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.

30. *PCBs*—Polychlorinated biphenyls.

31. *Petroleum*—Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.

32. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.

33. *Project*—The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.

34. *Project Manual*—The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.

35. *Radioactive Material*—Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

36. *Resident Project Representative*—The authorized representative of Engineer who may be assigned to the Site or any part thereof.

37. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

38. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.

39. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

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40. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.

41. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.

42. *Specifications*—That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.

43. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.

44. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

45. *Successful Bidder*—The Bidder submitting a responsive Bid to whom Owner makes an award.

46. *Supplementary Conditions*—That part of the Contract Documents which amends or supplements these General Conditions.

47. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or Subcontractor.

48. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

49. *Unit Price Work*—Work to be paid for on the basis of unit prices.

50. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.

51. *Work Change Directive*—A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer ordering an

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addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

1.02 *Terminology*

A. The words and terms discussed in Paragraph 1.02.B through F are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. *Intent of Certain Terms or Adjectives:*

1. The Contract Documents include the terms "as allowed," "as approved," "as ordered," "as directed" or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.09 or any other provision of the Contract Documents.

C. *Day:*

1. The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective:*

1. The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:

a. does not conform to the Contract Documents; or

b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or

c. has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

E. *Furnish, Install, Perform, Provide:*

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1. The word "furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word "install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words "perform" or "provide," when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. When "furnish," "install," "perform," or "provide" is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, "provide" is implied.

F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

A. When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.

B. *Evidence of Insurance:* Before any Work at the Site is started, Contractor and Owner shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which Contractor and Owner respectively are required to purchase and maintain in accordance with Article 5.

2.02 *Copies of Documents*

A. Owner shall furnish to Contractor up to ten printed or hard copies of the Drawings and Project Manual. Additional copies will be furnished upon request at the cost of reproduction.

2.03 *Commencement of Contract Times; Notice to Proceed*

A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Agreement. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

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2.04 *Starting the Work*

A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to the date on which the Contract Times commence to run.

2.05 *Before Starting Construction*

A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), Contractor shall submit to Engineer for timely review:

1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;

2. a preliminary Schedule of Submittals; and

3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.06 *Preconstruction Conference; Designation of Authorized Representatives*

A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.05.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.

B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit instructions, receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.07 *Initial Acceptance of Schedules*

A. At least 10 days before submission of the first Application for Payment a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.

1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of

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the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.

3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 *Intent*

A. The Contract Documents are complementary; what is required by one is as binding as if required by all.

B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that reasonably may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated result will be provided whether or not specifically called for, at no additional cost to Owner.

C. Clarifications and interpretations of the Contract Documents shall be issued by Engineer as provided in Article 9.

3.02 *Reference Standards*

A. Standards, Specifications, Codes, Laws, and Regulations

1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

2. No provision of any such standard, specification, manual, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the Contract Documents. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies:*

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1. *Contractor's Review of Contract Documents Before Starting Work*: Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor discovers, or has actual knowledge of, and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.

2. *Contractor's Review of Contract Documents During Performance of Work*: If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation , (b) any standard, specification, manual, or code, or (c) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.

3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies:*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:

a. the provisions of any standard, specification, manual, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference in the Contract Documents); or

b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Amending and Supplementing Contract Documents*

A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.

B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:

1. A Field Order;

2. Engineer's approval of a Shop Drawing or Sample (subject to the provisions of Paragraph 6.17.D.3); or

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3. Engineer's written interpretation or clarification.

3.05 *Reuse of Documents*

A. Contractor and any Subcontractor or Supplier shall not:

1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions; or

2. reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer.

B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

3.06 *Electronic Data*

A. Unless otherwise stated in the Supplementary Conditions, the data furnished by Owner or Engineer to Contractor, or by Contractor to Owner or Engineer, that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.

B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.

C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

ARTICLE 4 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS

4.01 *Availability of Lands*

A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the

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Contract Price or Contract Times, or both, as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.02 *Subsurface and Physical Conditions*

A. *Reports and Drawings:* The Supplementary Conditions identify:

1. those reports known to Owner of explorations and tests of subsurface conditions at or contiguous to the Site; and

2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).

B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

4.03 *Differing Subsurface or Physical Conditions*

A. *Notice:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed either:

1. is of such a nature as to establish that any "technical data" on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or

2. is of such a nature as to require a change in the Contract Documents; or

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3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

B. *Engineer's Review*: After receipt of written notice as required by Paragraph 4.03.A, Engineer will promptly review the pertinent condition, determine the necessity of Owner's obtaining additional exploration or tests with respect thereto, and advise Owner in writing (with a copy to Contractor) of Engineer's findings and conclusions.

C. *Possible Price and Times Adjustments:*

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

   a. such condition must meet any one or more of the categories described in Paragraph 4.03.A; and

   b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.07 and 11.03.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:

   a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or

   b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or

   c. Contractor failed to give the written notice as required by Paragraph 4.03.A.

3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, neither Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other

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professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

4.04 *Underground Facilities*

A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data provided by others; and

2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:

a. reviewing and checking all such information and data;

b. locating all Underground Facilities shown or indicated in the Contract Documents;

c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction; and

d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated:*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

2. If Engineer concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price

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or Contract Times, Owner or Contractor may make a Claim therefor as provided in Paragraph 10.05.

4.05 *Reference Points*

A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.06 *Hazardous Environmental Condition at Site*

A. *Reports and Drawings:* The Supplementary Conditions identify those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at the Site.

B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.

C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.

D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by

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Paragraph 6.16.A); and (iii) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 4.06.E.

E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered written notice to Contractor: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefor as provided in Paragraph 10.05.

F. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.

G. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.G shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

H. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.H shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

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I. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 – BONDS AND INSURANCE

5.01 *Performance, Payment, and Other Bonds*

A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.

B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed each bond.

C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.

5.02 *Licensed Sureties and Insurers*

A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.03 *Certificates of Insurance*

A. Contractor shall deliver to Owner, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.

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B. Owner shall deliver to Contractor, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Contractor or any other additional insured) which Owner is required to purchase and maintain.

C. Failure of Owner to demand such certificates or other evidence of Contractor's full compliance with these insurance requirements or failure of Owner to identify a deficiency in compliance from the evidence provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.

D. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor.

E. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner in the Contract Documents.

5.04 *Contractor's Insurance*

A. Contractor shall purchase and maintain such insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:

1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;

2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;

3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;

4. claims for damages insured by reasonably available personal injury liability coverage which are sustained:

   a. by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or

   b. by any other person for any other reason;

5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and

6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

B. The policies of insurance required by this Paragraph 5.04 shall:

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1. with respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, be written on an occurrence basis, include as additional insureds (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;

2. include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;

3. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;

4. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);

5. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and

6. include completed operations coverage:

    a. Such insurance shall remain in effect for two years after final payment.

    b. Contractor shall furnish Owner and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.

5.05 *Owner's Liability Insurance*

A. In addition to the insurance required to be provided by Contractor under Paragraph 5.04, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

5.06 *Property Insurance*

A. Unless otherwise provided in the Supplementary Conditions, Owner shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

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1. include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee;

2. be written on a Builder's Risk "all-risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than that caused by flood), and such other perils or causes of loss as may be specifically required by the Supplementary Conditions.

3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);

4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;

5. allow for partial utilization of the Work by Owner;

6. include testing and startup; and

7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other loss payee to whom a certificate of insurance has been issued.

B. Owner shall purchase and maintain such equipment breakdown insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee.

C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other loss payee to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.

D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property

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insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

E. If Contractor requests in writing that other special insurance be included in the property insurance policies provided under this Paragraph 5.06, Owner shall, if possible, include such insurance, and the cost thereof will be charged to Contractor by appropriate Change Order. Prior to commencement of the Work at the Site, Owner shall in writing advise Contractor whether or not such other insurance has been procured by Owner.

5.07 *Waiver of Rights*

A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 will protect Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or loss payees thereunder. Owner and Contractor waive all rights against each other and their respective officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued.

B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for:

1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and

2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04, or after final payment pursuant to Paragraph 14.07.

C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery

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against Contractor, Subcontractors, or Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them.

5.08 *Receipt and Application of Insurance Proceeds*

A. Any insured loss under the policies of insurance required by Paragraph 5.06 will be adjusted with Owner and made payable to Owner as fiduciary for the loss payees, as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph 5.08.B. Owner shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order.

B. Owner as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to Owner's exercise of this power. If such objection be made, Owner as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Owner as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, Owner as fiduciary shall give bond for the proper performance of such duties.

5.09 *Acceptance of Bonds and Insurance; Option to Replace*

A. If either Owner or Contractor has any objection to the coverage afforded by or other provisions of the bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by Paragraph 2.01.B. Owner and Contractor shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

A. If Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to Paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

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ARTICLE 6 – CONTRACTOR'S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.

B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

6.02 *Labor; Working Hours*

A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.

B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner's written consent (which will not be unreasonably withheld) given after prior written notice to Engineer.

6.03 *Services, Materials, and Equipment*

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.

B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

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6.04 *Progress Schedule*

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 as it may be adjusted from time to time as provided below.

1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.

6.05 *Substitutes and "Or-Equals"*

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.

1. *"Or-Equal" Items:* If in Engineer's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment Engineer determines that:

1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole; and

3) it has a proven record of performance and availability of responsive service.

b. Contractor certifies that, if approved and incorporated into the Work:

1) there will be no increase in cost to the Owner or increase in Contract Times; and

2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

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2. *Substitute Items:*

   a. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.

   b. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.

   c. The requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented by the General Requirements, and as Engineer may decide is appropriate under the circumstances.

   d. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:

      1) shall certify that the proposed substitute item will:

         a) perform adequately the functions and achieve the results called for by the general design,

         b) be similar in substance to that specified, and

         c) be suited to the same use as that specified;

      2) will state:

         a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time,

         b) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and

         c) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;

      3) will identify:

         a) all variations of the proposed substitute item from that specified, and

         b) available engineering, sales, maintenance, repair, and replacement services; and

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4) shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.

B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.

C. *Engineer's Evaluation:* Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by a Change Order in the case of a substitute and an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination.

D. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

E. *Engineer's Cost Reimbursement*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

F. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

6.06 *Concerning Subcontractors, Suppliers, and Others*

A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Contractor shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.

B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or

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other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.

C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:

   1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity; nor

   2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.

E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.

F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as a loss payee on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner, Contractor, Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

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6.07 *Patent Fees and Royalties*

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.

B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.

C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

6.08 *Permits*

A. Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

6.09 *Laws and Regulations*

A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all

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court or arbitration or other dispute resolution costs) arising out of or relating to such Work. However, it shall not be Contractor's responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.

C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

6.10 *Taxes*

A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

6.11 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas:*

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.

2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.

3. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.

B. *Removal of Debris During Performance of the Work:* During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor

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shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.12 *Record Documents*

A. Contractor shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction. These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to Engineer for reference. Upon completion of the Work, these record documents, Samples, and Shop Drawings will be delivered to Engineer for Owner.

6.13 *Safety and Protection*

A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.

C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.

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D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.

E. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

F. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 *Safety Representative*

A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

6.15 *Hazard Communication Programs*

A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

6.16 *Emergencies*

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

6.17 *Shop Drawings and Samples*

A. Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals (as required by Paragraph 2.07). Each submittal will be identified as Engineer may require.

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1. *Shop Drawings:*

    a. Submit number of copies specified in the General Requirements.

    b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 6.17.D.

2. *Samples:*

    a. Submit number of Samples specified in the Specifications.

    b. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.17.D.

B. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. *Submittal Procedures:*

1. Before submitting each Shop Drawing or Sample, Contractor shall have:

    a. reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;

    b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

    c. determined and verified the suitability of all materials offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

    d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.

3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop

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Drawings or Sample submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

D. *Engineer's Review:*

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

E. *Resubmittal Procedures:*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

6.18 *Continuing the Work*

A. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Paragraph 15.04 or as Owner and Contractor may otherwise agree in writing.

6.19 *Contractor's General Warranty and Guarantee*

A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on representation of Contractor's warranty and guarantee.

B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

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1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or

2. normal wear and tear under normal usage.

C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:

1. observations by Engineer;

2. recommendation by Engineer or payment by Owner of any progress or final payment;

3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;

4. use or occupancy of the Work or any part thereof by Owner;

5. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Engineer;

6. any inspection, test, or approval by others; or

7. any correction of defective Work by Owner.

6.20 *Indemnification*

A. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable .

B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor,

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Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

C. The indemnification obligations of Contractor under Paragraph 6.20.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:

1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or

2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

6.21 *Delegation of Professional Design Services*

A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.

B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.

D. Pursuant to this Paragraph 6.21, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.

E. Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

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ARTICLE 7 – OTHER WORK AT THE SITE

7.01 *Related Work at Site*

A. Owner may perform other work related to the Project at the Site with Owner's employees, or through other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:

1. written notice thereof will be given to Contractor prior to starting any such other work; and

2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.

B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.

C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

7.02 *Coordination*

A. If Owner intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:

1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;

2. the specific matters to be covered by such authority and responsibility will be itemized; and

3. the extent of such authority and responsibilities will be provided.

B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

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7.03 *Legal Relationships*

A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.

B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor's wrongful actions or inactions.

C. Contractor shall be liable to Owner and any other contractor under direct contract to Owner for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's wrongful action or inactions.

ARTICLE 8 – OWNER'S RESPONSIBILITIES

8.01 *Communications to Contractor*

A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

8.02 *Replacement of Engineer*

A. In case of termination of the employment of Engineer, Owner shall appoint an engineer to whom Contractor makes no reasonable objection, whose status under the Contract Documents shall be that of the former Engineer.

8.03 *Furnish Data*

A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

8.04 *Pay When Due*

A. Owner shall make payments to Contractor when they are due as provided in Paragraphs 14.02.C and 14.07.C.

8.05 *Lands and Easements; Reports and Tests*

A. Owner's duties with respect to providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

8.06 *Insurance*

A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

8.07 *Change Orders*

A. Owner is obligated to execute Change Orders as indicated in Paragraph 10.03.

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8.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 13.03.B.

8.09 *Limitations on Owner's Responsibilities*

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

8.10 *Undisclosed Hazardous Environmental Condition*

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 4.06.

8.11 *Evidence of Financial Arrangements*

A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents.

8.12 *Compliance with Safety Program*

A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed pursuant to Paragraph 6.13.D.

ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *Owner's Representative*

A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract Documents.

9.02 *Visits to Site*

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits

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and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 9.09. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

9.03 *Project Representative*

A. If Owner and Engineer agree, Engineer will furnish a Resident Project Representative to assist Engineer in providing more extensive observation of the Work. The authority and responsibilities of any such Resident Project Representative and assistants will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 9.09. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

9.04 *Authorized Variations in Work*

A. Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on Owner and also on Contractor, who shall perform the Work involved promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

9.05 *Rejecting Defective Work*

A. Engineer will have authority to reject Work which Engineer believes to be defective, or that Engineer believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Engineer will also have authority to require special inspection or testing of the Work as provided in Paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

9.06 *Shop Drawings, Change Orders and Payments*

A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.

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B. In connection with Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 6.21.

C. In connection with Engineer's authority as to Change Orders, see Articles 10, 11, and 12.

D. In connection with Engineer's authority as to Applications for Payment, see Article 14.

9.07 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of Paragraph 10.05.

9.08 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 30 days of the event giving rise to the question.

B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believes that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.

C. Engineer's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.

D. When functioning as interpreter and judge under this Paragraph 9.08, Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

9.09 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

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B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with, the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to the Resident Project Representative, if any, and assistants, if any.

9.10 *Compliance with Safety Program*

A. While at the Site, Engineer's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Engineer has been informed pursuant to Paragraph 6.13.D.

ARTICLE 10 – CHANGES IN THE WORK; CLAIMS

10.01 *Authorized Changes in the Work*

A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 10.05.

10.02 *Unauthorized Changes in the Work*

A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.16 or in the case of uncovering Work as provided in Paragraph 13.04.D.

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10.03 *Execution of Change Orders*

A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:

1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;

2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and

3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

10.04 *Notification to Surety*

A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

10.05 *Claims*

A. *Engineer's Decision Required*: All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.

B. *Notice:* Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Times shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The

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opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).

C. *Engineer's Action*: Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:

1. deny the Claim in whole or in part;

2. approve the Claim; or

3. notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.

D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.

E. Engineer's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.

F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

ARTICLE 11 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

11.01 *Cost of the Work*

A. *Costs Included:* The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 11.01.B, and shall include only the following items:

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on

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Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

5. Supplemental costs including the following:

    a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.

    b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

    c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

    d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.

    e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

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f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, express and courier services, and similar petty cash items in connection with the Work.

i. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain.

B. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.

2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.

4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A.

C. *Contractor's Fee:* When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.

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D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

11.02 *Allowances*

A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

B. *Cash Allowances:*

1. Contractor agrees that:

a. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

b. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

C. *Contingency Allowance:*

1. Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 *Unit Price Work*

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.

C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

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D. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if:

1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and

2. there is no corresponding adjustment with respect to any other item of Work; and

3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 12 – CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

12.01 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.

B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or

2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or

3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).

C. *Contractor's Fee:* The Contractor's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or

2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

a. for costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;

b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent;

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c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 12.01.C.2.a and 12.01.C.2.b is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;

d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;

e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and

f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 *Change of Contract Times*

A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.

B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 12.

12.03 *Delays*

A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.

B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the

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control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.C.

D. Owner, Engineer, and their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

ARTICLE 13 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.01 *Notice of Defects*

A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. Defective Work may be rejected, corrected, or accepted as provided in this Article 13.

13.02 *Access to Work*

A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

13.03 *Tests and Inspections*

A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:

1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;

2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in Paragraph 13.04.C; and

3. as otherwise specifically provided in the Contract Documents.

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C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.

E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation.

F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.

13.04 *Uncovering Work*

A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's observation and replaced at Contractor's expense.

B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.

C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05.

D. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

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13.05 *Owner May Stop the Work*

A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

13.06 *Correction or Removal of Defective Work*

A. Promptly after receipt of written notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).

B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

13.07 *Correction Period*

A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. repair such defective land or areas; or

2. correct such defective Work; or

3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and

4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.

B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute

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resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.

C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.

D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

13.08 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to Engineer's recommendation of final payment, Engineer) prefers to accept it, Owner may do so. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness) and for the diminished value of the Work to the extent not otherwise paid by Contractor pursuant to this sentence. If any such acceptance occurs prior to Engineer's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

13.09 *Owner May Correct Defective Work*

A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven days written notice to Contractor, correct, or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 13.09, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and

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equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this Paragraph.

C. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefor as provided in Paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 13.09.

ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 *Schedule of Values*

A. The Schedule of Values established as provided in Paragraph 2.07.A will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed.

14.02 *Progress Payments*

A. *Applications for Payments:*

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the

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Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

B. *Review of Applications:*

1. Engineer will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

   a. the Work has progressed to the point indicated;

   b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and any other qualifications stated in the recommendation); and

   c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:

   a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or

   b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:

   a. to supervise, direct, or control the Work, or

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b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or

c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or

d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or

e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:

   a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;

   b. the Contract Price has been reduced by Change Orders;

   c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or

   d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

C. *Payment Becomes Due:*

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.02.D) become due, and when due will be paid by Owner to Contractor.

D. *Reduction in Payment:*

1. Owner may refuse to make payment of the full amount recommended by Engineer because:

   a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;

   b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;

   c. there are other items entitling Owner to a set-off against the amount recommended; or

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d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.

2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor remedies the reasons for such action.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1 and subject to interest as provided in the Agreement.

14.03 *Contractor's Warranty of Title*

A. Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment free and clear of all Liens.

14.04 *Substantial Completion*

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.

B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the tentative certificate during which to make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the tentative certificate to Owner, notify Contractor in writing, stating the reasons therefor. If, after consideration of Owner's objections, Engineer considers the Work substantially complete, Engineer will, within said 14 days, execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities

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pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.

E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the tentative list.

14.05 *Partial Utilization*

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 14.04.A through D for that part of the Work.

2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 5.10 regarding property insurance.

14.06 *Final Inspection*

A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

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14.07 *Final Payment*

A. *Application for Payment:*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:

   a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.6;

   b. consent of the surety, if any, to final payment;

   c. a list of all Claims against Owner that Contractor believes are unsettled; and

   d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

B. *Engineer's Review of Application and Acceptance:*

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Paragraph 14.09. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. *Payment Becomes Due:*

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1. Thirty days after the presentation to Owner of the Application for Payment and accompanying documentation, the amount recommended by Engineer, less any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages, will become due and will be paid by Owner to Contractor.

14.08 *Final Completion Delayed*

A. If, through no fault of Contractor, final completion of the Work is significantly delayed, and if Engineer so confirms, Owner shall, upon receipt of Contractor's final Application for Payment (for Work fully completed and accepted) and recommendation of Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if bonds have been furnished as required in Paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Engineer with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

14.09 *Waiver of Claims*

A. The making and acceptance of final payment will constitute:

1. a waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Contract Documents; and

2. a waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.

ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

15.01 *Owner May Suspend Work*

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be granted an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 10.05.

15.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will justify termination for cause:

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1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);

2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;

3. Contractor's repeated disregard of the authority of Engineer; or

4. Contractor's violation in any substantial way of any provisions of the Contract Documents.

B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:

1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion);

2. incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere; and

3. complete the Work as Owner may deem expedient.

C. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this Paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.

E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.

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F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B and 15.02.C.

15.03 *Owner May Terminate For Convenience*

A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):

1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;

3. all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and

4. reasonable expenses directly attributable to termination.

B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (iii) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

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ARTICLE 16 – DISPUTE RESOLUTION

16.01 *Methods and Procedures*

A. Either Owner or Contractor may request mediation of any Claim submitted to Engineer for a decision under Paragraph 10.05 before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract. Timely submission of the request shall stay the effect of Paragraph 10.05.E.

B. Owner and Contractor shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.

C. If the Claim is not resolved by mediation, Engineer's action under Paragraph 10.05.C or a denial pursuant to Paragraphs 10.05.C.3 or 10.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:

1. elects in writing to invoke any dispute resolution process provided for in the Supplementary Conditions; or

2. agrees with the other party to submit the Claim to another dispute resolution process; or

3. gives written notice to the other party of the intent to submit the Claim to a court of competent jurisdiction.

ARTICLE 17 – MISCELLANEOUS

17.01 *Giving Notice*

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:

1. delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended; or

2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

17.02 *Computation of Times*

A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

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17.03 *Cumulative Remedies*

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents. The provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

17.04 *Survival of Obligations*

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

17.05 *Controlling Law*

A. This Contract is to be governed by the law of the state in which the Project is located.

17.06 *Headings*

A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

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SECTION 00 73 00

SUPPLEMENTARY CONDITIONS

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract, Section 00 72 00 (EJCDC C-700, 2007 Edition). All provisions which are not so amended or supplemented remain in full force and effect.

The terms used in these Supplementary Conditions have the meanings stated in the General Conditions. Additional terms used in these Supplementary Conditions have the meanings stated below, which are applicable to both the singular and plural thereof.

The address system used in these Supplementary Conditions is the same as the address system used in the General Conditions, with the prefix "SC" added thereto.

ARTICLE 2 – PRELIMINARY MATTERS

SC-2.02 *Copies of Documents*

SC-2.02 Delete Paragraph 2.02.A in its entirety and insert the following in its place:

A. Owner shall furnish to Contractor up to 3 printed or hard copies of the Drawings and Project Manual and one set in electronic format. Additional copies will be furnished upon request at the cost of reproduction.

ARTICLE 4 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS

SC-4.02 *Subsurface and Physical Conditions*

SC-4.02 Delete Paragraphs 4.02.A and 4.02.B in their entirety and insert the following:

A. No reports of explorations or tests of subsurface conditions at or contiguous to the Site, or drawings of physical conditions relating to existing surface or subsurface structures at the Site, are known to Owner.

SC-4.06 *Hazardous Environmental Conditions*

SC-4.06 Delete Paragraphs 4.06.A and 4.06.B in their entirety and insert the following:

A. No reports or drawings related to Hazardous Environmental Conditions at the Site are known to Owner.

B. Not Used.

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ARTICLE 5 – BONDS AND INSURANCE

SC-5.04 *Contractor's Liability Insurance*

SC-5.04 Add the following new paragraph immediately after Paragraph 5.04.B:

C. The limits of liability for the insurance required by Paragraph 5.04 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:

1. Workers' Compensation, and related coverages under Paragraphs 5.04.A.1 and A.2 of the General Conditions:

a. State:	Statutory
b. Applicable Federal (e.g., Longshoreman's):	Statutory
c. Employer's Liability:	$1,000,000

2. Contractor's General Liability under Paragraphs 5.04.A.3 through A.6 of the General Conditions which shall include completed operations and product liability coverages and eliminate the exclusion with respect to property under the care, custody and control of Contractor:

a. General Aggregate	$ 2,000,000
b. Products - Completed Operations Aggregate	$ 2,000,000
c. Personal and Advertising Injury	$ 1,000,000
d. Each Occurrence (Bodily Injury and Property Damage)	$ 1,000,000

e. Property Damage liability insurance will provide Explosion, Collapse, and Under-ground coverages where applicable.

f. Excess or Umbrella Liability

□ General Aggregate	$ 1,000,000
□ Each Occurrence	$ 1,000,000

3. Automobile Liability under Paragraph 5.04.A.6 of the General Conditions:

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a. Bodily Injury:
Each person $1,000,000

b. Each Accident $1,000,000

c. Property Damage:
Each Accident $1,000,000

[or]

a. Combined Single Limit of $ 1,000,000

4. The Contractual Liability coverage required by Paragraph 5.04.B.4 of the General Conditions shall provide coverage for not less than the following amounts:

a. Bodily Injury:
Each person $ 1,000,000
Each Accident $ 1,000,000

b. Property Damage:
Each Accident $ 1,000,000
Annual Aggregate $ 1,000,000

5. The Contractor shall secure and present to the Engineer prior to starting work on the project the current insurance policy that shows the Owner and the Engineer as "Additionally Insured".

SC-5.06 *Property Insurance*

SC-5.06.A. Delete Paragraph 5.06.A in its entirety and insert the following in its place:

A. Contractor shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof. Contractor shall be responsible for any deductible or self-insured retention. This insurance shall:

1. include the interests of Owner, Contractor, Subcontractors, Engineer, and the officers, directors, partners, employees, agents and other consultants and subcontractors of any of them, each of whom is deemed to have an insurable interest and shall be listed as an insured or loss payee;

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2. be written on a Builder's Risk "all-risk" policy form that shall at least include insurance for physical loss and damage to the Work, temporary buildings, falsework, and materials and equipment in transit and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than that caused by flood), and such other perils or causes of loss as may be specifically required by these Supplementary Conditions.

3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);

4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;

5. allow for partial utilization of the Work by Owner;

6. include testing and startup;

7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other loss payee to whom a certificate of insurance has been issued; and

8. comply with the requirements of Paragraph 5.06.C of the General Conditions.

ARTICLE 6 – CONTRACTOR'S RESPONSIBILITIES

SC-6.13 *Safety and Protection*

SC-6.13 Delete the second sentence of Paragraph 6.13.C and insert the following:

1) The following Owner safety programs are applicable to the Work:

"Manual of Accident Prevention in Construction", Associated General Contractors of America and State Safety Regulations.

"General Safety Orders Covering Utah Industries", Industrial Commission of Utah.

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"OSHA Construction Standards – Part 1926", Occupational Safety and Health Administration.

"Manual on Uniform Traffic Control Devices – (Latest Version)", Federal Highway Administration (FHWA).

"City and County Highway Department"

2) The Contractor shall maintain at his office or other well-known place at the job site, all articles necessary for giving first aid to the injured; and shall have an employee who has completed the American Red Cross Standard First Aid Course or its equivalent, and standing arrangements for the immediate removal to a hospital for a doctors care of all persons who may be injured on the job site.

SC-6.13 Add the following new paragraphs immediately after Paragraph 6.13.B:

1) If the Contractor damages any utility during construction he shall immediately notify the utility company, department of persons involved and shall satisfactorily repair or replace such utility, or Contractor shall arrange for the utility company to perform said repairs or replacement. If the Contractor fails or neglects to make, or arrange with the utility company to make such repairs or replacements immediately, the Owner may make the necessary repairs and the cost of so doing will be deducted from the sum due or to become due the said Contractor under this contract.

2) The Contractor shall not be entitled to claims for damage on account of hindrance of delay from cause unless the delay is due to acts or omission on the part of the Owner. Such hindrance or delay may entitle the Contractor to an extension of time in which to complete the work. The Contractor shall give notice in writing to the engineer and Owner of the causes of such delay. No additional time will be given for time elapsing before such notice is given.

SC-6.17 *Shop Drawings and Samples*

SC-6.17 Add the following new paragraphs immediately after Paragraph 6.17.E:

F. Contractor shall furnish required submittals with sufficient information and accuracy in order to obtain required approval of an item with no more than three submittals. Engineer will record Engineer's time for reviewing subsequent submittals of Shop Drawings, samples, or other items requiring approval and Contractor shall reimburse Owner for Engineer's charges for such time.

G. In the event that Contractor requests a change of a previously approved item, Contractor shall reimburse Owner for Engineer's charges for its

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review time unless the need for such change is beyond the control of Contractor.

ARTICLE 7 – OTHER WORK AT THE SITE

SC-7.04 *Claims Between Contractors*

SC-7.04 Add the following new paragraph immediately after paragraph GC-7.03:

SC-7.04 *Claims Between Contractors*

A. Should Contractor cause damage to the work or property of any other contractor at the Site, or should any claim arising out of Contractor's performance of the Work at the Site be made by any other contractor against Contractor, Owner, Engineer, or the construction coordinator, then Contractor (without involving Owner, Engineer, or construction coordinator) shall either (1) remedy the damage, (2) agree to compensate the other contractor for remedy of the damage, or (3) remedy the damage and attempt to settle with such other contractor by agreement, or otherwise resolve the dispute by arbitration or at law.

B. Contractor shall, to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner, Engineer, the construction coordinator and the officers, directors, partners, employees, agents and other consultants and subcontractors of each and any of them from and against all claims, costs, losses and damages (including, but not limited to, fees and charges of engineers, architects, attorneys, and other professionals and court and arbitration costs) arising directly, indirectly or consequentially out of any action, legal or equitable, brought by any other contractor against Owner, Engineer, consultants, or the construction coordinator to the extent said claim is based on or arises out of Contractor's performance of the Work. Should another contractor cause damage to the Work or property of Contractor or should the performance of work by any other contractor at the Site give rise to any other Claim, Contractor shall not institute any action, legal or equitable, against Owner, Engineer, or the construction coordinator or permit any action against any of them to be maintained and continued in its name or for its benefit in any court or before any arbiter which seeks to impose liability on or to recover damages from Owner, Engineer, or the construction coordinator on account of any such damage or Claim.

C. If Contractor is delayed at any time in performing or furnishing the Work by any act or neglect of another contractor, and Owner and Contractor are unable to agree as to the extent of any adjustment in Contract Times attributable thereto, Contractor may make a Claim for an extension of times in accordance with Article 12. An extension of the Contract Times shall be Contractor's exclusive remedy with respect to Owner, Engineer, and construction coordinator for any delay,

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disruption, interference, or hindrance caused by any other contractor. This paragraph does not prevent recovery from Owner, Engineer, or construction coordinator for activities that are their respective responsibilities.

ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCITON

SC-9.03 *Project Representative*

As indicated in GC-9.03, in those cases in which the Engineer will provide a Resident Project Representative (RPR) during construction, the authority and responsibilities of the RPR and any assistants must be specified in the Supplementary Conditions; thus this is a mandatory Supplementary Condition in such cases. The following suggested language which parallels the working of Exhibit D to EJCDC E-500, the Standard Form of Agreement between Owner and Engineer for Professional Services, should be edited to indicate the RPR authority and responsibilities that apply to this project:

SC-9.03 Add the following new paragraphs immediately after Paragraph 9.03.A:

B. The Resident Project Representative (RPR) will be Engineer's employee or agent at the Site, will act as directed by and under the supervision of Engineer, and will confer with Engineer regarding RPR's actions. RPR's dealings in matters pertaining to the Work in general shall be with Engineer and Contractor. RPR's dealings with Subcontractors shall be through or with the full knowledge and approval of Contractor. The RPR shall:

1. *Schedules:* Review the progress schedule, schedule of Shop Drawing and Sample submittals, and schedule of values prepared by Contractor and consult with Engineer concerning acceptability.

2. *Conferences and Meetings:* Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences and other project-related meetings, and prepare and circulate copies of minutes thereof.

3. *Liaison*:

   a. Serve as Engineer's liaison with Contractor, working principally through Contractor's authorized representative, assist in providing information regarding the intent of the Contract Documents.

   b. Assist Engineer in serving as Owner's liaison with Contractor when Contractor's operations affect Owner's on-Site operations.

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c. Assist in obtaining from Owner additional details or information, when required for proper execution of the Work.

4. *Interpretation of Contract Documents:* Report to Engineer when clarifications and interpretations of the Contract Documents are needed and transmit to Contractor clarifications and interpretations as issued by Engineer.

5. *Shop Drawings and Samples:*

   a. Record date of receipt of Samples and approved Shop Drawings.

   b. Receive Samples which are furnished at the Site by Contractor, and notify Engineer of availability of Samples for examination.

6. *Modifications:* Consider and evaluate Contractor's suggestions for modifications in Drawings or Specifications and report such suggestions, together with RPR's recommendations, to Engineer. Transmit to Contractor in writing decisions as issued by Engineer.

7. *Review of Work and Rejection of Defective Work*:

   a. Conduct on-Site observations of Contractor's work in progress to assist Engineer in determining if the Work is in general proceeding in accordance with the Contract Documents.

   b. Report to Engineer whenever RPR believes that any part of Contractor's work in progress will not produce a completed Project that conforms generally to the Contract Documents or will imperil the integrity of the design concept of the completed Project as a functioning whole as indicated in the Contract Documents, or has been damaged, or does not meet the requirements of any inspection, test or approval required to be made; and advise Engineer of that part of work in progress that RPR believes should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection or approval.

8. *Inspections, Tests, and System Startups:*

   a. Verify that tests, equipment, and systems start-ups and operating and maintenance training are conducted in the presence of appropriate Owner's personnel, and that Contractor maintains adequate records thereof.

   b. Observe, record, and report to Engineer appropriate details relative to the test procedures and systems start-ups.

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9. *Records:*

    a. Record names, addresses, fax numbers, e-mail addresses, web site locations, and telephone numbers of all Contractors, Subcontractors, and major Suppliers of materials and equipment.

    b. Maintain records for use in preparing Project documentation.

10. *Reports:*

    a. Furnish to Engineer periodic reports as required of progress of the Work and of Contractor's compliance with the progress schedule and schedule of Shop Drawing and Sample submittals.

    b. Draft and recommend to Engineer proposed Change Orders, Work Change Directives, and Field Orders. Obtain backup material from Contractor.

    c. Immediately notify Engineer of the occurrence of any Site accidents, emergencies, acts of God endangering the Work, damage to property by fire or other causes, or the discovery of any Hazardous Environmental Condition.

11. *Payment Requests:* Review Applications for Payment with Contractor for compliance with the established procedure for their submission and forward with recommendations to Engineer, noting particularly the relationship of the payment requested to the schedule of values, Work completed, and materials and equipment delivered at the Site but not incorporated in the Work.

12. *Certificates, Operation and Maintenance Manuals:* During the course of the Work, verify that materials and equipment certificates, operation and maintenance manuals and other data required by the Specifications to be assembled and furnished by Contractor are applicable to the items actually installed and in accordance with the Contract Documents, and have these documents delivered to Engineer for review and forwarding to Owner prior to payment for that part of the Work.

13. *Completion*:

    a. Participate in a Substantial Completion inspection, assist in the determination of Substantial Completion and the preparation of lists of items to be completed or corrected.

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b. Participate in a final inspection in the company of Engineer, Owner, and Contractor and prepare a final list of items to be completed and deficiencies to be remedied.

c. Observe whether all items on the final list have been completed or corrected and make recommendations to Engineer concerning acceptance and issuance of the Notice of Acceptability of the Work.

C. The RPR shall not:

1. Authorize any deviation from the Contract Documents or substitution of materials or equipment (including "or-equal" items).

2. Exceed limitations of Engineer's authority as set forth in the Contract Documents.

3. Undertake any of the responsibilities of Contractor, Subcontractors, Suppliers, or Contractor's superintendent.

4. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of Contractor's work unless such advice or directions are specifically required by the Contract Documents.

5. Advise on, issue directions regarding, or assume control over safety practices, precautions, and programs in connection with the activities or operations of Owner or Contractor.

6. Participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically authorized by Engineer.

7. Accept Shop Drawing or Sample submittals from anyone other than Contractor.

8. Authorize Owner to occupy the Project in whole or in part.

ARTICLE 11 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

SC-11.03 *Unit Price Work*

The following SC is typically called a variation in estimated quantities clause and facilitates administrative resolution of situations where actual quantities differ materially from estimated quantities. Typically, the clause applies where the Bid price of an item of the Unit Price Work is more than 5 percent of the Contract Price and the actual quantity of the units of work performed varies by 15 to 25 percent.

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SC-11.03.D Delete Paragraph 11.03.D in its entirety and insert the following in its place:

D. The unit price of an item of Unit Price Work shall be subject to reevaluation and adjustment under the following conditions:

1. if the Bid price of a particular item of Unit Price Work amounts to 5 percent or more of the Contract Price and the variation in the quantity of that particular item of Unit Price Work performed by Contractor differs by more than 20 percent from the estimated quantity of such item indicated in the Agreement; and

2. if there is no corresponding adjustment with respect to any other item of Work; and

3. if Contractor believes that Contractor has incurred additional expense as a result thereof or if Owner believes that the quantity variation entitles Owner to an adjustment in the unit price, either Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Article 10 if the parties are unable to agree as to the effect of any such variations in the quantity of Unit Price Work performed.

ARTICLE 12 – CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

SC-12.01 *Change of Contract Price*

In some cases a change in Contract Price will include a Contractor's fee for overhead and profit, which under GC-12.01.C.2 may be determined through application of prescribed percentages on portions of the Cost of the Work. The percentages to be applied to subcontract work of one or more tiers is set forth in GC-12.01.C.2.c, under which the Subcontractor actually performing the work earns a fee of 15 percent, and any higher tier Subcontractors and the Contractor will each earn a fee of 5 percent of the amount paid to the next lower tier Subcontractor. If the parties wish to cap the total amount of the fee that could result from application of this formula, EJCDC suggests the following Supplementary Condition establishing a maximum fee of 27 percent, based on a fee at three tiers (1.15 x 1.05 x 1.05=1.268):

SC-12.01.C *Contractor's Fee.* Delete the semicolon at the end of GC 12.01.C.2.c, and add the following language:

, provided, however, that on any subcontracted work the total maximum fee to be paid by Owner under this subparagraph shall be no greater than 27 percent of the costs incurred by the Subcontractor who actually performs the work;

ARTICLE 16 – DISPUTE RESOLUTION

SC-16.01 *Methods and Procedure*

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As an alternative to the dispute resolution process set forth in the General Conditions (mediation followed by litigation), the contract could pair final and binding arbitration with mediation. A discussion of the pros and cons of the arbitration process (and there are many advocates on either side) is beyond the scope of this Guide. Consultation with the Owner's legal counsel is highly recommended. Users should also note that they will need to insert the name of an arbitration agency, such as the American Arbitration Association or the CPR Institute for Dispute Resolution, in SC-16.02.A. The mediation/arbitration option requires the following:

SC-16.01 Delete Paragraph 16.01.C in its entirety and insert the following in its place:

C. If the Claim is not resolved by mediation, Engineer's action under Paragraph 10.05.C or a denial pursuant to Paragraphs 10.05.C.3 or 10.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:

1. elects in writing to demand arbitration of the Claim, pursuant to Paragraph SC-16.02; or

2. agrees with the other party to submit the Claim to another dispute resolution process.

SC-16.02 Add the following new paragraph immediately after Paragraph 16.01.

SC-16.02 *Arbitration*

A. All Claims or counterclaims, disputes, or other matters in question between Owner and Contractor arising out of or relating to the Contract Documents or the breach thereof (except for Claims which have been waived by the making or acceptance of final payment as provided by Paragraph 14.09) including but not limited to those not resolved under the provisions of Paragraphs SC-16.01A and 16.01.B will be decided by arbitration in accordance with the rules of *[insert name of selected arbitration agency]*, subject to the conditions and limitations of this Paragraph SC-16.02. This agreement to arbitrate and any other agreement or consent to arbitrate entered into will be specifically enforceable under the prevailing law of any court having jurisdiction.

B. The demand for arbitration will be filed in writing with the other party to the Contract and with the selected arbitrator or arbitration provider, and a copy will be sent to Engineer for information. The demand for arbitration will be made within the 30 day period specified in Paragraph SC-16.01.C, and in all other cases within a reasonable time after the Claim or counterclaim, dispute, or other matter in question has arisen, and in no event shall any such demand be made after the date when institution of legal or equitable proceedings based on such Claim or other dispute or matter in question would be barred by the applicable statue of limitations.

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C. No arbitration arising out of or relating to the Contract Documents shall include by consolidation, joiner, or in any other manner any other individual or entity (including Engineer, and Engineer's consultants and the officers, directors, partners, agents, employees or consultants of any of them) who is not a party to this Contract unless:

1. the inclusion of such other individual or entity is necessary if complete relief is to be afforded among those who are already parties to the arbitration; and

2. such other individual or entity is substantially involved in a question of law or fact which is common to those who are already parties to the arbitration and which will arise in such proceedings.

D. The award rendered by the arbitrator(s) shall be consistent with the agreement of the parties, in writing, and include: (i) a concise breakdown of the award; (ii) a written explanation of the award specifically citing the Contract Document provisions deemed applicable and relied on in making the award.

E. The award will be final. Judgment may be entered upon it in any court having jurisdiction thereof, and it will not be subject to modification or appeal, subject to provisions of the Controlling Law relating to vacating or modifying an arbitral award.

F. The fees and expenses of the arbitrators and any arbitration service shall be shared equally by Owner and Contractor.

ARTICLE 17 – MISCELLANEOUS

SC-17.07 Add the following new paragraph immediately after Paragraph 17.06.

SC-17.07 Access and Usage of Fire Hydrants and Other Utilities. The Contractor shall not obstruct, destroy, or deter usage of fire hydrants and other utilities. Contractor shall not use any utility without proper consent and connection from the utility company.

SC-17.08 Add the following new paragraphs immediately after Paragraph 17.07.

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SC-17.08 SPECIAL CONDITIONS

A. Traffic Control. The Contractor shall be responsible for preparing and submitting a traffic control plan to the Engineer prior to beginning construction. Traffic control plan will be reviewed for general compliance to the latest MUTCD edition. The Contractor shall be responsible for providing all traffic control devices and/ or flagging personnel as may be required for construction. The Contractor is responsible for project safety. Temporary ramps to allow access for private ingress and egress to driveways shall be provided by the contractor at no additional compensation.

B. Engineer Field Reviews. The Contractor is required to contact the Engineer at least 24 hours prior to beginning construction. Coordinate testing and field reviews with Engineer or Engineer's representative. A field review by the Engineer or Engineer's representative does not secure that completed construction has been accepted. All materials and workmanship shall conform to the City Standards and Specifications. The Engineer and/or City reserve the right to accept or reject any such materials or workmanship that does not conform to the City Standards and Specifications.

C. Coordination with City Water Department. Contractor shall give at least 24 hours notice to residents prior to any activity which will affect their culinary water supply or pressure. Notification shall be as follows: (1) Obtain door knob notification cards at the Public Works Building (2) Fill out card with day, time and approximate duration water supply will be effected and (3) Attach the cards to each door knob of the water users effected. Coordinate this effort and give 24 hours notice to the City. Contractor shall not operate any valve without the Water Department's permission. Contact Jason Reney (801) 782-8111 for permission.

D. Irrigation Lines. Contact Doug Jeppesen, Pineview Water Systems (801) 621-6555 for help locating and opening valves for the irrigation system. Contractor shall not operate any irrigation main valve without the appropriate Irrigation Company's permission.

E. Lump Sum Prices. The lump sum items on the Bid Schedule are the Engineer's estimate for the convenience of the contractor only and contractor will not be entitled to any additional compensation for overages of quantities over the estimate.

F. Safety and Protection of Utilities & Landscaping and Utility Crossings. The *Manual on Uniform Traffic Control Devices* must be followed to insure safety to workers and the public. Contractor shall be responsible to protect all existing utilities when excavating and to repair at their own expense any damage to them during construction. The contractor will be responsible to restore any damaged sod, sprinkler systems and fencing to their original condition.

G. Existing Improvements and Utilities. The contractor shall be responsible for damage that occurs to existing improvements outside the construction limits. This includes all existing curb & gutter, concrete collars, asphalt, inlet boxes, manholes, street lights, etc. Please note that not all lines may be shown, and not all utilities may be located where shown. All

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locations are subject to protect all existing utilities when excavating in the street and to repair at his own expense any damage done during construction.

H. Soft Spots. If contractor encounters any soft areas in the existing subgrade while excavating, he will immediately contact the Engineer. The Engineer will observe the conditions and make the decision of where to over-excavate. The contractor will be paid on a square yard basis and these areas will be measured at the time of excavation. Three inch minus granular material is scheduled to be used for soft spot replacement as determined by the Engineer. No over-excavation or replacement shall be done without prior approval from Engineer

I. Asphalt Saw-cutting. The City intends for all existing asphalt edges to be sawcut for a neat, clean edge prior to installation of new asphalt. The Contractor may remove the existing asphalt for utility trenches by means other than saw-cutting (i.e., zipping). Prior to installation of new asphalt, the edges of the existing asphalt must be sawcut if the asphalt removal was by means other than saw-cutting or if the edges were previously sawcut and damaged due to construction equipment, traffic, etc. to provide a neat clean edge. Asphalt removal will be paid on a square yard basis. No additional payment will be made for a second sawcut, including trip charges. All saw-cutting for edge restoration will be as per Engineer.

J. Record drawings. An accurate set record drawings or shall be kept by the contractor and submitted to North Ogden City before final payment.

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SECTION 01 00 00 – 34 00 00

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SECTION 01 22 13

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Measurement and payment criteria applicable to the work or portions of the work performed under a unit price payment method.
B. Payment provisions.
C. Additional compensation procedures.
D. Defect assessment and nonpayment for rejected work.

1.2 **AUTHORITY**

A. Measurement methods specified in the individual sections are intended to compliment the criteria of this section.
B. Take all measurements and compute quantities. ENGINEER will verify measurement and quantities.
C. Provide all equipment and workers to assist in making measurements.

1.3 **MEASUREMENT OF QUANTITIES**

A. Unit of Measurement: As listed in bid forms for bidding and contract purposes only. Quantities supplied or placed in the work and measurements verified by ENGINEER determine payment.
B. Weight Basis: Measured by scale or by handbook weights for the type and quantity of material actually furnished and used.
1. For material to be measured and paid for by weight, furnish accurate scale. Use platform scales of sufficient size and capacity to permit the entire vehicle or entire combination of vehicles to rest on the scale platform while being weighted. Combination vehicles may be weighed as separate units provided they are disconnected while being individually weighed.
2. ENGINEER may be present to witness weighing and to check and compile daily records of such scale weights; however, in any case, furnish weigh slips and daily summary weigh sheets. Furnish duplicate weigh slip or a load slip to each vehicle weighed and deliver the slip to ENGINEER at the point of delivery of the material.
3. Trucks used to haul material shall be weighted empty daily and at such additional times as directed. Each truck shall bear a plainly legible identification mark. ENGINEER may require the weight of the material verified by weighing empty and loaded trucks on other scales.
C. Area Basis: Measured by square dimension using mean length and width or radius.
D. Linear Basis: Measured by linear dimension at the item centerline or mean chord.
E. Volume Basis: Measured by cubic dimension using mean length, width and height or thickness. When material is to be measured and paid for on a volume basis and it is impractical to determine the volume by rectilinear measurements in place of by the specified method of measurement, or when requested by the CONTRACTOR in writing and accepted in writing, the material will be weighed in accordance with the requirements specified for weight measurement. Such weights will be converted to volume measurement for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined and shall be agreed to by CONTRACTOR before such method of measurement of pay quantities will be accepted.
F. Each Basis: Measured by the unit.
G. Lump sum Basis: Measured on a percent complete basis.

1.4 **PAYMENT**

A. Payment Includes: Full compensation for all required labor, products, tools, equipment, paint, transportation, services and incidentals; erection, application or installation of an item of the work; overhead and profit.
B. Final payment for work governed by unit prices will be made on the basis of the actual measurements and quantities multiplied by the unit price for work which is incorporated in or made necessary by the work.

1.5 **PAYMENT FOR MATERIALS AND EQUIPMENT ON HAND**

A. CONTRACTOR may include in partial payment applications, an advanced payment item for acceptable nonperishable products purchased or manufactured expressly for the work, if:
1. Certified copies of product invoices are approved.
2. The maximum sum to be included in partial payment applications does not exceed 75 percent of the value of the product shown on the invoice or 75 percent of the in-place rice, whichever sum is less.
3. Product is stored in the vicinity of the project or when the approved storage location is other than the site, evidence is furnished that the stored product is irrevocably obligated to the work.
4. CONTRACTOR is responsible for any damages, loss or theft of product until product is incorporated in the work and accepted.
B. Payment for materials shall not constitute acceptance of any materials which do not conform to the contract documents.
C. No partial payment will be made on living, or perishable plant materials until planted.

1.6 **INCIDENTAL WORK**

A. If unit price bid forms do not contain an item for work described in the contract documents or the drawings do not show this item, but it is necessary for the proper completion of the work, such item shall be defined as incidental work and will not be measured or be paid for separately. Include the cost of such an item in other bid form pay items.

1.7 **DOCUMENTATION FOR ADDITIONAL COMPENSATION**

A. Do not rely on any verbal communications when requested to make alterations, variations, additions, or omissions to the terms of the contract documents. The only acceptable forms of communication to make these changes are specified in Part 3 of the General Conditions.

B. Although not to be construed as proceeding under extra work provisions of the contract, keep and furnish records of additional work for additional compensation in accordance with contract provisions. Obtain ENGINEER's signature on all documentation.

C. Show justification for additional work by quoting reference to applicable terms or specifications in the contract documents.

1.8 **NONPAYMENT FOR REJECTED PRODUCTS**

A. Payment will not be made for any of the following:

1. Products wasted or disposed of in a manner that is not acceptable.
2. Products determined as unacceptable before or after placement.
3. Products not completely unloaded from the transporting vehicle.
4. Products placed beyond the lines and levels of the required work.
5. Products remaining on hand after completion of the work.
6. Loading, hauling and disposing of rejected products.

1.9 **DEFECT ASSESSMENT**

A. Replace the work, or portions of the work, not conforming to specified requirements.

B. If ENGINEER determines it is not practical to remove and replace defective work, one of the following remedies may be applied.

1. The defective work may remain, but the unit price reduced up to 50 percent.
2. The defective work will be partially repaired and the unit price will be adjusted to a new price.

C. Individual specification sections hereinafter may modify these options or may identify specific formula, pay factor or percentage price reduction to be used.

PART 2 PRODUCTS Not used

PART 3 EXECUTION Not used

END SECTION

SECTION 01 26 00

CONTRACT MODIFICATION PROCEDURES

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Procedures for initiating and authorizing contemplated changes to the Work.

1.2 **DEFINITIONS**

A. Request for Proposal (RFP): Written or verbal inquiry by ENGINEER to the CONTRACTOR that asks for information pertinent to OWNER's contemplated changes to the Work.

B. Request for Change (RFC): Written or verbal inquiry to the ENGINEER by the CONTRACTOR that asks for changes to the Work.

1.3 **PRELIMINARY PROCEDURES**

A. Changes Proposed by ENGINEER: ENGINEER may initiate changes by issuing a Request for Proposal (RFP) to CONTRACTOR. Such request is for information only, and is not an instruction to execute the changes, nor to stop work in progress. The request will include:

1. A specific statement from the CONTRACTOR advising the ENGINEER whether or not the proposed change affects the Progress Schedule's critical path.
2. Description of the propose change, products required in the change, and location of the change in the Project.
3. Supplementary or revised Drawings and Specifications.
4. The projected time span for making the change, and a specific statement as to whether overtime work is, or is not, authorized.
5. A specific period of time during which the requested price will be considered valid.

B. Changes Proposed by CONTRACTOR: CONTRACTOR may propose changes by submitting a written Request for Change (RFC) to the ENGINEER, containing:

1. A specific statement of the effect that the contemplated change has on the Progress Schedule's critical path.
2. Description of the proposed change.
3. Statement of the reason for making the changes.
4. Statement of the effect on the work of separate contractors.
5. Documentation supporting any change in the Contract Price or Contract Time as appropriate.
6. Documentation of any Substitutions per Section 01 25 00.

C. Work Directive Change: In lieu of a Request for Proposal (RFP), ENGINEER may issue a Work Directive Change for CONTRACTOR to proceed with work which will be included in a subsequent Change Order.

1. The Work Directive Change will describe changes in the Work, both additions and deletions, with attachments of revised Contract Documents to define details of the change, and will designate the method of determining any change in the Contract Price and any change in Contract Time.
2. CONTRACTOR may sign and date the Work Directive Change to indicate agreement with the terms therein.
3. ENGINEER will sign and date the Work Directive Change as authorization for the CONTRACTOR to proceed with the changes.

D. Force Account: When Contract Price or Contract Time cannot be determined prior to executing a Change Order for contemplated work:

1. ENGINEER will issue a Work Directive Change instructing the CONTRACTOR to proceed with the contemplated work.
2. At completion of the contemplated work, CONTRACTOR shall submit itemized accounting and supporting data as provided in the General Conditions.
3. ENGINEER will determine the allowable cost of such contemplated work, as provided in the General Conditions.
4. CONTRACTOR signs and dates the Change Order to indicate agreement therewith.
5. ENGINEER signs and dates the Change Order to establish the change in Contract Price and Contract Time.

1.4 DOCUMENTATION REQUIRED FOR PROPOSALS OR CLAIMS

A. Support each proposal or claim with sufficient substantiating data to allow ENGINEER to evaluate the quotation. Provide the following data.

1. Existing work affected (change to progress schedule).
2. Labor required.
3. Equipment required.
4. Products required.
   a. Recommended source of purchase and unit cost.
   b. Quantities required.
5. Taxes, insurance and bonds.
6. Credit for work deleted from Contract, similarly documented.
7. Overhead and profit.
8. Justification for any change in Contract Time.

B. Support each claim on a time and materials (force account) basis, with documentation as required for a lump-sum proposal, plus additional information:

1. Name of OWNER's authorized agent who ordered the work, and date of the order.
2. Dates and times work was performed, and by whom.
3. Time record, summary of hours worked, and hourly rates paid.
4. Receipts and invoices for:

   a. Equipment used, listing dates and time of use.
   b. Products used, listing of quantities.
   c. Subcontracts.

C. Document requests for Substitutions for products as specified in Section 01 25 00.

1.5 PREPARATION OF CHANGE ORDER

A. ENGINEER will prepare the Change Order.

B. The Change Order will describe changes in the Work, both additions and deletions, with attachments of revised Contract Documents to define details of the change.

C. The Change Order will provide an accounting of the adjustment in the Contract Price and in the Contract Time.

D. Several Request for Proposal (RFP) and Request for Changes (RFC) may be included in one Change Order.

1.6 LUMP SUM, OR FIXED PRICE CHANGE ORDER

A. The content of a Change Order in a lump sum contract will be based on, either:

1. ENGINEER's Request for Proposal (RFP) and CONTRACTOR's responsive proposal as mutually agreed between ENGINEER and CONTRACTOR; or
2. CONTRACTOR's Request for Change (RFC), as recommended by ENGINEER to OWNER.

B. CONTRACTOR may sign and date the Change Order to indicate agreement with the terms therein.

C. ENGINEER will sign and date the Change Order as authorization for the CONTRACTOR to proceed with the contemplated work.

1.7 UNIT PRICE CHANGE ORDERS

A. Content of unit price Change Orders will be based on:

1. ENGINEER's definition of the scope of the required changes;
2. CONTRACTOR's proposal for a change, as recommended by ENGINEER; or
3. Survey of completed work.

B. The amounts of the unit prices to be:

1. Those stated in the Agreement; or
2. Those mutually agreed upon between ENGINEER and CONTRACTOR and accepted by the OWNER.

C. When quantities of each of the items affected by the Change Order can be determined prior to start of the contemplated work:

1. CONTRACTOR signs and dates the Change Order to indicate agreement with the quantities and the Terms therein;
2. ENGINEER signs and dates the Change Order as authorization for CONTRACTOR to proceed with the contemplated work, And

3. CONTRACTOR completes contemplated work and is paid total amount indicated on the Change Order.

D. When quantities of the items cannot be determined prior to start of the contemplated work:

1. ENGINEER prepares Change Order using his best estimate of needed quantities.
2. CONTRACTOR signs and dates Change Order to indicate agreement with the terms therein.
3. ENGINEER signs and dates Change Order as authorization for CONTRACTOR to proceed with the contemplated work.
4. CONTRACTOR completes contemplated work and is paid for work quantities completed.

1.8 **CORRELATION WITH CONTRACTOR'S SUBMITTALS**

A. Periodically revise Schedule of Values and request for payment forms to record each change as a separate item of Work, and to record the adjusted Contract Price.

B. Periodically revise the Progress Schedule to reflect each change in Contract Time. Revise sub-schedules to show changes for other items of work affected by the changes.

C. Upon completion of Change Order work, enter pertinent changes in the Record Documents. Refer to Section 01 78 39.

PART 2 PRODUCTS Not Used

PART 3 EXECUTION Not Used

END OF SECTION

SECTION 01 29 00

PAYMENT PROCEDURES

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Measurement and payment procedures, forms, submission requirements, and price adjustments.

1.2 **SUBMITTAL PROCEDURES**

A. Submit at least two copies of each Application for Payment. Each application must be signed by CONTRACTOR.

B. Submit an updated progress schedule with each Application for Payment.

C. When ENGINEER requires substantiating information, submit data.

1.3 **UNIT PRICE PAY REQUEST FORMS**

A. Application Form: ENGINEER prepared or one acceptable to the ENGINEER.

B. Schedule of Prices: ENGINEER prepared or one acceptable to the ENGINEER.

1.4 **LUMP SUM PAY REQUEST FORMS**

A. Application Form: Use AIA Form G702 -Application and Certificate for Payment; or AIA G722 -Project Application and Project Certificate for Payment; or EJCDC Form 1910-8-E -Application for Payment; or CONTRACTOR's standard form; or electronic media printout following one of the above standard forms.

B. Schedule of Values Form: Use AIA Form G703 -Application and Certificate for Payment Continuation Sheet and AIA G723 -Project Application Summary, or EJCDC Form 1910-8-E, or CONTRACTOR's standard form, or electronic media printout following one of the above standard forms. Follow the outline presented in the Bid Form. For each item, provide a column (or row) for listing each of the following:

1. Item number.
2. Description of work.
3. Scheduled values.
4. Previous applications.
5. Work in plan and stored materials under this application.
6. Authorized Change Orders.
7. Total completed and stored to date of application.
8. Percentage of completion.

9. Balance to finish.
10. Retainage.
11. Overhead and profit.

C. Submission Schedule: Comply with the time requirement of Paragraph 2.5 B of the General Conditions when submitting the Schedule of Values. (Within 10 Days after the Effective Date of the Construction Contract) when submitting the Schedule of Values. (Within 10 Days after the Effective Date of the Construction Contract.)

D. Revisions: Revise schedule of values to list approved Change Orders, with each Application for Payment.

1.5 MEASUREMENT

A. General:

1. Measurement methods specified in the individual Sections of the Standard Specifications are intended to compliment the criteria of this Section.
2. Furnish labor to assist ENGINEER in obtaining and handling test samples at site or sources.
3. ENGINEER will take all measurements and compute all quantities.
4. CONTRACTOR will verify ENGINEER's measurements and computations.
5. CONTRACTOR will provide all equipment, workers, and survey crews to assist ENGINEER in making measurements.

B. Unit of Measurement: Refer to the Bid Form that identifies the unit of measurement to be used for unit price items.

C. Weight Basis: Measured by scale or by handbook weights for the type and quantity of material actually furnished and used.

1. For material to be measured and paid for by weight, furnish accurate scales. Use platform scales of sufficient size and capacity to permit the entire vehicle or entire combination of vehicles to rest on the scale platform while being weighed. Combination vehicles may be weighed as separate units provided they are disconnected while being individually weighed. Pay for all costs incurred as a result of regulating, adjusting, testing, inspecting, and certifying scales.
2. ENGINEER may be present to witness weighing and to check and compile daily records of such scale weights; however, in any case, furnish weigh slips and daily summary weigh sheets. Furnish duplicate weigh slip or a load slip to each vehicle weighed and deliver the slip to ENGINEER at the point of delivery of the material.
3. If the material is shipped by rail, certified car weights will be accepted. Only actual weight of material will be paid for and not minimum car used for assessing freight tariff. Car weights will not be used for material to be passed through mixing plants.

4. Trucks used to haul material shall be weighed empty daily and at such additional times as directed. Each truck shall bear a plainly legible identification mark. ENGINEER may require the weight of the material verified by weighing empty and loaded trucks on other scales.

D. Area Basis: Measured by square dimension using mean length and width and radius.

E. Linear Basis: Measured by linear dimension at the item centerline or mean chord.

F. Volume Basis: Measured by cubic dimension using mean length, width and height or thickness.

1. Volumes will be determined and based upon material compacted in-place (not loose measure as per delivery ticket).
2. When it is impractical to determine the volume by rectilinear measurements in place or by the specified method of measurement, or when requested by the CONTRACTOR in writing and accepted in writing, the material will be weighed in accordance with the requirements specified for weight measurement. Such weights will be converted to volume measurement for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined and shall be agreed to by CONTRACTOR before such method of measurement of pay quantities will be accepted.

G. Each Basis: Measured by the unit.

H. Lump Sum Basis: Measured on a percent complete basis.

1.6 PAYMENT

A. Payment covers all labor, products, tools, equipment, paint, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

B. Quantities supplied or placed in the Work and measurements agreed to by CONTRACTOR determine payment.

C. The final payment sum may be as great as twice the value of Punch List work or at least equal to the value of the work declared defective by the ENGINEER.

1.7 INCIDENTAL WORK

A. No separate measurement or payment for incidental work. See paragraph 3.1C of the General Conditions (Document 00 72 00).

1.8 PRODUCT

A. No separate measurement and payment for:

1. Product or work provided by ENGINEER or OWNER;
2. Product wasted or disposed of in a manner that is not acceptable;
3. Product determined as unacceptable before or after placement;
4. Product not completely unloaded from the transporting vehicle;

5. Product placed beyond the lines and levels of the required Work;
6. Product remaining on hand after completion of the Work; or
7. Loading, hauling and disposing of rejected product.

1.9 **MATERIALS AND EQUIPMENT ON-HAND**

A. CONTRACTOR may include in partial payment applications, an advanced payment item for acceptable non-perishable products purchased or manufactured expressly for the Work, if:
1. Certified copies of product invoices are approved.
2. The maximum sum to be included in partial payment applications does not exceed 75 percent of the value of the product shown on the invoice or 75 percent of the in-place price, whichever sum is less.
3. Product is stored in the vicinity of the Project or when the approved storage location is other than the site, evidence is furnished that the stored product is irrevocably obligated to the Work.
4. CONTRACTOR is responsible for any damages, loss or theft of product until product is incorporated in the Work and accepted.

B. Payment for materials shall not constitute acceptance of any materials which do not conform to the Contract Documents.

C. No partial payment will be made on living, or perishable plant materials until planted.

1.10 **PRICE ADJUSTMENT**

A. Defective Work: If ENGINEER determines it is not practical to remove and replace Defective Work or material, one of the following remedies may be applied.
1. Defective Work or material may remain, but the price reduced up to 50 percent. If non-complying material has been installed and no price for the material is specified, apply price reduction against cost of work requiring complying material as part of its installation.
2. Defective Work or material will be partially repaired and the price will be adjusted to a new price.
3. Pay for Defective Work on a pay factor basis.
   a. Where 2 or more pay factors apply to one item of Defective Work or material (even if pay factors are determined using separate specification sections), the smallest pay factor shall be used to determine price adjustment.
   b. Pay factors shall not be cumulative.
   c. Pay factors shall be applied to unit prices in either the bid form or a Change Order.

B. Change Order: Contract Price adjustment shall be effected by Change Order in lump sum contracts. In unit price contracts, Contract Price adjustment shall be effected by adjusting unit price quantities.

C. Early Completion: No additional money will be due CONTRACTOR:
1. if CONTRACTOR completes Work or any portion of Work prior to Contract Time, or
2. if early completion is delayed.

PART 2 PRODUCTS Not Used

PART 3 EXECUTION Not Used

END OF SECTION

SECTION 01 31 13

COORDINATION

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Coordination among CONTRACTOR's employee's and Subcontractors, And any utility company, separate contractor, property owner, OWNER, and authority having jurisdiction.

1.2 **COORDINATING WITH ENGINEER**

A. Cooperate with ENGINEER, inspectors, and separate contractors to establish on-site lines of authority for communication.

B. Develop procedures for handling submittals, reports, records, recommendations, coordination drawings, and schedules.

C. Notify in writing of problems that develop during construction.

D. Ensure agency responsible for operation and maintenance of the completed facility is advised before a project or parts thereof are open for use.

E. Maintain and operate the Work until accepted and turned over to the agency responsible for operation and maintenance.

1.3 **COORDINATING WITH PRIVATE AND PUBLIC AGENCIES**

A. Notify private and public agencies affected by the proposed construction, coordinate required adjustments, and arrange for all necessary adjustments of utilities within or adjacent to the limits of construction.

B. Obtain utility locations from the one-call center (Blue Stake) or other utility coordination service 2 to 7 working Days prior to any excavation. Locations must be updated every 14 Days.

C. All utilities and utility appurtenances within the limits of the Work that are to be relocated or adjusted shall be moved by the affected utility company, unless specified otherwise.

D. Notify police, fire and transit authority.

1.4 **COORDINATING WITH SEPARATE CONTRACTORS**

A. Coordinate with separate contractors at no additional cost to OWNER to leave Work complete and finished.

B. Inspect and promptly report any apparent discrepancies or defects in work done by

separate contractors that render Work unsuitable for proper execution and results. Failure to inspect and report shall constitute acceptance of separate contractor's work as fit and proper to receive work of this contract, except as to defects that may develop in the other separate contractor's work after the execution of the CONTRACTOR's work.

1.5 **COORDINATING WITH ADJACENT PROPERTY OWNER**

A. Notice: Notify property owner 10 Days prior to the start of construction and at least 48 hours in advance of the interruption of utility service or the interruption of access, or the installation of bituminous material.

B. Access: Provide all weather access to property owner at all times, unless property owner or ENGINEER approve otherwise.

C. Easements: Where work is on easements on private property, coordinate work with the property owner so that work will minimize inconvenience to property owner.

D. Refuse Collection:

1. Notify all affected property owners ahead of time by written notice. Notify them not to put out any refuse at the appropriate time. Tell them another time that will be the time to collect their refuse.
2. If necessary haul refuse to nearest point of suitable collection as determined by the refuse collection agency. E, Mail: Cooperate with the U.S. Postal Service in the delivery of mail.

1.6 INTERRUPTION OF UTILITIES

A. Notify fire and police services in local jurisdiction if emergency is safety related or if construction activities interrupt any utility service.

B. Contact the affected utility company. Find out how soon repairs can be made as well as when the repairs will begin.

C. Contact the affected local residences or businesses. Inform when repairs will begin and how long it will take to complete them.

D. Inform ENGINEER and OWNER.

1.7 **INTERRUPTION OF OWNER'S OPERATIONS**

A. If any aspect of normal OWNER operations needs to be interrupted for completion of the Work, notify ENGINEER in writing.

B. Submit notice with an alternate plan to cover contingency problems. In the alternate plan allow for maintenance of utilities or other essential services that must be interrupted for any period otherwise deemed necessary by OWNER to be unacceptable for necessary OWNER operations.

C. Shutdown of utilities must be accomplished during approved hours at no additional cost to OWNER. If work requires a longer shutdown, it must then be accomplished

during separate periods.

D. Do not proceed with proposed shutdown without written approval.

PART 2 PRODUCTS Not Used

PART 3 EXECUTION Not Used

END OF SECTION

SECTION 01 31 19

PRECONSTRUCTION CONFERENCE

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. CONTRACTOR participation in preconstruction conference.

1.2 **PRECONSTRUCTION CONFERENCE**

A. Prior to commencement of Work at site, a preconstruction conference will be held at a mutually agreed time and place attended by CONTRACTOR, its' superintendent, and its' Subcontractors as appropriate. Other attendees will be:

1. ENGINEER and Resident Project Representative.
2. Representatives of OWNER.
3. Representatives of affected utility companies.
4. Governmental representatives as appropriate.
5. Others as requested by CONTRACTOR, OWNER, or ENGINEER.

B. Unless previously submitted, bring to the conference one copy of each of the following:

1. Progress schedule.
2. Procurement schedule of major equipment and materials and items requiring long lead time.
3. Schedule of submittals.
4. Schedule of values (lump sum price breakdown) for progress payment purposes.
5. Schedule of OWNER furnished items.

C. The purpose of the conference is to designate responsible personnel and establish a working relationship. Matters requiring coordination will be discussed and procedures for handling such matters established. The complete agenda will be furnished to the CONTRACTOR prior to the meeting date, which may include the following:

1. CONTRACTOR's tentative schedules.
2. Transmittal, review and distribution of CONTRACTOR's tentative schedules.
3. Processing applications for payment.
4. Maintaining Record Documents.
5. Critical work sequencing.
6. Field decisions and Change Orders.
7. Use of Project site, office and storage areas, security, housekeeping, and OWNER's needs.
8. Major equipment deliveries and priorities.
9. CONTRACTOR's assignments for safety and first aid.

D. ENGINEER will preside at preconstruction conference and will arrange for recording and distributing minutes to all persons in attendance.

PART 2 PRODUCTS Not Used

PART 3 EXECUTION Not Used

END OF SECTION

SECTION 01 32 16

PROGRESS SCHEDULE

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Requirements for preparing and submitting a construction progress schedule for ENGINEER's use in determining if Work can be Substantially Complete within the Contract Time.

1.2 **TYPE OF SCHEDULE**

A. CONTRACTOR's choice.

1.3 **SUBMITTALS**

A. Prior to construction, submit the preliminary progress schedule per paragraph 2.5B1 of the General Conditions (Document 00 72 00).

B. During construction submit.

1. Updated progress schedule on a monthly basis.
2. A narrative report when the schedule does not reflect the Work process. Discuss recovery procedures shown in the schedule because of problem areas. Identify any costs to be paid by OWNER.
3. Promptly deliver to ENGINEER a revised progress schedule if work cannot be completed per the current schedule.

C. At any time upon ENGINEER's request and at no additional cost to the OWNER, submit a critical path schedule, in place of an activity bar chart (Gantt chart) schedule if work falls more than 7 Days behind schedule.

1.4 **CONTENT OF SCHEDULES**

A. Title Block: Show on each page:

1. Project title, number and CONTRACTOR's name.
2. Date of submittal, revision number, page number, and Project status cutoff date.
3. Approval signatures for each Subcontractor.
4. Legend of symbols, codes and abbreviations.
5. Network nomenclature, e.g., "Detailed" or "Summary" or "Building Area" identification.

B. Activities: Show complete sequence of construction activity networks as time scaled (squared) with starting time for all activities, in no less than weekly divisions from left to right, and with activities scheduled from **right to left**. Provide complete sequence of construction by activity to include but not limited to:

1. Shop drawings, product data and sample submittal dates, and dates required for submittal approvals.
2. Decision dates for product specified by allowances, Selection of finishes, And critical material or equipment release order.
3. Product procurement and delivery dates.
4. Detailed construction activities, including all Subcontractor's work, oriented to identifiable work areas.
5. Fabrication of special material, equipment and their installation and testing.
6. Coordination activities, including utility relocations, separate contractors, etc.
7. Constraints between interrelated activities. Ensure that those constraints are compatible and coordinated with separate contractors.
8. Anticipated weather impacts, holidays, and change orders.
9. Certificates of compliance, submittal reviews, Substantial Completion review and progress schedule reviews, especially if submittals or schedules are not approved.
10. Specific dates for all special Inspections required prior to any utilities "turn-on" including temporary power.
11. Cleanup, Final Inspection, Punch List.
12. Submittal of record drawings and maintenance manuals.
13. Anything that affects Work Completion.

C. Activity Bar Chart (Gantt Chart) Schedule: Plan and record the construction of the Project using a conventional activity schedule chart analysis system. Include activities of Subcontractors and Suppliers.

1. Provide a minimum of 25 activities showing construction prosecution or preparation activities. Unit price contracts with ten or fewer bid items shall have a minimum of 10 activities. Use the table of contents or bid schedule as the basis for defining activities.
2. Note periods of non-work when the non-working period exceeds three consecutive calendar days.
3. When employing "S" curve analysis, plot contract time vs. percent of contract completed.

D. Critical Path Schedule: Plan and record the construction of the Project using a conventional critical path network analysis system such as outlined in the Associated General Contractors of America (AGC) publication "The Use of CPM in Construction. A Manual for General Contractors and the Construction Industry".

1. Use activity-on-node (AON) format.
2. Divide long activities into small units so no single activity exceeds a total flow time (including float time) of **20 calendar Days**.
3. Show the head to tail path of activities (scheduled from right to left) that requires the longest construction activity time.
4. Precedence diagramming method (PDM) with

E. Float Time:

1. Where float exists, show activities at late-start/late-finish times and periods.
2. Allocate float time in the best interests of the Work. Float time shall not be owned solely by CONTRACTOR.
3. ENGINEER may notify CONTRACTOR of OWNER's claim to use any float time at any time.

1.5 **REVISIONS**

A. Revise the progress schedule if work falls behind.

B. Provide written narratives describing cause of delay for each impacted activity. Identify any cost to be charged against the OWNER.

C. Indicate progress of each activity, and new completion date of each activity.

D. Identify changes in scope, and other changes since previous submittal.

E. Identify all planned actions for construction recovery such as:

1. Use of overtime or extended work hours and extended workweek.
2. Use of additional equipment.
3. Use of additional crews, or other auxiliary forces.
4. Projected cost to the OWNER.

F. Add extra work to schedule at no additional cost to OWNER, except as identified by Change Order.

1.6 **DISTRIBUTION**

A. Distribute copies of schedule per the General Conditions. Instruct recipients to promptly report, in writing, problems anticipated by projections shown.

1.7 **PERFORMANCE**

A. Prosecute Work in accordance with and measure all progress against the progress schedule.

PART 2 PRODUCTS Not Used

PART 3 EXECUTION Not Used

END OF SECTION

SECTION 01 33 00

SUBMITTAL PROCEDURE

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. General procedures and requirements for submittals during the course of construction.

1.2 **CONTRACTOR REVIEW**

A. Review submittals prior to transmittal. Determine and verify field measurements, field construction criteria, manufacturer's catalog numbers, and conformance of submittal with requirements of Contract Documents.

B. Coordinate submittals with requirements of Work and of Contract Documents.

C. Sign or initial each sheet of shop drawings and product data, and each sample label to certify compliance with requirements of Contract Documents. Notify ENGINEER in writing at time of submittal, of any deviations from requirements of Contract Documents.

D. Do not fabricate products or begin work that requires submittals until return of submittal with ENGINEER acceptance.

1.3 **PROCEDURE**

A. Transmit submittals to ENGINEER under transmittal form. Submit the number of copies that CONTRACTOR requires, plus the number of copies required by ENGINEER.

B. Comply with submittal sequences shown in the progress schedule.

C. When required by Laws and Regulations, affix licensed professional's stamp to submittal documents.

D. Identify pertinent Drawing sheet and detail number, and Specification section number.

E. Identify deviations from Contract Documents.

F. Identify the date when ENGINEER must complete review of submittal.

G. Provide space for CONTRACTOR and ENGINEER review stamps.

H. After ENGINEER's review of submittal, revise and resubmit as required, identifying changes made since previous submittal.

I. Distribute copies of reviewed submittals to concerned persons. Instruct recipients to promptly report any inability to comply with provisions.

1.4 **SHOP DRAWINGS**

A. Present drawings in a clear and thorough manner. Title each drawing with Project name and number. Identify each element of drawings by reference to sheet number and detail or equipment schedule.

B. Identify field dimensions. Show relation to adjacent or critical features or work or products.

C. Provide sheet size adequate for ENGINEER's review.

1.5 **PRODUCT DATA**

A. Submit only pages which are pertinent. Mark each copy of standard printed data to identify pertinent products, referenced to specification section and article number. Show reference standards, performance characteristics, and capacities; wiring and piping diagrams and controls; component parts; finishes; dimensions, And required clearances.

B. Modify product data by deleting information that is not applicable to the Work or by marking each copy to identify pertinent data.

C. Supplement standard information, if necessary, to provide additional information applicable to the Work.

D. Provide manufacturer's preparation, assembly and installation instructions.

1.6 **SAMPLES**

A. Submit 1 of each sample required by Contract Documents. Samples shall show the quality, type, range of color, finish and texture of the material.

1.7 **CERTIFICATES**

A. Submit certificates, in duplicate, in accordance with requirements of each Specification section.

PART 2 PRODUCTS Not Used

PART 3 EXECUTION Not Used

END OF SECTION

SECTION 01 33 23

SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Procedures for submitting shop drawings, product data and samples.

1.2 **SCHEDULE**

A. Designate a coordinated schedule, the dates for submission and the dates that reviewed shop drawings, product data and samples will be needed.

1.3 **SUBMITTAL REQUIREMENTS**

A. Identify submittals with project title and number. Include CONTRACTOR's name, date and revision date.

B. Include names of subcontractors and suppliers, applicable specification section number and CONTRACTOR's stamp, initialed or signed, certifying review of submittal, verification of field measurements and compliance with Contract Documents.

C. Submittals shall contain:

1. The date of submission and the dates of any previous submissions.
2. The project title and number.
3. The names of CONTRACTOR, supplier and manufacturer.
4. Product identification with the specification section number.
5. Clearly identified field dimensions.
6. Relationship to adjacent or critical features of work or materials.
7. Proposed deviation from the Contract Documents requirements.

1.4 **SHOP DRAWINGS**

A. Present in a clear and thorough manner. Title each drawing with project name and number. Identify each element of drawings by reference to sheet number and detail or equipment schedule.

B. Identify field dimensions. Show relation to adjacent or critical features of work or products.

C. Sheet size adequate for ENGINEER's review.

D. Corrections or comments made on shop drawings during ENGINEER's review shall not relieve the CONTRACTOR of requirements of the Contract Documents. The ENGINEER will check and review only for general conformance with the design concept of the project and general compliance with information given in the Contract Documents. The CONTRACTOR shall be responsible for: Conforming and correlating all quantities and dimensions; fabrication processes and techniques of construction; coordination of this work with that of all other trades; and the safe and

satisfactory performance of his work.

1.5 **PRODUCT DATA**

A. Submit only pages which are pertinent; mark each copy of standard printed data to identify pertinent products, referenced to specification section and article number. Show reference standards, performance characteristics, and capacities; wiring and piping diagrams and controls; component parts; finishes; dimensions, and required clearances.

B. Modify product data by deleting information which is not applicable to work or by marking each copy to identify pertinent data.

C. Supplement standard information, if necessary, to provide additional information applicable to project.

D. Provide manufacturer's preparation, assembly, installation, operation, maintenance and lubrication instructions.

1.6 **SAMPLES**

A. Submit one of each sample required by Contract Documents. Samples shall show the quality, type, range of color, finish and texture of the material.

1.7 **RESUBMITTALS**

A. Make any corrections or required changes in the submittals and resubmit under procedures specified for initial submittals.

1.8 **ENGINEER'S REVIEW**

A. Review submittals in accordance with acceptable schedule.

B. Affix stamp and initials or signature, and indicate requirements for resubmittal, or contract compliance.

1.9 **CONTRACTOR'S DUTIES**

A. Do not commence work requiring a shop drawing or other submittal until contract compliance has been issued.

PART 2 PRODUCTS Not used

PART 3 EXECUTION Not used

END OF SECTION

SECTION 01 35 10

ACCEPTANCE

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. ENGINEER's acceptance provisions.

B. Dispute resolution.

1.2 **DEFINITIONS**

A. Acceptance Testing: Testing to verify product or work complies with the Contract Documents. ENGINEER or Independent Testing Agency usually accomplishes the testing. The CONTRACTOR's control testing is sometimes used.

B. Independent Testing Agency: A testing agency NOT owned by affiliated with, or in any way associated with CONTRACTOR, or any of CONTRACTOR's Subcontractors and Suppliers, that is accredited by a national authority.

C. Lot: A lot is an isolated quantity of material produced essentially by the same process. Example: One day's production or 1500 tons.

D. Sample: A sample is one measurement or count that represents a part or all of the Lot. Example: Five density measurements that represent the day's production (or Lot) are five separate samples.

1.3 **ACCEPTANCE**

A. Acceptance of Product and Material: Based upon visual examination or physical testing. ENGINEER may have such examination or testing done by a separate agency.

B. Control Testing: ENGINEER retains right to accept or reject material or work based upon CONTRACTOR's control testing.

C. Acceptance of Lots:

1. Samples in a Lot will be randomly collected.
2. A Lot may be evaluated on the basis of fewer Samples when the minimum specified number of Samples cannot be collected.
3. A Lot will not be passed until ENGINEER accepts or passes all sub-lots.
4. A Lot with a defective sub-lot may be accepted at a reduced price if an appropriate pay factor is used to determine the price adjustment for the whole Lot. Do not apply pay factors only against defective sub-lots.

D. Submittals: Acceptance of submittal data supercedes specified criteria. Example; Mix design acceptance may alter specified mix design criteria.

1.4 **DEFECTIVE WORK**

A. Failure to detect any Defective Work or materials does not prevent later rejection when such defect is discovered, nor does it obligate ENGINEER for acceptance.

B. If work or material is obviously defective, it must be corrected even if it or they are not a part of a set of random Samples.

1.5 **DISPUTE RESOLUTION**

A. CONTRACTOR must provide basis of disagreement in writing to ENGINEER.

B. If CONTRACTOR desires to do any retesting, CONTRACTOR must submit a written plan to the ENGINEER for approval. Any testing done without ENGINEER's written approval will be rejected.

C. The retesting must be performed by a mutually acceptable Independent Testing Agency.

D. Retesting for acceptance will be done at no cost to the OWNER.

E. ENGINEER reserves the sole right not to utilize the retest results for evaluation of the Work.

PART 2 PRODUCTS Not Used

PART 3 EXECUTION Not Used

END OF SECTION

SECTION 01 42 19

REFERENCES

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Acronyms used in Contract Documents for reference standards.
B. Source of references.
C. Applicability of referenced standards.
D. Provision of referenced standards at site.

1.2 **QUALITY ASSURANCE**

A. For products or workmanship specified by trade association or government agency, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. The latest edition of the standards and their supplements referenced as a part of any section are incorporated in that section to the extent specified therein. In any case of conflict, the requirements of the section shall prevail. The date of the standard is that in effect as of the Bid date, or date of OWNER-CONTRACTOR Agreement when there are no bids, except when a date is specified.

C. When required by individual specification section, obtain copy of standard. Maintain copy at job site during submittals, planning, and progress of the specific work, until Substantial Completion.

1.3 **TRADE ASSOCIATIONS**

A. The following acronyms or abbreviations referenced in Contract Documents are subject to change, and are the best known at date of this book's publishing.

AAMA American Architectural Manufacturer's Association, 2700 River Road, Suite 118, Des Plaines, IL 60018.

AAN American Association of Nurserymen, Inc., 1250 I Street, NW., Suite 500, Washington DC 20005.

AASHTO American Association of State Highway and Transportation Officials, 444 North Capitol Street, NW, Washington, DC 20001.

ACI American Concrete Institute, Box 19150, Reford Station, Detroit, MI 48219.

ACPA American Concrete Pipe Association, 8320 Old Courthouse Rd., Vienna, VA 22180.

AGC Associated General Contractors of America,1957 E. Street, NW, Washington, DC 20006.

AI Asphalt Institute, Asphalt Institute Building, College Park, MD 20740.

AIA American Institute of Architects, 1735 New York Avenue, N.W., Washington, D.C. 20006-5292.

AISC American Institute of Steel Construction, 400 North. Michigan Ave., Chicago, IL 60611.

AMRL Aashto Materials Reference Library, 444 North Capitol Street, NW, Washington, DC 20001.

AISI American Iron Standards Institute, 1133 Fifteenth St., NW Washington, DC 20005.

ANSI American National Standards Institute, 1430 Broadway, New York, NY 10018.

APA American Plywood Association, P.O. Box 11700, Tacoma, WA 98411.

ASME American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017.

ASPA American Sod Producers Association, Association Building, Ninth and Minnesota, Hastings, NE 68901.

ASTM American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ATSSA American Traffic Safety Services Association, Inc., ATSSA Building, 5440 Jefferson Davis Highway, Fredericksburg, VA 22401.

AWPA American Wood-Preservers' Association, P.O. Box 849, Stevensville, MD 21666

AWPB American Wood-Preservers' Bureau,

P.O. Box 5283, Springfield, VA 22150. AWS American Welding Society, 350 Le Jeune Road, NW., Miami, FL 33125. AWWA American Water Works Association, 6666 West Quincy Avenue, Denver, CO 80235. BIA Brick Institute of America, 11490 Commerce Park Drive, Suite 300, Reston, VA 22091. CLFMI Chain Link Fence Manufacturers Institute, 1776 Massachusetts Avenue, N.W., Washington, DC 20036. CRSI Concrete Reinforcing Steel Institute, 933 Plum Grove Rd., Schaumburg, IL 60195. CSI The Construction Specifications Institute, 601 Madison Street, Alexandria, VA 22314-1791. EIA Electronic Industries Association, 2001 I Street, NW, Washington, DC 20037.

ICBO Workman Mill Road, Whittier, CA 90601. ICEA Insulated Cable Engineer’s Association, P.O. Box 440, South, Yarmouth, MA 02664

ICPI Interlocking Concrete Pavement Institute, 14444 Eye Street NW, Suite 700, Washington DC 20005-2210. www.icpi.org.

IMIAC International Masonry Industry All-Weather Council, International Masonry Institute, 823 15th Street, N.W, Washington, DC 20005.

IMSA International Municipal Signal Association, P.O. Box 539, 1115 N. Main St., Newark, NY 14513.

MBMA Metal Building Manufacturer's Association, 1230 Keith Building, Cleveland, OH 44115.

NAA National Arborist Association, 174 Rt. 101, Bedford, NH 03102.

NEC National Electric Code (from NFPA).

NEMA National Electrical Manufacturer's Association, 2101 L Street NW, Suite 300, Washington CD 20037.

N.F.P.A. National Forest Products Association, 1250 Connecticut Avenue, N.W., Washington, DC 20036.

NFPA National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

NPCA National Precast Concrete Association, 1033 N. Meridian Street, Suite 272, Indianapolis, IN 46290

NSF National Sanitation Foundation, P.O. Box 1468, 3475 Plymouth Road, Ann Arbor, MI 48106.

PCA Portland Cement Association, 5420 Old Orchard Road, Skokie, IL 60077.

PCI Prestressed Concrete Institute, 175 W. Jackson Blvd., Chicago, IL 60604.

PPI Plastic Pipe Institute. A Division of the Society of The Plastics Industry, Inc., 355 Lexington Avenue, New York, N.Y. 10017.

S.D.I. Steel Door Institute, (c/o A.P. Wherry and Assoc. Inc.) 712 Lakewood Center North, 14600 Detroit Ave, Cleveland, OH 44107.

SSPC Steel Structures Painting Council, 4400 Fifth Avenue, Pittsburgh, PA 15213.

UBC Uniform Building Code (from ICBO).

UL Underwriters' Laboratories, Inc., 333 Pfingsten Road, Northbrook, IL 60062.

WAQUC Western Alliance for Quality Transportation Construction.

WWPA Western Wood Products Association, 522 SW 5th Avenue, Yeon Building, Portland, OR 97204.

1.4 **GOVERNMENT AGENCIES**

A. The following acronyms or abbreviations indicate names of standards or specification producing agencies of the Federal and State Governments and are the best known at the publishing date of this document.

CE Corps of Engineers (U.S. Dept. of the Army) Chief of Engineers Referral,

Washington, DC 20314.

CS Commercial Standard (U.S. Department of Commerce), Government Printing Office, Washington DC 20402.

DOT Department of Transportation, Federal Highway Administration, 400 Seventh St., SW, Washington, DC 20590.

FS Federal Specification (General Services Administration), Specifications and Consumer Information, Distribution Section (WFSIS), 7th and D Street, SW, Washington, DC 20406.

MIL Military Standardization Documents (U.S. Dept. of Defence) Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

NBS National Bureau of Standards (U.S. Department of Commerce), Gaithersburg, ND 20234.

PS Product Standard of NBS (U.S. Department of Commerce), Government Printing Office, Washington, DC 20402.

REA Rural Electrification Administration (U.S. Department of Agriculture) 14th St. and Independence Ave., SW, Washington, DC 20250.

UDOT Utah Department of Transportation, 4501 South 2700 West Street, Salt Lake City, UT 84119.

USPS U.S. Postal Service, 475 L'Enfant Plaza, SW, Washington, DC 20260.

PART 2 PRODUCTS Not Used

PART 3 EXECUTION Not Used

END OF SECTION

SECTION 01 43 00

QUALITY ASSURANCE

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. CONTRACTOR quality assurance responsibilities.

1.2 **WORKMANSHIP**

A. Employ workers, Subcontractors and Suppliers who can produce the specified quality.

B. Supervise and manage workmanship and site conditions so work complies with Contract Document.

C. Comply with industry standards except where more restrictive tolerances, specified requirements, or precise workmanship is required.

1.3 **INSTALLER**

A. Qualifications: Employ installers with at least 3 years of successful installation experience on work similar to that required for Project.

B. Certificates: When required or request by ENGINEER, submit copy of installer's certifications issued by certification agency.

C. Field Services;

1. Examine areas and conditions under which materials and products are to be installed.
2. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to installer.
3. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration and racking.
4. Make new finishes match adjacent or old finishes.

1.4 **MANUFACTURER**

A. Qualifications: Employ firms regularly engaged in manufacture of materials and products of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Instructions: When required in individual section, submit manufacturer's instructions in the quantity required for product data, delivery, handling, storage, assembly, installation, start-up, adjusting, balancing, and finishing as appropriate.

1. Should instructions conflict with Contract Documents, request clarification before proceeding.
2. Require compliance with instructions in full detail, including each step in sequence.

C. Certificates: When required or request by ENGINEER, prove that manufacturer's product meets or exceeds specified requirements.

D. Field Services: Provide qualified representative to observe field conditions, conditions of surfaces and installation, quality of workmanship and start-up of equipment. Test, adjust, and balance equipment. Make written report of observations and recommendations to ENGINEER.

1.5 **MOCK-UPS**

A. Erect field samples and mock-ups in location(s) acceptable to ENGINEER.

B. Assemble and erect complete, with specified attachment and anchorage devices, flashings, seals, finishes, and similar items.

PART 2 PRODUCTS Not used

PART 3 EXECUTION Not used

END OF SECTION

SECTION 01 43 40

RESIDENT SUPERINTENDENT

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Minimum qualifications.

B. Duties in general.

1.2 **QUALIFICATIONS**

A. Fluent in English.

B. Completed at least three (3) projects of similar size and nature as the one specified in the Contract Documents.

C. Capable and authorized to take prompt corrective measures to protect the environment and public health, and to protect the health and safety of workers.

D. Authorized to approve Change Orders.

1.3 **DUTIES IN GENERAL**

A. On-site Presence: Be on-site during work activity.

B. English Proficiency: Keep a person at each work location who is fluent in English who can respond to the concerns of anybody affected by construction.

C. Contract Documents:

1. Know the content and intent of the Contract Documents.
2. Keep on-site all construction Plans; Project Manual; Plans or Specifications associated with updates and Change Orders, Submittals; traffic control plans; copies of the Standard Plans and Standard Specifications.

D. Labor: Provide adequate labor to operate construction equipment, finish concrete, perform land survey work, or to monitor or adjust traffic and pedestrian barricades.

E. Subcontractors and Suppliers: Direct means and methods of work so their work co complies with Plans and Specifications.

F. Safety and Protection: Enforce the work site safety plan. Protect ENGINEER's personnel, the general public and the environment per state or federal Laws and Regulations.

G. Quality Assurance: When materials and installed work require laboratory testing, verify required laboratory personnel are present to do the tests and the tests are made per industry standard.

H. Conflicts: Notify ENGINEER of any drawing, specification, or design conflict so it can be resolved before construction is adversely affected. Recommend any desirable changes to ENGINEER.

1.4 **CONTRACTOR's DUTIES**

A. Empower Resident Superintendent with all necessary authority, equipment, product, labor and budget to prosecute the Work within the Contract Time.

B. Suspend Work if Resident Superintendent is not on-site or if any of these section requirements are not being met. Contract Time shall continue to run.

C. Replace the Resident Superintendent with one acceptable to the ENGINEER when directed by the ENGINEER.

PART 2 PRODUCTS Not Used

PART 3 EXECUTION Not Used

END OF SECTION

SECTION 01 45 00

QUALITY CONTROL

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. CONTRACTOR quality control responsibilities.

1.2 **QUALITY ASSURANCE**

A. Employ an agency or staff to assure installed product and materials comply with Contract Documents, and to assure inspections, tests, and other services comply with industry standards.

B. Use an AMRL certified laboratory that has WAQTC certified personnel.

C. When requested by ENGINEER, provide a professional opinion from a testing Agency concerning test results and quality of work covered by testing performed.

D. Do more testing, if, in ENGINEER's opinion, work is not being adequately controlled.

1.4 **TESTING AGENCY**

A. Provide sufficient personnel and cooperate with ENGINEER and CONTRACTOR in performing testing service.

B. Secure samples using procedures specified in the applicable testing code.

C. Perform product testing in accordance with applicable sections of the Contract Documents.

D. Correlate tests with ENGINEER's acceptance tests.

E. When an out-of-tolerance condition exists, perform additional control testing until tolerance is attained.

F. Report report any non-compliance of materials and mixes to CONTRACTOR and ENGINEER immediately.

1.5 **SUBMITTALS – CONTRACTOR**

A. Before Construction: Identify.

1. Name, address and telephone number of testing agency.
2. Person whom agency has charged with engineering managerial responsibility.
3. Licensed professional for testing agency who is to review services.
4. Names and levels of certification and years of experience of testing agency's laboratory and field technicians.

B. During Construction: Submit quality control test data requested by ENGINEER to demonstrate work performed complies with Contract Documents.

1.6 **SUBMITTALS – TESTING AGENCY**

A. During Construction: Submit field test results immediately to ENGINEER and CONTRACTOR or not later than day of test. Submit laboratory test results within 48 hours of determination.

B. After Construction: Submit a final summary report in tabular form. Show each failed test and its corresponding passing test.

C. Reports: Include on all reports. Project title, number and date. Date, time and location of test. . Name and address of material Supplier.. Identification of product being tested and type of test. Testing results and interpretation of results. Name of technician(s) who sampled and who performed test.

1.7 **LIMITS ON TESTING AGENCY**

A. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.

B. Agency may not suspend work.

C. Agency has no authority to determine acceptance for ENGINEER.

D. Samples must be collected and secured only by the testing agency.

PART 2 PRODUCTS

3.1 **MATERIALS**

A. Material furnished from sources that have been found satisfactory under OWNER's or ENGINEER's normal testing and sampling procedures may be used in the Work.

B. Materials that are supported with a Supplier's certificate of compliance may be used in the Work. Certificate must be in possession of CONTRACTOR for review by ENGINEER prior to use.

PART 3 EXECUTION Not Used

END OF SECTION

SECTION 01 55 26

TRAFFIC CONTROL

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Traffic control requirements.

1.2 **REFERENCES**

A. ASTM D 4956: Retroreflective Sheeting for Traffic Control.

B. Instructions to Flaggers. Publication of UDOT.

C. Work Zone Traffic Control Guide: Publication of the Utah LTAP Center.

D. MUTCD: Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD).

1.3 **SUBMITTALS**

A. Traffic control plan within 10 days of receiving the Notice of Intent to Award.

B. Flagger or traffic control technician certificates when requested by ENGINEER.

1.4 **TRAFFIC CONTROL PLAN**

A. Create a traffic control plan using the following resources. Resolve discrepancies between resources in descending order shown.

1. MUTCD.
2. Work Zone Traffic Control Guide.
3. ATSSA.

B. Include the following documentation as part of the traffic control plan.

1. Written description of phasing.
2. Drawing showing phasing (if required for clarity).
3. Drawing showing placement of traffic control devices.

C. Show how to move pedestrians through or around the Work site.

D. Show how to handle signalized intersections.

E. Meet grade, slope and protection requirement of the Americans with Disabilities Act (ADA).

1.5 **TRAFFIC CONTROL TECHNICIAN**

A. Certified by ATSSA or AGC.

1.6 **FLAGGER**

A. Certified by ATSSA, AGC or UDOT.

B. Equipment:

1. 24” x 24” “Stop/Slow” sign.
2. 6” to 8” long red wand for night flagging.
3. Light plant for night flagging.

C. Clothing:

1. Clothed; full length pants and long or short sleeved shirt.
2. Hard toed shoes.
3. Orange, red-orange hardhat and vest.
4. Night clothing to be reflectorized.

PART 2 PRODUCTS

2.1 **PAVEMENT MARKINGS, SIGNS, BARRICADES**

A. MUTCH.

B. Channelizing Devices: Crash worthy plastic cones, drums and barricades.

C. Reflective Sheeting: ASTM D 4956.

D. Pavement Markings: Section 32 17 23.

PART 3 EXECUTION

3.1 **FLAGGING**

A. MUTCD.

3.2 **TRAFFIC CONTROL DEVICES**

A. Install before work activities begin.

B. Maintain to ensure proper, continuous function.

C. Remove when no longer needed.

END OF SECTION

SECTION 01 57 00

TEMPORARY CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Requirements for controlling surface and subsurface environmental conditions at the construction site, and related areas under the CONTRACTOR's responsibility.

B. Requirements for removal of physical evidence of temporary controls upon completion of the Work.

PART 2 PRODUCTS

2.1 MATERIALS

A. Temporary Materials: CONTRACTOR's choice.

PART 3 EXECUTION

3.1 NOISE CONTROL

A. Use equipment that is equipped with noise attenuation devises. Comply with local Laws and Regulations.

B. Control construction noise in residential areas from 9:00 pm to 7:00 am.

3.2 DUST AND MUD CONTROL

A. Provide suitable equipment to control dust or air pollution caused by construction operations.

B. Provide suitable mud and dirt containment, so Work site, access roadways and properties adjacent to the Work site are kept clean.

3.3 SURFACE WATER CONTROL

A. Control all on-site surface water. Provide proper drainage so flooding of the site or adjacent property does not occur.

B. Provide and maintain ample means and devices with which to promptly remove and properly dispose of all water entering the site.

C. Immediately prior to suspension of construction operations for any reason, provide proper and necessary drainage of Work site area.

D. Provide berms or channels as necessary to prevent flooding or saturation of Subgrade. Promptly remove all water collecting in depressions.

E. Dispose of water in a manner that will not cause damage to adjacent areas or facilities.

3.4 GROUND WATER CONTROL

A. Provide a dewatering system sufficient to maintain Excavations and foundations dry and free of water on a 24 hour basis.

B. Notify ENGINEER, in writing, if groundwater conditions differ from conditions shown in the Bidding Documents, or in any soil test data that has been supplied.

C. Remove all dewatering facilities when no longer required.

D. Dispose of water in a manner that will not cause damage to adjacent areas or facilities.

3.5 POLLUTION CONTROL

A. Soil: Prevent contamination of soil from discharge of noxious substances (including engine oils, fuels, lubricants, etc.) during construction operations. Excavate and legally dispose of any such contaminated soil off-site, and replace with acceptable compacted fill and topsoil.

B. Water: Prevent disposal of wastes, effluent, chemicals, or other such substances adjacent to or into streams, waterways, sanitary sewers, storm drains, or public waterways. Perform any emergency measures that may be required to contain any spillage.

C. Air: Control atmospheric pollutants.

3.6 EROSION CONTROL

A. Use measures such as berms, dikes, dams, sediment basins, fiber mat netting, gravel, mulches, slopes, drains and other erosion control devices or methods to prevent erosion and sedimentation.

B. Provide construction and earthwork methods which control surface drainage from cut, fill, borrow, and waste disposal areas, to prevent erosion and sedimentation.

C. Inspect earthwork during execution to detect any evidence of the start of erosion. Apply corrective measures as required.

END OF SECTION

SECTION 01 64 00

OWNER-FURNISHED PRODUCTS

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. OWNER and CONTRACTOR responsibilities for items furnished by the OWNER.

1.2 **OWNER'S RESPONSIBILITIES**

A. Arrange for delivery of shop drawings, product data, samples, manufacturer's instructions, and certificates to CONTRACTOR.

B. Deliver Supplier's bill of materials to CONTRACTOR.

C. Arrange and pay for delivery to site in accordance with CONTRACTOR's progress schedule.

D. Inspect deliveries jointly with CONTRACTOR.

E. Submit claims for transportation damage.

F. Arrange for replacement of damaged, defective, or missing items.

G. Arrange for manufacturer's field services, Arrange for and deliver manufacturer's warranties and bonds to CONTRACTOR.

1.3 **CONTRACTOR'S RESPONSIBILITIES**

A. Designate submittal and delivery dates for each product in a schedule of OWNER Furnished items. Submit this schedule concurrently with the first submission of the progress schedule.

B. Review shop drawings, product data, samples, and other submittals.

C. Inspect deliveries jointly with ENGINEER, record shortages, and damaged or defective items.

D. Handle products at site, including uncrating and storage.

E. Protect products from damage, and from exposure to element.

F. Assemble, install, connect and adjust products.

G. Arrange for installation Inspections required by public authorities.

H. Repair or replace items damaged or lost.

1.4 **CONSTRUCTION DELAY**

A. If OWNER furnished items may cause delay in the critical path of progress

schedule notify ENGINEER in writing. Only changes to the critical path will be evidence as changes in the Contract Time.

PART 2 PRODUCTS Not Used

PART 3 EXECUTION Not Used

END OF SECTION

SECTION 01 65 00

PRODUCT DELIVERY AND HANDLING

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Basic requirements for product delivery and handling on site.

1.2 **DELIVERY**

A. Arrange for delivery of products in accordance with progress schedule to facilitate instruction prior to installation.

B. Coordinate deliveries to avoid conflict with work and conditions at site and:

1. Work of separate contractors, or OWNER.
2. Limitations of storage space.
3. OWNER's use of premises.

C. Deliver products in undamaged condition in original containers or packaging, with identifying labels for handling, storing, unpacking, protecting and installing intact and legible.

D. Partial deliveries of component parts of equipment shall be clearly marked to identify the equipment, to permit easy accumulation of parts and to facilitate assembly.

E. Immediately upon delivery, inspect shipment to determine:

1. Product complies with requirements of Contract Document reviewed submittals.
2. Quantities are correct.
3. Containers and packages are intact, labels are legible.
4. Products are properly protected and undamaged.

1.3 **PRODUCT HANDLING**

A. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.

B. Coordinate delivery with installation time to ensure minimum holding time for items that are hazardous, easily damaged, or sensitive to deterioration, theft and other losses.

C. Handle products to prevent bending or over-stressing.

D. Lift heavy components at designated lifting points.

E. Discard damaged products.

1.4 **ACCESS**

A. Identify access to the CONTRACTOR's work and office area by use of signs so that agents, delivery trucks and other parties desiring to contact the CONTRACTOR may do so.

B. In security zones, prevent unauthorized personnel from proceeding outside of CONTRACTOR's work and office areas.

PART 2 PRODUCTS Not Used

PART 3 EXECUTION Not Used

END OF SECTION

SECTION 01 66 00

PRODUCT STORAGE AND PROTECTION

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Storage, handling and protection of products to be incorporated in the Work.

1.2 **SUBMITTALS**

A. Submit a copy of written permission if property other than OWNER's is used to store materials or equipment.

1.3 **STORAGE**

A. Store products immediately on delivery, per manufacturer's instructions, with seals and labels intact and legible.

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

1. Maintain temperatures within ranges required by manufacturer's instructions.
2. Provide humidity control for sensitive products, as required by manufacturer's instructions.
3. Store unpacked products on shelves, in bins or in neat piles, accessible for Inspection.

C. Provide substantial platforms, blocking or skids to support fabricated products above ground, to prevent soiling or staining. Cover products, subject to discoloration or deterioration from exposure to the elements, with impervious sheet coverings. Provide adequate ventilation to avoid condensation.

D. Store loose granular materials on solid surfaces to prevent mixing with foreign matter. Provide surface drainage to prevent flooding or ponding of rainwater. Prevent mixing with refuse or injurious materials. Do not store construction materials and equipment in municipal rights-of-way for more than 5 days.

E. Arrange storage in manner to provide easy access for Inspection.

1.4 **STORAGE ON SIDEWALK, CURB AND GUTTER**

A. Do not remove, block, or otherwise render sidewalks unusable by either the storage of construction equipment or materials or construction procedures used, unless a safe, usable, alternate walkway at least 4 feet wide is provided.

B. Maintain curb and gutter clean and clear of debris, dirt, or excavated materials at all times.

1.5 **MAINTENANCE OF STORAGE**

A. Maintain periodic system of Inspection of stored products on scheduled basis to assure that:

1. State of storage facilities is adequate to provide required conditions.
2. Required environmental conditions are maintained.
3. Surfaces of products exposed to elements are not adversely affected.

B. Any weathering of products, coatings and finishes is not acceptable.

1.6 **STORAGE AREA RESTORATION**

A. Remove all plant, equipment and stockpiles from the Work.

B. Restore all storage areas and service roads to prior condition without any additional cost to OWNER.

1.7 **PROTECTION**

A. Installed Product: Provide protection of installed products to prevent damage from subsequent operations. Remove when no longer needed, prior to completion and acceptance of Work.

B. Finished Surfaces: Provide coverings to protect finished surfaces from damage.

1. Cover projections, wall corners, jambs, sills and soffits of openings, in areas used for traffic and for passage of products in subsequent work.
2. Protect finished floors and stairs from dirt and damage.
   a. In areas subject to foot traffic, secure heavy paper, sheet goods, or other materials in place.
   b. For movement of heavy products, lay planking or similar materials in place.
   c. For storage of products, lay tight wood sheathing in place.
   d. Cover walls and floor of elevator cars, and unprotected surfaces of car doors when used by construction personnel.

C. Waterproofed and roofed surfaces:

1. Prohibit use of surfaces for traffic of any kind, and for storage of any products.
2. When some activity must take place in order to carry out the Work, obtain recommendations of Supplier and installer for protection of surface.
   a. Install recommended protection and remove on completion of that activity.
   b. Restrict use of adjacent unprotected areas.

D. Security: Provide security for materials, equipment and tools. OWNER will not protect Work from vandalism.

1.8 **PROTECTION OF LAWNS AND LANDSCAPING**

A. Protect planted lawn and landscaped areas from pedestrian

and vehicular traffic.

PART 2 PRODUCTS Not Used

PART 3 EXECUTION Not Used

END OF SECTION

SECTION 01 71 13

MOBILIZATION AND DEMOBILIZATION

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Mobilization and demobilization requirements.

1.2 **DEFINITIONS**

A. Mobilization includes bringing all necessary equipment to the site to do the Work. It also includes all labor, materials, and equipment to set up temporary offices, buildings, facilities, signs, and utilities.

B. Demobilization includes removing all construction equipment and debris so site is left clean.

1.3 **TEMPORARY FACILITIES**

A. Field Office: CONTRACTOR's choice.

B. Utilities: Provide power, telephone, water, storm and sanitary facilities, and all other temporary utilities required.

C. Security and Protection: Construct and maintain temporary fencing for the protection of materials, tools, and equipment. Obtain prior approval for all fence locations.

D. Construction and Support: Set up and maintain in a neat and orderly manner temporary roads and paving, dewatering facilities, enclosures, identification signs and bulletin boards, waste disposal and temporary heat. Provide and maintain temporary all weather pedestrian walk ways and road detours.

E. Invert Cover: Install covers as shown in Standard Plans or Drawings. Installation must be tight so no debris can by-pass the cover and enter the pipes below.

PART 2 PRODUCTS

2.1 **MATERIALS**

A. Temporary Materials: CONTRACTOR's choice.

PART 3 EXECUTION

3.1 **INSTALLATIONS**

A. Relocate and modify temporary facilities as required.

B. Install temporary utility service or connect to existing service.

C. Locate field offices, storage sheds, sanitary facilities and other temporary construction and support facilities for easy access. Use of gasoline-burning, open flame, or salamander type heating units is prohibited.

D. Use local standards and codes for erection of adequate fences and barricades. Maintain all signing, barricades, fencing, drainage, and other items as required to protect public and private property from damage caused by construction operations.

E. Coordinate location of storage areas to avoid interference with drainage, traffic, or private property.

F. Provide and maintain all temporary signage required by the Work.

3.2 **REMOVALS**

A. Completely remove temporary materials and equipment;

1. When construction needs can be met because of permanent installation.
2. At completion of the Work.

B. Clean or repair damage caused by installation or use of temporary facilities.

C. Restore areas to original or to specified conditions at completion of the Work

END OF SECTION

SECTION 01 73 29

CUTTING AND PATCHING

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Cutting and patching to:

1. Fit the several parts together, to integrate with other work.
2. Uncover work to install work done out of sequence.
3. Remove and replace defective and non-conforming work.
4. Remove samples of installed work for testing.
5. Provide openings in non-structural elements for penetrations of mechanical and electrical work.

1.2 **SUBMITTALS**

A. Submit written request in advance of cutting and patching that affects:

1. Structural integrity of any element of Project.
2. Integrity of weather-exposed or moisture-resistant element.
3. Efficiency, maintenance, or safety of any operational element.
4. Visual qualities of sight-exposed elements.
5. Work of OWNER or separate contractor.

B. Include in request:

1. Identification of Project.
2. Location and description of affected work.
3. Necessity for cutting and patching.
4. Description of proposed work, and products to be used.
5. Alternatives to cutting and patching.
6. Effect on work of OWNER or separate contractor.
7. Written permission of affected separate contractor.
8. Date and time work will be executed.

PART 2 PRODUCTS

2.1 **MATERIALS**

A. Those required for original installation.

B. For any change in materials, submit request for Substitution, Section 01 25 00 requirements.

PART 3 EXECUTION

3.1 **INSPECTION**

A. Inspect existing conditions, including elements subject to damage or movement during modifications to completed work.

B. After uncovering, inspect conditions affecting performance of work.

C. Beginning of Modification work constitutes acceptance of existing conditions.

3.2 **PREPARATION**

A. Provide supports to assure structural integrity of surroundings, devices and methods to protect other portions of work from damage.

B. Provide protection from elements for areas which may be exposed by work.

3.3 **PERFORMANCE**

A. Execute work by methods to avoid damage to existing structures and other work, and which will provide proper surfaces to receive patching and finishing.

B. Employ original installer if possible to be responsible for modification work on weather-exposed and moisture-resistant elements, and exposed to view surfaces.

C. Restore Work with new products per requirements of Contract Documents.

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

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

END OF SECTION

SECTION 01 74 13

PROGRESS CLEANING PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Cleaning and disposal of waste materials, debris, and rubbish.

B. Cleaning of Work prior to Final Inspection.

1.2 **SUBMITTALS**

A. Prior to Project Closeout: Certificate of disposal of Hazardous Waste if applicable.

1.3 **JOB CONDITIONS**

A.On Site Burning: Not permitted.

PART 2 PRODUCTS

2.1 **CLEANING MATERIALS**

A. Use only materials which will not create hazards to health or property, and which will not damage surfaces.

B. Use only cleaning materials recommended by manufacturer of item being cleaned.

PART 3 EXECUTION

3.1 **CLEANING DURING CONSTRUCTION**

A. Initiate and maintain a specific cleaning program to prevent accumulation of debris. Maintain areas under CONTRACTOR'S control free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Provide covered containers for deposit of debris and rubbish.

C. Periodically clean interior areas to provide suitable conditions for finish work.

D. Remove debris and rubbish from closed or remote spaces prior to closing the space.

E. Broom clean interior areas prior to start of surface finishing, and continue cleaning on an as-needed basis.

F. Control cleaning operations so that dust and other particulate will not adhere to wet or newly-coated surfaces.

3.2 **DISPOSAL DURING CONSTRUCTION**

A. Regularly remove and legally dispose of waste materials, debris, and rubbish from

site.

B. Provide additional collections and disposal of debris whenever the periodic schedule is inadequate to prevent accumulation.

3.3 **CLEANING PRIOR TO FINAL INSPECTION**

A. Site:

1. Clean exposed-to-view surfaces.
2. Remove waste, debris, and surplus materials from site.
3. Clean grounds; paved areas and sweep clean.
4. Rake clean other surfaces.

B. Building:

1. Clean interior and exterior exposed-to-view surfaces.
2. Remove temporary protection and labels not required to remain.
3. Clean finishes free of dust, stains, films and other foreign substances.
4. Clean transparent and glossy materials to a polished condition. Polish reflective surfaces to a clear shine.
5. Vacuum clean carpeted and similar soft surfaces.
6. Clean resilient and hard-surface floors.
7. Clean surfaces of equipment; remove excess lubrication.
8. Clean plumbing fixtures to a sanitary condition.
9. Clean permanent filters of ventilating equipment and replace disposable filters when units have been operated during construction; in addition, clean ducts, blowers, and coils when units have been operated without filters during construction.
10. Clean lighting fixtures and lamps.
11. Continue cleaning until acceptance.
12. Remove waste and debris from roofs, gutters, area ways, and drainage systems.

END OF SECTION

SECTION 01 75 16

STARTUP PROCEDURES

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Procedural requirements for start-up, testing, adjusting and balancing systems.

1.2 **COORDINATION**

A. Coordinate services with the work of the various trades to ensure rapid completion of the services.

B. Report any deficiencies noted during performance of services to allow immediate corrective action.

1.3 **JOB CONDITIONS**

A. Prior to start of testing, adjusting and balancing, verify required job conditions.

1. Systems installation is complete and in full operation.
2. Conditions are within a reasonable range relative to design conditions.
3. Special equipment such as electronic equipment are in full operation.

B. Verify that special product or equipment requirements for preparation, testing and balancing have been met for elements of each of the systems that require testing.

PART 2 PRODUCTS

2.1 **MATERIALS**

A. Provide material required to perform start-up of each respective item of equipment and system prior to beginning of test, adjust and balance procedures.

2.2 **VERIFICATION OF PERFORMANCE**

A. Provide an independent certifying association to provide information and assistance required to adjust and balance system.

PART 3 EXECUTION

3.1 **START-UP**

A. Start up completed facility with appropriate personnel present.

B. Perform specified services and if necessary employ and pay for a manufacturer

approved organization to perform specified services.

C. Provide appropriate utilities and instrumentation required for starting, testing, adjusting and balancing operations.

1. Make instruments available to ENGINEER to facilitate spot checks during testing.
2. Retain possession of instruments, remove from site at completion of services.

D. Comply fully with the procedural standards of the certifying association under whose standards service will be performed.

1. Execute each step of the prescribed procedure without omission.
2. Accurately record the required data.

END OF SECTION

SECTION 01 78 23

OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Preparation of operation and maintenance manual to include compilation of product data, related information, and instructions for systems and equipment.

B. Instruction of OWNER'S personnel in maintenance of products and in operation of equipment and systems

C. Schedule of required submittals.

1.2 **FORMAT**

A. Prepare data in the form of an instructional manual.

B. Consult with ENGINEER to determine format requirements.

1.3 **CONTENTS, EACH VOLUME**

A. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of ENGINEER and CONTRACTOR with name of responsible parties, Schedule of products and systems, indexed to content of the volume.

B. For Each Product or System: List names, addresses and telephone numbers of Subcontractors and Suppliers, including local source of supplies and replacement parts.

C. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.

D. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Record Documents as maintenance drawings.

E. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

F. Guaranties and Warranties: Copies of each showing dates of expiration.

1.4 **MANUAL FOR EQUIPMENT AND SYSTEMS**

A. Each Item of Equipment and Each System: Include description of unit or system, and component parts. Give function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

B. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications.

C. Include as installed color coded wiring diagram.

D. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequence. Include regulation, control, stopping, shutdown and emergency instructions. Include summer, winter, and any special operating instructions.

E. Maintenance Requirements: Include routine procedures and guide for troubleshooting; disassembly, repair and reassembly instructions: and alignment, adjusting, balancing, and checking instructions.

F. Provide servicing and lubrication schedule, and list of lubricants required.

G. Include manufacturer's printed operation and maintenance instructions.

H. Include sequence of operation by controls manufacturer.

I. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

J. Provide as-installed control diagrams by controls manufacturer.

K. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

L. Include test and balancing reports.

M. Additional Requirements: As specified in individual sections.

1.5 **INSTRUCTION OF OWNER'S PERSONNEL**

A. Prior to Substantial Completion, instruct OWNER'S designated personnel in operation, adjustment, and maintenance of products, equipment, and systems, at agreed upon times.

B. Use operation and maintenance manuals as basis of instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

C. Prepare and insert additional data in Operating and Maintenance Manual when need for such data becomes apparent during instruction.

1.6 **SUBMITTALS**

A. Submit 2 copies of preliminary draft or proposed formats and outlines of contents before start of Work.

B. For equipment, or component parts of equipment put into service during construction and operated by OWNER, submit documents within 10 days after acceptance.

C. Submit 1 copy of completed volumes in final form 15 days prior to Final Inspection. Revise content of documents as required prior to final submittal.

D. Submit 6 copies of revised volumes of data in final form within 14 calendar days after complete system start-up.

PART 2 PRODUCTS Not Used

PART 3 PRODUCTS Not Used

END OF SECTION

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Requirements for collecting, maintaining, updating, and submitting Record Documents.

1.2 **DEFINITIONS**

A. Record Documents: Those documents maintained and annotated by CONTRACTOR during construction for the purpose of recording the "as built" condition of the Work.

1.3 **CONSTRUCTION PHOTOGRAPHS**

A. Provide photographs when specified in the Contract Documents starting with a series of photographs before the start of any physical construction, and continuing for as long as the Work progresses.

1. On 5 inches x 7 inches color prints or size approved by ENGINEER showing the regular progress of the Work, provide not less than 12 exposures of different subjects or angles of view each time from different locations in the Project area at intervals not exceeding one month.
2. On each print indicate the date, job title, photograph identification, and direction the camera was facing.
3. With each request for payment.
4. Upon completion of the Work, submit all negatives. ENGINEER may request an additional 10 exposures of the Work.

B. Secure ENGINEER'S approval if a video tape is to be substituted for the photograph prints.

1.4 **DOCUMENTS ON SITE**

A. Keep at job site 1 copy of each of the following, if issued for the Work.

1. Contract Drawings.
2. Project Manual.
3. Addenda.
4. Reviewed Shop Drawings, Product Data and Samples.
5. Modifications to the Contract Documents.
6. Field test records.

7. Inspection certificates.
8. Manufacturer's certificates.
9. Survey documentation.

B. Do not use Record Documents for construction purposes.

C. Store Record Documents in a location, apart from documents used for construction.

D. Maintain Record Documents in a clean, dry, legible condition.

E. Provide adequate files and racks for storage of Record Documents that will allow ready access for review and updating.

F. Make Record Documents available at all times for review and Inspection by ENGINEER.

1.5 **MARKING DEVICES**

A. Red colored waterproof for all marking unless requested otherwise.

1.6 **RECORDING**

A. Clearly and legibly label each document "PROJECT RECORD".

B. Number Record Documents in a manner which will allow ready retrieval of documents and allow indexing of documents for submittal to ENGINEER.

C. Update Record Documents as work occurs to show the current status of the Work.

D. Do not permanently cover or conceal any work until all required information Has been recorded on the Record Documents.

E. Contract Drawings: Legibly mark contract Drawings to record following actual construction information.

1. Measured depths of various elements of foundation or finish grading in relation to finish floor datum or other permanent benchmark.
2. Measured horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.
3. Measured location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of construction.
4. Field changes of dimension and detail.
5. Changes made by contract Modifications.
6. Details not contained in original contract Drawings.

F. Project Manual and Addenda: Legibly update each to record:

1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.
2. Changes made by contract Modifications.
3. Other technical matters and details included in the Work, but not originally specified.

G. Shop Drawings: Maintain reviewed Shop Drawings as Record Documents; legibly

annotate drawings to record changes made to Shop Drawings.

H. Product Data and Samples: Maintain reviewed product data and samples as Record Documents; update and document any variations from the reviewed product data and samples after acceptance.

1.7 **SUBMITTAL OF DOCUMENTS**

A. At the completion of the Work, submit all Record Documents.

B. Accompany the submittal with a transmittal letter, in duplicate, containing:

1. Submittal date.
2. Project title and number.
3. CONTRACTOR'S name and address.
4. Title and number of each Record Document.
5. Certification that each document as submitted is complete and accurate.
6. Signature of CONTRACTOR, or CONTRACTOR'S authorized representative.

PART 2 PRODUCTS Not Used

PART 3 EXECUTION Not Used

END OF SECTION

SECTION 01 78 50

CLOSEOUT PROCEDURES

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Administrative provisions for Substantial Completion, Final Inspection and acceptance.

1.2 **REFERENCES**

A. American Public Works Associations (Utah Chapter).

1. Plan 110: Arrow Diagram for Project Close-Out.

1.3 **SUBSTANTIAL COMPLETION**

A. When Work, or designated portion thereof, is Substantially Complete, submit written notice with list of any outstanding items to be completed or corrected.

B. After receipt of CONTRACTOR'S certification of Work Completion, ENGINEER will make Final Inspection to determine status of completion.

C. Should Work not be Substantially Complete, remedy deficiencies and resubmit a written notice.

1.4 **ACCEPTANCE OF WORK**

A. Protect Work until it is accepted.

B. Neither ENGINEER'S determination that Work is complete, nor acceptance thereof by the OWNER, shall operate as a bar to claim against the CONTRACTOR under the provisions of the Contract Documents.

1.5 **CLOSEOUT SUBMITTALS**

A. Record Documents: Section 01 78 39.

B. Operation and maintenance data: Section 01 78 23.

C. Evidence of payment to Subcontractors and Suppliers: Document 00 72 00, Final Application for Payment.

D. Final Summary Report of CONTRACTOR’S testing agency: Section 01 45 00 requirements.

1.6 **CLOSEOUT SCHEDULE**

A. Plan 110.

PART 2 PRODUCTS Not Used

PART 3 EXECUTION Not Used

END OF SECTION

SECTION 02 41 14

PAVEMENT REMOVAL

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Removal of roadway Pavement.

B. Milling roadway Pavement.

C. Removal of curb, gutter, sidewalk, Driveway Approach, waterway, or similar flatwork.

D. Disposal of removed materials.

1.2 **RELATED WORK**

A. Demolition of structures and utilities.

1.3 **DEFINITIONS**

A. ADA: Americans with Disabilities Act.

1.4 **SUBMITTALS**

A. Traffic control plan, Section 01 55 26.

1.5 **SITE CONDITIONS**

A. Control dust, Section 01 57 00.

PART 2 PRODUCTS Not Used

PART 3 EXECUTION

3.1 **PREPARATION**

A. General

1. Coordinate utility location, Section 01 31 13.
2. Preserve all active utilities.
3. Notify neighborhood of day and time of operation.
4. Make sure invert covers are properly installed in storm drain and sanitary sewer systems, Section 01 71 13.
5. Mark existing utilities on redline drawings.

B. Traffic Control: Provide worker and public safety, Section 01 55 26.

C. Tree Roots:

1. Avoid or minimize damage to tree roots. Roots provide anchorage, storage of energy, and absorption and conduction of water and mineral elements. Loss of root connection affects health and stability of tree and safety of people and property.
2. Provide certified arborist observation of root cuts larger than 4 inches diameter. Notify ENGINEER of such root cut.

D. Existing Surfaces:

1. Do not damage adjacent concrete surfaces that are not scheduled for removal.
2. Use rubber cleats or Pavement pads when operating backhoes, outriggers, track equipment, or any other equipment on or crossing paved surfaces.
3. Restore paved surfaces that are damaged by removal operations at no additional cost to the OWNER. Match the existing Pavement surface plus 1 inch.

3.2 SAW-CUT PEDESTRIAN TRIP HAZARDS

A. Make saw cuts 1:8 slope measured to grade.

B. Eliminate trip hazards across the full width of the hazard.

3.3 SAW-CUT CURB HORIZONTALLY

A. Saw cut curbs for ADA ramps at 1:12 slope. No trip hazard at gutter flow line.

B. Saw cut curbs for flares:

1. 1:4 slope measured to grade, or
2. 1:12 slope measured horizontally when complying with ADA.

3.4 REMOVE PORTLAND CEMENT CONCRETE

A. Remove concrete to the nearest expansion joint or vertical saw cut.

B. Make concrete cuts straight, vertical to the surface, true, full depth.

C. DO NOT use machine mounted impact hammers.

3.5 REMOVE ASPHALT CONCRETE

A. Saw cut full depth and remove Pavement.

B. When asphalt concrete overlays Portland cement concrete Pavements do not use a machine mounted impact hammer.

3.6 MILLING

A. Machine:

1. Equipped to prevent air pollution.
2. Equipped with a system to control slope of mill cut.

B. Tolerances:

1. Milling Depth: As indicated plus or minus 10 percent not uniformly high or uniformly low.
2. Striation Texture: Uniform, discontinuous, longitudinal, 3/16 inch deep maximum, 3/4 inch center to center.
3. Smoothness: Plus or minus 5/16 inch in 25 feet.
4. Cross Slope: Plus or minus 1/4 inch in 10 feet.

C. Performance:

1. Lower utility frames, covers, and other Street Fixtures.
2. Mill surfaces to the depth shown on the Drawings or indicated by ENGINEER. Do not disfigure adjacent work or existing surface improvements.
3. If milling exposes smooth underlying Pavement surfaces, mill the smooth surfaces to make them rough.
4. Mill off material if it ponds water or if it has been damaged by water.
5. Where vehicles or pedestrians must pass over milled edges provide safe temporary ramps suitable to speed of user vehicles (or suitable for wheel chair user needs).
6. Remove excess material and clean milled surfaces.
7. If work equipment is removed from the milling site and milled surface awaits further work, provide appropriate traffic control and cleaning.

3.7 GRINDING

A. Machine:

1. Cutting head 36 inches wide minimum.
2. 50 to 60 diamond blades per foot of head.

B. Preparation:

1. Control traffic.
2. Provide water truck, waste truck, and other support machinery.
3. Mark areas to be ground.

C. Tolerances:

1. 1/4 inch lip transverse to the direction of vehicular travel. Potential for ponding not allowed.
2. 1/8 inch lip (or dent) parallel to direction of vehicular travel.
3. Taper ground areas from the lane/shoulder line into the shoulder area at 1/4 inch per foot.

D. Performance:

1. Skid resistance of final ground surface must be comparable to adjacent sections not requiring corrective work.
2. Surface treatment of ground areas.
   a. Asphalt Concrete: Asphalt tack coat and sand blotter, Section 32 12 14.
   b. Hydraulic Concrete: Water repellant, Section 07 19 00.
3. Waste grindings legally.
4. Protect downstream fish habitat.

3.8 **CLEANING**

A. Remove all debris and concrete dust. Clean surrounding rails, sidewalks, Driveways, landscaping and other objects in vicinity of work.

END OF SECTION

SECTION 02 41 15

PAVEMENT PULVERIZING

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Full depth reclamation.

B. Stabilizer selection guide.

1.2 **REFERENCES**

A. ASTM C 136: Standard Method for Sieve Analysis of Fine and Coarse Aggregates.

B. ASTM C 150: Standard Specification for Portland Cement.

C. ASTM D 558: Standard Test Methods for Moisture-Density Relations of Soil-Cement Mixtures.

D. ASTM C 595: Standard Specifications for Blended Hydraulic Cement.

E. ASTM C 618: Standard Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.

F. ASTM D 2922: Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

G. ASTM D 4318: Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

H. ASTM D 4832: Standard Test Method for Preparation and Testing of Soil-Cement Slurry Test Cylinders.

1.3 **SUBMITTALS**

A. List of equipment to be used.

B. Mix design showing percentage and quantity of stabilizer needed.

C. Traffic control plan; Section 01 55 26.

1.4 **SITE CONDITIONS**

A. Section 01 57 00; control dust.

1.5 **ACCEPTANCE**

A. Gradation: Random measure.

B. Depth: Random measure each 1,000 square yards.

C. Density: Nuclear gage or proof roll.

D. Quantity of stabilizer added matches submittal data.

PART 2 PRODUCTS

2.1. **TACK COAT CURING COMPOUND**

A. Cationic or anionic emulsified asphalt, Section 32 12 03.

2.2 **STABILIZER**

A. Cement:
   1. Type I or II, ASTM C 150, or
   2. Type IP or IS; ASTM C 595.

B. Aggregate: Gravel, untreated base course, crushed Portland cement concrete.

C. Chemical Stabilizer: Use type allowed by ENGINEER.

2.3 **MIX DESIGN**

A. Gradation ASTM C 136.

Sieve	Percent Passing by Weight
3"	100
3"	85 to 95
No. 4	45 maximum

B. Stabilizer: Use the following table as a guide.

Table 1 - Stabilizer Selection Guide	
Characteristics of Reclaimed Aggregate Before Addition of Stabilizer	**Stabilizer**
Asphaltic binder content; greater than 15 percent	Aggregate
More than 45 percent of material passes No. 4 sieve	Aggregate or Cement
Plasticity index (ASTM D 4318) of material passng No. 4 sieve is more than 10.	Cement

1. Unless specified otherwise, cement stabilization per ASTM D 4832 is to be in the range of 300 to 800 psi at 7 days.

PART 3 EXECUTION

3.1 **CONSTRUCTION EQUIPMENT**

A. Capable of cutting to the required depth, pulverizing, and sizing the material.

3.2 **PREPARATION**

A. Identify location of all buried utilities.

B. Notify neighborhood of day and time of operation.

C. Set traffic control devices.

D. Install invert covers.

E. Lower Street Fixtures.

F. Determine need for stabilizer.

3.3 **CONSTRUCTION**

A. Pulverize full depth. Do not remove excess material until full depth pulverizing is complete.

B. Remove excess material.

C. Pulverize a second time if stabilizer is required.

D. Shape, grade, roll, compact.

E. Cure stabilized material with water or asphalt tack coat.

3.4 **FIELD QUALITY CONTROL**

A. Reclaimed Aggregate: 95 percent minimum compaction using
   1. Optimum water content and maximum density, ASTM D 558, and
   2. Nuclear gage shallow depth, ASTM D 2922.

B. Stabilized Reclaimed Aggregate: Proof roll (prior to cement set).

3.5 **REPAIR**

A. Repair surface irregularities.

B. Seal cracks in cured stabilized material.

END OF SECTION

SECTION 03 11 00

CONCRETE FORMING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Formwork for cast-in-place concrete.
B. Openings in formwork for other affected work.
C. Form accessories such as snap ties, bracing, etc.
D. Stripping formwork.

1.2 REFERENCES

A. ACI 347: Recommended Practice for Concrete Formwork.

1.3 DEFINITIONS

A. Shoring: The activity to support formwork.

B. Reshoring: The activity to reduce the amount of formwork supporting concrete elements. As concrete sets and strength increases, less need for formwork occurs gradually until concrete becomes free standing.

1.4 SUBMITTALS

A. Shop Drawings: Fabrication and erection drawings of forms for specific finished concrete surfaces, as indicated. Show general construction of forms, jointing, special joints or reveals, location and pattern of form tie placement, and other items affecting exposed concrete visibility.

B. Form Release Agent: Where concrete surfaces are scheduled to receive special finishes or applied coverings which may be affected by agent submit manufacturer's instructions for use of agent.

1.5 QUALITY ASSURANCE

A. Designer's Qualifications: Structural professional engineer who complies with Utah licensing law, has experience in concrete formwork, and is acceptable to the authority having jurisdiction.

B. Design Forms:

1. With sufficient strength to maintain finished tolerances indicated in Section 03 35 00, to support loads, pressures, and allowable stresses as outlined in ACI 347 and for design considerations such as wind loads, allowable stresses, and other applicable requirements of local Laws and Regulations.
2. To permit easy removal.
3. For required finishes.

C. The design, engineering, and construction of formwork is CONTRACTOR's responsibility.

1.6 JOB CONDITIONS

A. For reference purposes, establish and maintain sufficient control points and bench marks to check tolerances. Maintain in an undisturbed condition and until final completion and acceptance of Work.

B. Regardless of tolerances specified, allow no portion of Work to extend beyond legal boundaries.

1.7 FIELD SAMPLES

A. Prepare field samples and submit per Section 01 33 00.

B. Construct and erect sample formwork panel for architectural concrete surfaces receiving special treatment or finish as a result of formwork. Formwork to include vertical and horizontal form joints and typical rustication joints when required.

C. Size panel to indicate special treatment or finish required, including form release agent.

D. Remove formwork after casting concrete.

1.8 ACCEPTANCE

A. Secure ENGINEER's inspection of form layout for concrete flat work.

PART 2 PRODUCTS

2.1 FORM MATERIALS

A. Faced with material which will produce smooth and uniform texture on concrete, unless indicated otherwise.

B. Arrange facing material orderly and symmetrical, keeping number of seams to a minimum.

C. Do not use material with raised grain, patches, or other defects which will impair texture of concrete surface.

2.2 FORMWORK ACCESSORIES

A. Form Ties:

1. Use ties constructed so that end fasteners can be removed without spalling concrete faces.
2. After end fasteners of ties have been removed, embedded portion of ties are to

terminate not less than 2 times the diameter or thickness of the fasteners from formed faces of concrete, but in no case greater than 3/4 inch.

3. When the formed face on concrete is not exposed, form ties may be cut off flush with formed surfaces. Use ties with 3/4 inch diameter cones on both ends or an approved equal for water retaining structures.

B. Premolded Expansion Joint Filler: Unless indicated otherwise, provide Type F1, Section 32 13 73.

C. Form Release Agent: Colorless material which will not stain concrete, absorb moisture, impair natural bonding or color characteristics of concrete. To prevent contamination, agents used on potable water structures are subject to review by ENGINEER prior to use.

D. Fillets for Chamfered Corners: Wood strips 1 inch x 1 inch size, maximum length possible.

PART 3 EXECUTION

3.1 INSPECTION

A. Verify lines, levels, and measurements before proceeding with formwork.

3.2 FORM CONSTRUCTION

A. Make forms sufficiently tight to prevent loss of concrete.

B. Unless indicated otherwise, place chamfer strips in corners of forms to produce beveled edges on permanently exposed exterior corners.

C. To maintain specified finish tolerances, camber formwork to compensate for anticipated deflections.

D. Provide positive means of adjustment using wedges, jacks, Shores, and struts to take up all settlement during concrete placing operation.

E. Provide temporary ports in formwork to facilitate cleaning and Inspection. Locate openings at bottom of forms to allow flushing water to drain.

F. At construction joints, overlap forms over hardened concrete at least 6 inches. Hold forms against hardened concrete to prevent offsets or loss of mortar at construction joint and to maintain true surface.

G. Construct wood forms for wall openings to facilitate loosening, or counteract swelling.

H. Fasten wedges used for final adjustment of forms prior to concrete placement in position after final check.

I. Anchor formwork to Shores, supporting surfaces or members to prevent upward or lateral movement and deflection of any part of formwork system during concrete placement.

J. Provide runways for moving equipment with struts or legs, supported directly on formwork or structural member without resting on reinforcing.

K. Position expansion joint material and other embedded items accurately and support to prevent displacement.

L. To prevent entry of concrete, fill voids in sleeves, inserts, and anchor slots temporarily with readily removable material.

M. For architectural concrete, limit deflection of facing materials between studs as well as deflection of studs and walers to 0.0025 times span.

N. For underground concrete work, do not use soil walls for forming unless authorized by ENGINEER.

3.3 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings for elements embedded in or passing through concrete.

B. Coordinate work of other sections for the forming and setting of openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.

C. Install accessories per manufacturer's instructions. Ensure items are not disturbed during concrete placement.

3.4 FORM FINISHES

A. Use forms with smooth rubbed, scrubbed, sand floated finishes that meet ACI 347 unless indicated otherwise.

B. For As-cast Finishes:

1. Install form panels in orderly arrangement with joints planned in approved relation to building elements.
2. Where panel joints are recessed or otherwise emphasized, locate form ties within joints, not within panel areas.
3. Where an as-cast finish is required, no grouting will be permitted in the finishing operation.

C. Textured Finishes: As indicated.

3.5 APPLICATION OF FORM RELEASE AGENT

A. Apply form release agent on formwork per manufacturer's instructions. Apply prior to placing reinforcing steel, anchoring devices, and embedded items.

3.6 FORM REMOVAL

A. Do not pry against face of concrete. Use only wooden wedges.
B. When repair of surface defects or finishing is required at an early age, remove forms as soon as concrete has hardened sufficiently to resist damage from removal operations.
C. Remove top forms on sloping surfaces of concrete as soon as concrete has attained sufficient stiffness to prevent sagging. Perform needed repairs or treatment required on such sloping surfaces at once, followed by specified curing.
D. Loosen wood forms for wall openings as soon as it can be accomplished without damage to concrete.
E. Formwork for columns, walls, sides of beams, and other members not supporting the weight of concrete may be removed as soon as the concrete has hardened sufficiently to resist damage from removal.
F. Where no Reshoring is planned, leave forms and Shoring used to support weight of concrete in beams, slabs, and other concrete members in place until concrete has attained its specified strength.
G. Where Reshoring is planned, supporting formwork may be removed when concrete has reached 70 percent of specified strength, provided Reshoring is installed immediately.
H. When Shores and other vertical supports are so arranged that non-load carrying, form-facing material may be removed without loosening or disturbing Shores and supports, facing material may be removed at an earlier age as directed.

3.7 **RESHORING**

A. When Reshoring is permitted or required, plan operations in advance and obtain Approval.
B. During Reshoring do not subject concrete in beam, slab, column, or any other structural member to combined dead and construction loads and live loads in excess of loads permitted for developed concrete strength at time of Reshoring.
C. Place Reshores as soon as practical after stripping operations are complete, but in no Tighten Reshores to carry required loads without over-stressing.
E. Leave Reshores in place until the concrete being supported has reached its specified strength.
F. For floors supporting Shores under newly placed concrete, level original supporting Shore or Reshore.
   1. Reshoring system shall have a capacity to resist anticipated loads in all cases equal to at least 1/2 the capacity of the Shoring system.
   2. Unless otherwise specified locate Reshores directly under a Shore.
   3. In multistory buildings, extend Reshoring through a sufficient number of stories to distribute the weight of newly placed concrete, forms, and construction live loads in such a manner that design loads of floors and supporting Shores are not exceeded.
G. Design, engineering, and construction of Shoring and Reshoring is the responsibility of the CONTRACTOR.

3.8 **REMOVAL STRENGTH**

A. When removal of formwork or Reshoring is based on concrete reaching a specified strength, it shall be assumed that concrete has reached this strength when either of the following conditions has been met:
   1. When test cylinders, field cured along with the concrete they represent, have reached the specified strength.
   2. When concrete has been cured per Section 03 39 00 for the same length of time as the site-cured cylinders that reached specified strength. Determine the length of time the concrete has been cured in the structure by cumulative number of days or fractions thereof, not necessarily consecutive, during which the air temperature is above 50 deg. F. and concrete has been damp or sealed from evaporation and loss of moisture.

3.9 **REUSE OF FORMS**

A. Do not reuse forms if there is any evidence of surface wear or defect which would impair quality of concrete surface.
B. Thoroughly clean and properly coat forms before reuse.

3.10 **FIELD QUALITY CONTROL**

A. Before commencing a pour, verify connections, form alignment, ties, inserts and Shoring are placed and secure.
B. Observe formwork continuously while concrete is being placed to verify that the forms are plumb and there are no deviations from desired elevation, alignment, or camber.
C. If during construction any weakness develops and false-work shows undue settlement or discoloration, stop work, remove affected construction if permanently damaged, and strengthen false-work.

END OF SECTION

SECTION 03 15 15

EXPANSION AND CONTRACTION JOINTS

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Joints and joint sealants in horizontal traffic surfaces for cast-in-place concrete sidewalks, curb, gutter and pavement slabs.

1.2 **REFERENCES**

A. ASTM C 920: Standard Specification for Elastomeric Joint Sealants.
B. ASTM D 545: Standard Method of Testing Preformed Expansion Joint Fillers for Concrete Construction (Nonextruding and Resilient Types).
C. ASTM D 994: Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
D. ASTM D 1056: Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.
E. ASTM D 1190: Standard Specification for Concrete Joint Sealer, Hot-Poured Elastic Type.
F. ASTM D 1191: Standard Method for Testing Concrete Joint Sealers.
G. ASTM D 1751: Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
H. ASTM D 1752: Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
I. ASTM D 1850: Standard Specification for Concrete Joint Sealer, Cold-Application Type.
J. ASTM D 1851: Standard Methods of Testing Concrete Joint Sealers, Cold-Application Type.
K. ASTM D 2240: Standard Test Method for Rubber Property - Durometer Hardness.
L. ASTM D 2628: Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements.
M. ASTM D 3405: Standard Specification for Joint Sealants, Hot-Poured, For Concrete and Asphalt Pavements.
N. ASTM D 3406: Standard Specification for Joint Sealant, Hot-Applied, Elastomeric-Type, for Portland Cement Concrete Pavements.
O. ASTM D 3407: Standard Method of Testing Joint Sealants, Hot-Poured, For Concrete and Asphalt Pavements.
P. ASTM D 3408: Standard Methods of Testing Joint Sealants, Hot-Poured, Elastomeric-Type, for Portland Cement Concrete Pavements.
Q. ASTM D 3542: Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Bridges.

R. ASTM D 3569: Standard Specification for Joint Sealant, Hot-Applied, Elastomeric, Jet-Fuel-Resistant-Type for Portland Cement Concrete Pavements.
S. ASTM D 3581: Standard Specification for Joint Sealant, Hot-Poured, Jet-Fuel-Resistant Type, for Portland Cement Concrete and Tar-Concrete Pavements.
T. ASTM D 3582: Standard Method for Testing Joint Sealant, Hot-Poured, Jet-Fuel-Resistant Type, for Portland Cement Concrete and Tar-Concrete Pavements.
U. ASTM D 3583: Standard Methods of Testing Joint Sealant, Hot-Applied, Elastomeric-Type, for Portland Cement Concrete Pavements, or Joint Sealant, Hot-Applied, Elastomeric, Jet-Fuel-Resistant-Type, for Portland Cement Concrete Pavements.
V. FS SS-S-200: Sealants, Joint, Two Component, Jet-Blast Resistant, Cold-Applied, for Portland Cement Concrete Pavement.

1.3 **SYSTEM PERFORMANCES**

A. Pavement joints include longitudinal and transverse expansion joints, contraction joints, construction joints, and crack control joints.
B. Provide joint sealants that maintain watertight and airtight continuous seals.

1.4 **SUBMITTALS**

A. Manufacturer's product data and samples for each joint sealant product required when requested by ENGINEER.

1.5 **QUALITY ASSURANCE**

A. Obtain joint sealing materials from a single manufacturer for each different product required.

1.6 **DELIVERY, STORAGE, AND HANDLING**

A. Deliver materials to site in original unopened containers or bundles with labels identifying manufacturer, product name and designation, color, expiration period for use, pot life, cure time, and mixing instructions for multicomponent materials.
B. Store and handle materials in compliance with manufacturer's recommendations to prevent deterioration; or damage due to moisture, high or low temperatures, contaminants, or other causes.

PART 2 PRODUCTS

2.1 **GENERAL**

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

2.2 **JOINT VOID - FORMER**

A. 1/4 depth of concrete structural section or as indicated.

PART 3 EXECUTION

3.1 **EXAMINATION**

A. Do not proceed with installation of joint sealants under unfavorable weather conditions.

B. Install elastomeric sealants when temperature is stable in temperature range recommended by manufacturer for installation.

C. Joint Substrate Conditions: Do not proceed with installation of joint sealers until contaminants capable of interfering with their adhesion are removed from joint substrate.

3.2 **PREPARATION**

A. Clean, prepare and size joints in accordance with manufacturer's instructions. Remove any loose materials and other foreign matter which might impair adhesion of sealant.

B. Verify that joint shaping materials and release tapes are compatible with sealant.

C. Examine joint dimensions and size materials to achieve required width to depth ratio.

D. Adjust joint depths to allow sealants to perform properly.

E. Remove moisture on substrate.

F. Bond Breaker Tape: Install where needed or required by manufacturer's recommendations to ensure that elastomeric sealants will perform properly.

3.3 **JOINTS - GENERAL**

A. Construct all joints as follows:

1. At right angles to top surface of placement.
2. Straight unless indicated otherwise.
3. Before uncontrolled shrinkage cracking takes place.
4. To prevent concrete edge slump.

3.4 **EXPANSION JOINTS**

A. Do not extend reinforcement through an expansion joint. Place dowel mechanisms.

B. Set joint fillers at proper depth or position in joint to coordinate with other work, including installation of bond breakers, backer rods, and sealants. Do not leave voids or gaps between ends of joint filler units. Secure holders and supports to prevent joint filler movement.

C. Form transverse expansion joints at structures and concrete approaches using filler strips, backer rods and joint sealant. Support as needed with holders which will remain in place.

3.5 **CONSTRUCTION JOINTS**

A. Construction joints (contact joints) are those made by placing concrete against cured concrete. When indicated construct construction joints with an indented keyway or tie-bar.

B. Place tie-bar to eliminate edge slump.

C. Maintain tie bars perpendicular to joint unless indicated otherwise. Before placing concrete in adjoining slab, straighten tie bars to proper position. If a "S" shape bend

results from straightening, the offset from a straight line cannot exceed 0.1 feet.

3.6 **CONTRACTION CRACK CONTROL JOINTS**

A. Joint spacing in feet shall not exceed twice the slab thickness in inches. Regardless of the thickness, joint spacing shall not exceed 15 feet.

B. Contraction crack control joints are those made by sawing or tooling joints 1/4 depth of concrete structural section and 3/8 inch wide. Use of a plastic control joint-void former is acceptable in lieu of saw cutting or tooling.

C. Make longitudinal joints the same dimension as transverse joints.

D. Except where shown to be omitted or recommended to be omitted by sealant manufacturer, clean saw cut or tooled joint of loose debris, cement, dust, etc.; install 25 percent oversized backer rod to fit tightly in joint and seal joint.

3.7 **JOINT SEALING**

A. Surface Preparation:

1. Remove oil, grease, wax, form-release-agents, curing compounds, bitumens, latency and old chalking material by sandblast, or water blast as recommended by manufacturer of sealant. Maximum sand blast angle, 25° $\pm$ 5.
2. Clean and dry with air blast. Do not contaminate air blast with oils or lubricants.
3. Remove frost and moisture in concrete joint substrate before commencing sealing.

B. Installation:

1. Ensure that sealants are installed in uniform, continuous ribbons without gaps or air pockets, with complete bonding of joint surfaces on opposite sides.
2. Except as otherwise indicated, fill sealant rubbed flush with surface.
3. Where horizontal joints are between a horizontal surface and vertical surface, fill joint to from a slight cove so that joint will not trap moisture and dirt.

C. Depths: Saw cut joints if necessary to provide the required sealant thickness and depth. Install sealant to depths indicated or, if not indicated, as recommended by sealant manufacturer, but within the following general limitations measured at center (thin) section of bead:

1. For sidewalks, pavements, and similar joints sealed with elastomeric sealants and subject to traffic and other abrasion and indentation exposures, fill joints to a depth equal to 75 percent of joint width, but neither more than 5/8 inch deep nor less than 3/8 inch deep.
2. For normal moving joints sealed with elastomeric sealants, but not subject to traffic, fill joints to a depth equal to 50 percent of joint width, but not more than 1/2 inch deep nor less than 1/4 inch deep.
3. For joints sealed with nonelastomeric sealants and caulking compounds, fill joints to a depth in range of 75 percent to 125 percent of joint width.

D. Spillage: Do not allow poured sealant compound to overflow or spill onto adjoining surfaces or to migrate into voids of adjoining surfaces. Clean adjoining surfaces to eliminate evidence of spillage.

E. Heating: Do no overheat hot-applied sealants.

F. Edges: Unless indicated otherwise, recess exposed edges of gasket and exposed joint

fillers slightly behind adjoining surfaces so compressed units will not protrude from joints.

3.8 **CURE AND PROTECTION**

A. Cure sealants and caulking compounds in accordance with manufacturer's instructions and recommendations to obtain high early bond strength, internal cohesive strength and surface durability.

B. Follow procedures required for cure and protection of joint sealants during construction period so they will be without deterioration or damage (other than normal wear and weathering) at time of Substantial Completion.

3.9 **CLEANING**

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

B. Remove protective coating and oil from metals with solvent recommended by the sealant manufacturer.

3.10 **PROTECTION**

A. Protect joint sealant during and after curing period from contact with contaminating substances or from damage resulting from deterioration or damage at time of Substantial Completion.

B. If damage of deterioration occurs, cut out and remove damaged or deteriorated joint sealant immediately and reseal joints with new materials to produce joint sealer installations with repaired areas indistinguishable from original work at no additional cost to OWNER.

END OF SECTION

SECTION 03 20 00

CONCRETE REINFORCING

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Reinforcing steel bars, wire fabric or rod mats for cast-in-place concrete.

B. Support chairs, bolsters, bar supports, and spacers for supporting reinforcement.

1.2 **REFERENCES**

A. AASHTO M 254: Standard Specification for Corrosion Resistant Coated Dowel Bars.

B. ACI 301: Specifications for Structural Concrete for Buildings.

C. ACI 315: Details and Detailing of Concrete Reinforcement.

D. ASTM A 82: Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.

E. ASTM A 185: Standard Specification for Steel Welded Wire, Fabric, Plain, for Concrete Reinforcement.

F. ASTM A 615: Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

G. ASTM A 706: Standard Specification for Low-Alloy Steel Deformed Bars for Concrete Reinforcement.

H. ASTM C 1116: Standard Specification for Fiber-Reinforced Concrete and Shotcrete.

I. ASTM D 3963: Standard Specification for Epoxy-Coated Reinforcing Steel.

J. AWS D1.1: Structural Welding Code Steel.

K. AWS D1.4: Structural Welding Code Reinforcing Steel.

L. CRSI Document: Manual of Standard Practice.

1.3 **SUBMITTALS**

A. Manufacturer's Certificate: Submit mill test certificates of supplied concrete reinforcement, indicating physical and chemical analysis.

B. Welder's certification.

C. Shop Drawings.

1. Indicate sizes, spacings, locations, and quantities of reinforcing steel, wire fabric, bending and cutting schedules, splicing, stirrup spacing, supporting, and spacing devices.

2. When required, prepare shop drawings by an engineer who complies with Utah licensing law and is acceptable to agency having jurisdiction.

1.4 **QUALITY ASSURANCE**

A. Perform concrete reinforcement work per CRSI Manual of Standard Practice.

B. Comply with ACI 301.

C. Welders: Certified to comply with AWS D1.1 or AWS D1.4 as applicable.

1.5 **ACCEPTANCE**

A. Unless specified otherwise, chairs for supporting reinforcement in flat slabs are spaced as follows.

1. 3 feet maximum for No. 5 and smaller bars.
2. 5 feet maximum for bars larger than No. 5.

B. Dowels are placed on dowel baskets and properly aligned.

C. Epoxy and galvanized coatings are not chipped or cut. Ends of cut bars are epoxy coated or galvanize painted prior to placement.

D. Minimum covering over reinforcement is as specified.

PART 2 PRODUCTS

2.1 **MATERIALS**

A. Fiber Reinforcement: ASTM C 1116 glass.

B. Reinforcing Steel: Deformed 60 ksi yield grade steel, ASTM A 615 and supplementary requirements S1 or ASTM A 706 for welding.

C. Welded Steel Wire Fabric: ASTM A 185 plain type in flat sheets or coiled rolls. Dimensions of the mesh 4”x 4” or as indicated.

D. Stirrups: ASTM A 82 steel.

E. Plain Dowel Bars for Expansion Joints: Smooth grade 60 ksi yield grade steel, ASTM A 615,

1. Galvanized or epoxy coated in roadway Pavements.
2. Provide metal dowel cap at one end of dowel to permit longitudinal movement of dowel within concrete section. Design caps with 1 end closed.
3. Provide for movement equal to joint width plus 1/2 inch.
4. For load transfer bars, paint with 1 coat of paint conforming to AASHTO M 254 and coat 1/2 with grease.

F. Coatings for Corrosion Protection:

1. Epoxy coat, ASTM D 3963.
2. Galvanized, Section 05 05 10.

2.2 **ACCESSORY MATERIALS**

A. Tie Wire: Minimum 16 gage annealed type or an acceptable patented system.

B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during installation and placement of concrete.

2.3 **FABRICATION**

A. Fabricate reinforcement, ACI 315 providing for concrete cover.

B. Locate reinforcing splices not indicated on Drawings at points of minimum stress. Indicate location of splices on shop drawings.

C. Weld reinforcing bars; with AWS D1.4.

PART 3 EXECUTION

3.1 **PLACING**

A. All reinforcement to be free of loose mill scale, loose or thick rust, dirt, paint, oil or grease.

B. Place all reinforcement in the exact position indicated. With tie wire, tie bars together at all intersections except where spacing is less than 12 inches in each direction, in which case tie alternate intersections.

C. Maintain the distance from vertical forms and between layers of reinforcement by means of prefabricated chairs, ties, hangers, or other approved devices. Placing and fastening of reinforcement in each section of the Work must be approved before concrete is placed.

D. Overlap sheets of metal mesh one square plus 6 inches to maintain a uniform strength. Securely fasten at the ends, edges, and supports to maintain clearances.

E. Flat Slab Work:

1. Support reinforcing steel of formed flat slabs with metal chairs, precast concrete blocks or other slab bolsters.
2. Size chairs or bolsters to position the steel in the exact location indicated.
3. Space chairs for supporting the top steel and bolsters for supporting the bottom steel not more than 5 feet on centers in each direction.
4. Plastic or epoxy coat that portion of the metal support in contact with the forms to prevent rust.
5. Tie down deck steel to beams or forms at regular intervals of not more than 5 feet on centers along the beams or forms to prevent movement of the steel during concrete placement.

3.2 **SPLICING**

A. Furnish all reinforcement in the full lengths indicated unless otherwise permitted. Splicing of bars, except where indicated is not permitted without written approval. Stagger splices where possible.

B. Unless indicated otherwise, overlap reinforcing bars a minimum of 30 diameters to make the splice. In lapped splices, place the bars and wire to maintain the minimum

distance for clear spacing to the surface of the concrete.

C. Do not use lap splices on bars greater in diameter than No. 11 unless approved.

D. Weld reinforcing steel only if indicated or if authorized in writing. Weld in conformance to AWS D1.4.

E. Do not bend reinforcement after embedding in hardened concrete.

F. Do not permit reinforcement or other embedded metal items bonded to the concrete, to extend continuously through any expansion joint, except dowels in floors bonded on only one side of joints.

3.3 **PLACING EMBEDDED ITEMS**

A. Place all sleeves, inserts, anchors and embedded items prior to concrete placement. Temporarily fill voids in embedded items to prevent entry of concrete.

B. Give all trades whose work is related to the concrete section ample notice and opportunity to introduce or furnish embedded items before concrete placement.

END OF SECTION

SECTION 03 30 04

CONCRETE

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Material requirements.

1.2 **REFERENCES**

A. ACI 211.1: Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.

B. ACI 211.2: Standard Practice for Selecting Proportions for Structural Lightweight Concrete.

C. ACI 211.3: Standard Practice for Selecting Proportions for No-Slump Concrete.

D. ACI 214: Recommended Practice for Evaluation of Strength Test Results of Concrete.

E. ACI 301: Specifications for Structural Concrete for Buildings.

F. ACI 305: Hot Weather Concreting.

G. ACI 306: Cold Weather Concreting.

H. ACI 318: Building Code Requirements for Reinforced Concrete.

I. ASTM C 33: Standard Specification for Concrete Aggregates.

J. ASTM C 39: Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

K. ASTM C 88: Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.

L. ASTM C 94: Standard Specification for Ready-Mixed Concrete.

M. ASTM C 117: Standard Test Method for Material Finer than 75µ (No. 200) Sieve in Mineral Aggregates by Washing.

N. ASTM C 138: Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete.

O ASTM C 143: Standard Test Method for Slump of Hydraulic-Cement Concrete.

P. ASTM C 150: Standard Specification for Portland Cement.

Q. ASTM C 172: Standard Method of Sampling Freshly Mixed Concrete

R. ASTM C 227: Standard Test Method for Potential Reactivity of Cement-Aggregate Combinations (Mortar Bar Method).

S. ASTM C 231: Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

T. ASTM C 260: Standard Specification for Air-Entraining Admixtures for Concrete.

U. ASTM C 289: Standard Test Method for Potential Reactivity of Aggregates (Chemical Method).

V. ASTM C 295: Standard Practice for Petrographic Examination of Aggregates for Concrete.

W. ASTM C 441: Standard Test Method for Effectiveness of Mineral Admixtures or Ground Blast-Furnace Slag in Preventing Excessive Expansion of Concrete Due to The Alkali-Silica Reaction.

X. ASTM C 494: Standard Specification for Chemical Admixtures for Concrete.

Y. ASTM C 595: Standard Specification for Blended Hydraulic Cements.

Z. ASTM C 618: Standard Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.

AA. ASTM C 1064: Standard Test Method for Temperature of Freshly Mixed Portland Cement Concrete.

BB. ASTM C 1116: Standard Specification for Fiber-Reinforced Concrete and Shot Crete.

CC. ASTM C 1157: Standard Performance Specification for Blended Hydraulic Cement.

DD. ASTM C 1240: Standard Specification for Use of Silica Fume as a Mineral Admixture in Hydraulic Cement Concrete, Mortar, and Grout.

EE. ASTM C 1260: Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method).

FF. ASTM C 1293: Standard Test Method for Concrete Aggregates by Determination of Length Change of Concrete Due to Alkali-Silica Reaction.

GG. ASTM C 1567: Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method).

HH. ASTM C 1602: Standard Specification for Mixing Water Used in The Production of Hydraulic Cement Concrete.

I I. ASTM D 1077: Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.

J J. ASTM STP 15-C: Manual on Quality Control of Materials.

1.3 SUBMITTALS

A. **Quality Assurance**: Submit names, certification levels, and years of experience of testing agency's laboratory and field technicians that are assigned to the Work. Verify laboratory complies with ASTM and ACI standards.

B. **Mix Design**: Submit.

1. Date of mix design. If older than 365 days, recertify mix design.
2. Cement source, type and chemical composition.
3. Aggregate soundness and potential reactivity.

4. Average Strength (fcr), per quality control chart.
5. Allowable range of slump and air content.
6. Water cement ratio.
7. Proportions of materials in the mix.
8. Unit weight.
9. Analysis of water if water is not potable.
10. Mortar bar test results if a pozzolan is included in the mix.
11. Technical data sheets for additives to be used at the plant and at the job site. Certify additives are compatible with each other.

C. **Pre-approved mix design**, submit name and address of Supplier.

D. **Before changing mix design**, submit a new design and give ENGINEER 10 days to evaluate the changes.

E. **Source Quality Control Inspections and Testing Report**: If requested, submit report describing CONTRACTOR's and Supplier's quality control activities and test results.

1.4 QUALITY ASSURANCE

A. Use a laboratory that follows and complies with ASTM D 1077.

B. Reject concrete that does not meet requirements of this section.

C. Do not change material sources, type of cement, air-entraining agent, water reducing agent, other admixtures except as allowed by mix design.

D. Store bagged and bulk cement in weatherproof enclosures. Exclude moisture and contaminants.

E. Prevent segregation and contamination of aggregate stockpiles.

F. Avoid contamination, evaporation, or damage to admixtures. Protect liquid admixtures from freezing.

G. Use of admixtures will not relax hot or cold weather placement requirements.

1.5 ACCEPTANCE

A. Materials:

1. At the Source: Verify aggregate gradation. Determine percent of combined aggregate passing No. 200 sieve.
2. At the Site: Verify mix identification, batch time, slump, air content, and temperature.
3. At the Laboratory: Verify strength in 28 days.

B. Placement:

1. Concrete in general, Section 03 30 10.
2. Pavement, Section 32 13 13 and 32 01 26.
3. Exterior flatwork, Section 32 16 13 or 32 16 14.

C. Defective Material:

1. Price adjustment, Section 01 29 00 and Section 03 30 10.
2. Dispute resolution, Section 01 35 10.

PART 2 PRODUCTS

2.1 **CEMENT**

A. General:

1. Do not use air entraining cement except for hand mixed applications.
2. Do not use cement that contains lumps or is partially set.
3. Do not mix cement originating from different sources.

B. Standard Set Cement:

1. Type II cement per tables 1 and 3 in ASTM C 150, or Type V when necessary, or
2. Low-alkali cement per table 2 in ASTM C 150.

C. Rapid Set Cement: As above and as follows.

1. Initial set time: 15 minutes minimum.
2. Color: Acceptable to the ENGINEER.

D. Blended Hydraulic Cement: The following are the cement equivalencies when substituting blended cement for a portland cement.

Table 1 - Cement Equivalencies

ASTM C 150 (Low Alkali)	ASTM C 595	ASTM C 1157
Type I	IP	GU
Type II	IP (MS)	MS
Type III	–	HE
Type IV	–	–
Type V	–	HS

2.2 **WATER**

A. Clean, non-staining, non-detrimental per ASTM C 1602.

B. Screen out extraneous material.

C. Do not use alkali soil water.

2.3 **AGGREGATES**

A. Material: Clean, hard, durable, angular, and sound consisting of gravel, crushed gravel, crushed stone, crushed concrete, slag, sand or combination.

B. Source: Use the following requirements to determine suitability of aggregate source and not for project control.

1. Deleterious Substances and Physical Properties:

a. Coarse Aggregate: Class designation 4S in table 3 in ASTM C 33.

b. Fine Aggregate: Table 1 in ASTM C 33. Organic impurities producing a dark color concrete may cause rejection.

2. Reactivity:

a. Average prism length change in 12 months in an unmodified ASTM C 1293 test is less than 0.04 percent, or

b. Average mortar bar length change at 16 days in an unmodified ASTM C 1260 test is less than 0.10 percent, or

c. Historical data acceptable to ENGINEER, or

d. Petrographic limits per ASTM C 295. 1) Optically strained, micro fractured, or microcrystalline quartz: 5.0% maximum. 2) Chert or chalcedony: 3.0% maximum. 3) Tridymite or cristobalite: 1.0% maximum. 4) Opal: 0.5% maximum. 50 Natural volcanic glass volcanic rocks: 3.0% maximum

2.4 **ADMIXTURES**

A. Calcium Chloride: Not allowed.

B. Air Entrainment: ASTM C 260. For extrusion enhancement use nonvinsal resin.

C. Set Enhancement and Water Reducing Agents: ASTM C 494.

1. Type A: Water reducing.
2. Type B: Set retarding.
3. Type C: Set accelerating.
4. Type D: Water reducing and set retarding.
5. Type E: Water reducing and set accelerating.
6. Type F: High range water reducing (super plasticizer). *
7. Type G: High range water reducing and set retarding. *

* Keep the relative durability factor of water reducing additives not less than 90 and the chlorides content (as Cl^-) not exceeding 1 percent by weight of the admixtures.

D. Pozzolan:

1. Natural or fly ash per ASTM C 618.
2. Silica fume per ASTM C 1240

E. Special Admixtures: Allowed if mix design submittal is accepted.

1. Lithium nitrate based solution for control of reactive aggregates.
2. Calcium nitrite based solution for corrosion protection of reinforced structures subject to chloride-induced corrosion.
3. Shrinkage reducer for controlling drying shrinkage in concrete.
4. Viscosity modifier for enhancement of self consolidating concrete or for workability.

2.5 **MIX DESIGN**

A. Selection of Cement: ASTM C 150 or C 1157.

1. For sulfate resistance, use Type V portland cement, or Type II with Class F fly ash. Class F fly ash may be used as an addition to Type V portland cement.
2. Do not use fly ash with Type IP(MS) or Type III portland cement.

B. Selection of Aggregates.

1. Maximum Particle Size:

a. 1/5 of narrowest dimension between forms.
b. 1/3 of depth of slab.
c. 3/4 of minimum clear spacing between reinforcing bars.

2. Gradation: ASTM C 33.

a. Coarse Aggregate: Choose from the following grades. Gradations are based upon percent of material passing sieve by weight.

Sieve Size	Grade			
	357 (2")	467 (1.5")	57 (1")	67 (3/4")
2-1/2"	100	–	–	–
2 inch	95 - 100	100	–	–
1-1/2"	–	95 - 100	100	–
1"	35 - 20	–	95 - 100	100
3/4"	–	35 - 70	–	90 - 100
1/2"	10 - 30	–	25 - 60	–
3/8"	–	10 - 30	–	20 - 55
No. 4	0 - 5	0 - 5	0 - 10	0 - 10

b. Fine Aggregate:

Sieve Size	Percent Passing (by Weight)
3/8”	100
No. 4	95 to 100
No. 16	45 to 80
No. 50	10 to 30
No. 100	2 to 10

c. Silts and Clays: The amount of material smaller than the No. 200 sieve in any combined gradation sample is limited to the following percentages by weight of the combined sample.

1. 1.75 percent maximum for concrete subject to abrasion.
2. 3.0 percent maximum for all other concrete. 194

C. Selection of Pozzolan:

1. General: If a blended aggregate passes an unmodified ASTM C 1293 test, use of a pozzolan is CONTRACTOR’s choice, otherwise select a pozzolan (or blended

cement, or both) and determine the effective dosage to meet one of the following tests.

a. ASTM C 1567. The expansion of a cement-pozzolan-aggregate job-mix mortar bar is less than or equal to 0.10 percent at 16 days. Do not use this test if a lithium admixture is used in the job-mix.
b. ASTM C 441. The expansion of a test mixture at 56 days is less than or equal to a control mixture prepared with cement with equivalent alkalis between 0.5 and 0.6 percent.

2. Fly Ash (Class F): Allowed as a cement replacement under the following conditions.

a Before replacement is made, use the minimum cement content in the design formula to establish the water/cement ratio.
b. Replace up to 20 percent of the cement by weight on a minimum basis of 1 part fly ash to 1 part cement.
c. Submit to ENGINEER a quality history of the fly ash identifying a minimum of 20 of the most current ASTM C 618 analysis.

3. Natural Pozzolan (Class N): Allowed as a cement replacement if the 14 day expansion test (ASTM C 1567) with job aggregates, job cement and natural pozzolan does not exceed the 14 day expansion test of job aggregates, job cement and Class F fly ash.
4. Silica Fume: Allowed as a cement replacement if replacement of hydraulic cement on a 1 part silica fume to 1 part cement does not exceed 10 percent, and water/cement ratio is established before cement is replaced with silica fume.

D. Selection of Fiber Reinforcement: The basis for determining material proportions of fiber- reinforced concrete is the Supplier’s responsibility per ASTM C 1116 subject to mix property requirements of this Section. Unless specified otherwise provide synthetic fibers.

E. Selection of Mix Properties: Select and proportion mix to produce appropriate strength, durability and workability. Use ACI 211.1, 211.2, or 211.3, and meet the following properties and limitations.

Table 3 - Mix Properties and Limitations					
Properties		**Test Method**	**Class**		
			2000	**3000**	**4000**
Compressive Strength (fc') at 28 days, psi, minimum		ASTM C 39	2000	3000	4000
Compressive Strength at 7 days, psi, (for reference only)		ASTM C 39	1340	2010	2680
Average Strength, psi (fcr)		ACI 214	(a)	(a)	(a)
Cement content, bags, minimum (b)		–	4.5	5.5	6.5
Water-cement ratio (by weight), maximum (d)		ACI 318	(c)	(c)	0.44
Entrained air, percent (based upon aggregate size) (e)	2" 1-1/2" 1" 3/4"	ASTM C 231	3.0 to 6.0 " " "	4.5 to 7.5 " " "	4.0 to 7.0 4.5 to 7.5 5.0 to 7.5 5.0 to 7.5
Slump		ASTM C 143	(c)	(c)	©)
NOTES: (a) The amount by which average strength (fcr) exceeds compressive strength (fc') is based upon statistical assurance that no more than 1 test in 100 tests will fall below compressive strength (fc'). (b) Unless allowed otherwise by Engineer. (c) Specific to exposure conditions and finishing need. (d) Before pozzolan substitution. (e) Comply with ACI 211.1 if air content is changed. (f) 1 bag of cement = 94 pounds.					

1. Cold Weather: ACI 306. Unless allowed otherwise by ENGINEER, increase cement content in the mix design by 1 bag between **October 1 and March 1,** i.e. 5.5 becomes 6.5, or 6.5 becomes 7.5, etc.
2. Hot Weather: ACI 305. Reduce temperature of mix ingredients or use an admixture appropriate to job conditions when air temperature is over 75 deg. F.
3. Concrete Deposited Under Water: Increase cement content 1 bag per cubic yard greater than the design required for concrete placed above water or use viscosity modifying admixture.

2.6 **SOURCE QUALITY CONTROL**

A. Once selected, do not change source quality control sampling point.

B. Aggregate:

1. Soundness, ASTM C 88.
2. Alkali-silica Reactivity: ASTM C 289, C 1567, C 227 and C 1293.
3. Petrographically examine fine and coarse aggregate sources once every 3 years per ASTM C 295.

C. Concrete Mix: Obtain samples per ASTM C 172 and run the following tests.

1. Compressive strength, ASTM C 39.
2. Unit weight, ASTM C 138.
3. Slump, ASTM C 143.
4. Air, ASTM C 231.
5. Temperature, ASTM C 1064.

D. Concrete Quality Charts: Comply with ACI 214 and ACI 301. Plot new results and identify trends on quality control charts that comply in form to ASTM STP 15-C. Show the Specified Strength (fc'), the required Average Strength (fcr), and the compressive strength versus date of Sample.

E. Equipment: Certify through the services of a professional engineer that trucks and plant equipment comply with the requirements of the National Ready Mixed Concrete Association. Do so at least every 2 years.

1. Transit Trucks: Equip transit trucks with plates indicating total volume, agitating volume and mix volume.
2. Weights and Measures: Comply with regulatory requirements of State of Utah.

PART 3 EXECUTION

3.1 **INSTALLATION**

A. Placement, Section 03 30 10.

B. Pavement restoration, Section 33 05 25.

C. Driveways, sidewalks, curb, gutter, Section 32 13 16.

D. Roadway pavement, Section 32 13 13.

3.2 **FIELD QUALITY CONTROL**

A. Truck Mixed Concrete (Dry Batch): ASTM C 94.

1. Truck Mixer: Fill drum no more than 63 percent of the gross drum volume and no less than 2 cubic yards. Use drum manufacturer's recommended mixing speed (between 12 18 rpm).
2. Truck Agitator: Do not fill drum greater than 80 percent of the gross drum volume. Use drum manufacturer's recommended agitating speed (between 2 – 6 rpm).

B. Mixing Plant: ASTM C 94.

1. Use option C and requirements in this section for preparing ready-mixed concrete.

2. Use scales certified by the State of Utah. Do not use volume measurement except for water and liquid admixtures.
3. Mixing time must exceed 80 seconds after adding air entrainment admixture.

C. Hand Mixing:

1. Do not hand mix batches larger than 0.5 cubic yard.
2. Hand mix only on a watertight platform.
3. Ensure all stones are thoroughly covered with mortar and mixture is of uniform color and consistency prior to adding water.

END OF SECTION

SECTION 03 30 05

CONCRETE TESTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Concrete sampling and testing requirements.

1.2 REFERENCES

A. ACI 318: Building Code Requirements for Reinforced Concrete.

B. ASTM C 31: Standard Practice for Making and Curing Concrete Test Specimens in the Field.

C. ASTM C 39: Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

D. ASTM C 42: Standard Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

E. ASTM C 78: Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading).

F. ASTM C 136: Standard Method for Sieve Analysis of Fine and Coarse Aggregates.

G. ASTM C 138: Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete.

H. ASTM C 143: Standard Test Method for Slump of Portland Cement Concrete.

I. ASTM C 172: Standard Method of Sampling Freshly Mixed Concrete.

J. ASTM C 173: Standard Test Method for Air Content of Freshly Mixed Concrete by Volumetric Method.

K. ASTM C 231: Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

L. ASTM C 567: Standard Test Method for Unit Weight of Structural Lightweight Concrete.

M. ASTM C 1064: Standard Test Method for Temperature of Freshly Mixed Portland Cement Concrete.

N. ASTM D 1077: Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.

1.3 SUBMITTALS

A. Concrete Supplier: If requested, submit reports and material certificates verifying concrete quality control.

B. Laboratory: Promptly submit test data results for 7 and 28 day breaks to Supplier, CONTRACTOR and ENGINEER**.**

1.4 **QUALITY ASSURANCE**

A. Provide an ASTM D 1077 compliant and ACI certified laboratory.
B. Provide level I ACI certified field sampling technicians.

1.5 **SITE CONDITIONS**

A. Assist ENGINEER: Furnish labor to assist ENGINEER in obtaining and handling acceptance samples at site or sources.

B. Store and Cure Test Specimens: Safely store and cure concrete test specimens and acceptance test specimens for first 24 hours.

1. Follow ASTM C 31 in making and curing cylinders or beams at site. Do not move the cylinders or beams for the initial 16 hour cure period. Provide initial cure temperature as follows.

a. 60 to 80 deg. F. for Class 4,000 or less.
b. 68 to 78 deg. F. for Class 5,000 or greater.

2. Equip storage device with an automatic 24 hour temperature recorder with an accuracy of plus or minus 2 deg. F.
3. Use water containing hydrated lime if water is to be in contact with cylinders or beams.
4. Ensure the device(s) can accommodate the required number of test cylinders or beams. Lack of capacity will cause the placement of concrete to cease.
5. Have the storage devices available at the point of placement at least 24 hours before placement.
6. A 24 hour test run may be required.

1.6 **ACCEPTANCE**

A. At the Site:

1. Sampling: ASTM C 172. Reject non-complying batches until 2 consecutive batches are compliant then proceed in random batch testing for acceptance.
2. Temperature, ASTM C 1064.
3. Air content, ASTM C 231 or ASTM C 173 if lightweight aggregate is used.
4. Slump, ASTM C 143. 200

B. At the Laboratory:

1. Compressive strength, ASTM C 31.
2. Flexure strength, ASTM C 78.

PART 2 PRODUCTS Not Used

PART 3 EXECUTION

3.1 **PRECAST PRODUCTS**

A. Obtain composite Samples from different portions of the batch.
B. Make and cure concrete test specimens for acceptance, ASTM C 31.
C. Cure all precast products with water vapor or water.
D. Do not damage precast products by stripping forms or handling before the concrete reaches its specified strength.

3.2 **CAST-IN-PLACE PRODUCTS**

A. Obtaining Samples:
1. Batch samples, ASTM C 172.
2. Core samples, ASTM C 42.
B. Identify location of tests on test reports.
C. Compressive strength , ASTM C 39.
1. Mold 4 test specimens, ASTM C 31.
2. For each strength test perform slump, air, unit weight, and temperature test.
3. Break 1 cylinder at 7 days and 3 cylinders at 28 days. The average strength of 3 cylinder breaks shall be considered the test result.
4. If any one cylinder in a 28 day test shows definite evidence of improper sampling, molding, handling, curing, or testing, discard the cylinder. The average strength of the remaining cylinders shall be considered the test result.
D. Tensile (flexural) strength, ASTM C 78.
1. Mold 4 test specimens, ASTM C 31.
2. For strength test perform slump, air, unit weight, and temperature test.
3. Break 1 beam at 7 days and 3 beams at 28 days. The average strength of the 3 beam breaks shall be considered the test result.
4. If any one beam in a 28 day test shows definite evidence of improper sampling, molding, handling, curing, or testing, discard the beam. The average strength of the remaining beams shall be considered the test result.
E. Aggregate, ASTM C 136 for fine and coarse aggregate.
F. Slump test, ASTM C 143.
G. Air Test:
1. Normal weight concrete, ASTM C 231.
2. Light weight concrete, ASTM C 173.
H. Unit Weight:
1. Normal weight concrete, ASTM C 138.
2. Light weight concrete, ASTM C 567.
I. When requested, test in-place concrete by impact hammer, sonoscope, or other non-destructive device:

1. To determine relative strengths in various locations in Work.
2. To aid in evaluating concrete strength.
3. To select areas to be cored.
4. To verify quality control in the absence of control testing.

3.3 **RETESTING DEFECTIVE CONCRETE**

A. If CONTRACTOR desires to do a retest, a request to ENGINEER for retesting must be made within 35 days from time of concrete placement.
No coring or retesting shall be done after 40 days have elapsed from the time of placement.

1. Choose 3 random test locations and verify choice with ENGINEER. Obtain retest samples per ASTM C 42 and test compressive strength per ASTM C 39 or flexure strength per ASTM C 78.
2. Establish a chain of custody for all test samples.
3. If concrete placed in the Work will be dry under service condition, air dry cores for 7 days before tests. Unless otherwise specified, use air temperature 60 to 80 deg. F. and relative humidity less than 60 percent.
4. If concrete placed in the Work will be more than superficially wet under service conditions, test cores after moisture conditioning (liquid or vapor water cure).
5. If more than 1 core shows evidence of having been damaged before testing provide replacement cores, otherwise evaluation will be done on 2 or more core samples.
6. Evaluate cores in accordance with ACI 318 requirements.
7. If core tests are inconclusive, or impractical to obtain, or if structural analysis does not confirm the safety of the Work, load test may be used and evaluated in accordance with ACI 318 requirements.

B. Coat sides of core hole with concrete epoxy resin adhesive. Fill core holes with non-shrink concrete mortar. Match color and texture of surrounding concrete.

C. Within 40 days from time of placement publish the chain of custody record and the results of retesting.

END OF SECTION

SECTION 03 30 10

CONCRETE PLACEMENT

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Concrete placement for slabs on grade, slabs on fill, structural building frame, and other concrete components.

1.2 **REFERENCES**

A. ACI 301: Specifications for Structural Concrete for Buildings.

B. ACI 305: Hot Weather Concreting.

C. ACI 306: Cold Weather Concreting.

D. ACI 309: Standard Practice for Consolidation of Concrete.

E. ASTM C 881: Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.

F. ASTM C 1059: Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.

1.3 **SUBMITTALS**

A. Batch Delivery Ticket: For each batch delivered to site, identify.

1. Date and Project description.
2. Producer and plant.
3. Name of contractor.
4. Serial number of ticket.
5. Mix identification.
6. Truck number and time dispatched.
7. Volume of concrete.
8. Type and amount of cement.
9. Total water and water/cement ratio.
10. Water added for receiver of concrete and receiver's initials.
11. Admixture types.
12. Separate weights of fine and coarse aggregate.
13. Statement of whether batch is pre-mixed at plant or mixed in transit.

B. Record of Placed Concrete: Identify record date, location of pour, quantity, air temperature, and CONTRACTOR's quality control test samples taken.

C. Bonding Compound: Identify product name, type, and chemical analysis.

1.4 **QUALITY ASSURANCE**

A. Provide ACI certified finishers.

B. Remove and replace any placed concrete suffering hot or cold weather damage.

C. For control testing follow Section 03 30 05 requirements.

1.5 **ACCEPTANCE** A General:

A.1. Price adjustment, Section 01 29 00. CONTRACTOR may request ENGINEER determine appropriate Modifications or payment adjustments to correct Defective Work.

2. Dispute resolution, Section 01 35 10 and Section 03 30 05.

B. Concrete work that fails to meet any of the following requirements will be considered defective. Replace any Defective Work at no additional cost to the OWNER.

1. Placement:
   a. Reinforcing steel size, quantity, strength, position, damage, or arrangement is not as specified or does not comply with code.
   b. Formwork differs from required dimensions or location in such a manner as to reduce concrete's strength or load carrying capacity or physical esthetics.
   c. Workmanship likely to result in deficient strength.
2. Finishing:
   a. Concrete exposed to view has defects that adversely affect appearance.
   b. Slab tolerances of Section 03 35 00 are not met.
3. Protection:
   a. Method of curing is not as specified.
   b. Inadequate protection of concrete during early stages of hardening and strength development from
      1) temperature extremes.
      2) rapid moisture loss.
   c. Mechanical injury, construction fires, accidents, or premature removal of formwork likely to result in deficient strength development.

PART 2 PRODUCTS

2.1 **MATERIALS**

A. Concrete, Section 03 30 04. Class as indicated.

1. For roadway cuts, Section 33 05 25.

B. Bonding compound, ASTM C 1059. Either polyvinyl acetate base or acrylic base latex.

1. Use type I in areas not subject to high humidity or immersion in water with minimum bond strength of 400 psi.
2. Use type II in areas subject to high humidity or immersion in water with minimum bond strength of 1250 psi.

C. Vapor retarder, 10 mil thick clear polyethylene sheet. Type

recommended for below grade application.

D. Forms, Section 03 11 00.

E. Reinforcement, Section 03 20 00.

F. Coverings and curing compound, Section 03 39 00.

G. Shinkage compensating grout, Section 03 61 00.

H. Epoxy adhesive, Section 03 61 00.

PART 3 EXECUTION

3.1 **PREPARATION**

A. Notify ENGINEER minimum 24 hours prior to commencement of concrete placement operations.

B. Do not allow construction loads to exceed structural capacity.

C. Clean previously placed concrete. Apply bonding compound per manufacturer's instructions.

D. At locations where new concrete is dowelled to existing work, drill, remove dust, insert and pack steel dowels with shrink compensating grout.

3.2 **EXAMINATION**

A. Verify items to be cast into concrete are accurately placed and held securely.

B. Verify slump, air content range, mix identifty, and batch time on delivery ticket matches mix design.

C. Verify slab steel mats are supported by steel chairs, precast concrete blocks, or other slab bolsters. Do not pour if absent.

3.3 **DELIVERY**

A. Slump and Air Content: Keep slump and air content within the allowable range.

B. Placement Time:

Air Time <u>Temperature After Initial Batching</u>

Less than 90 deg. F. 1–1/2 hours
Greater than 90 deg. F. 1–hour (without retarder)
Greater than 90 deg. F. 1–1/2 hours (with retarder)

To increase time past 1-1/2 hours, a hydration stabilizer that is acceptable to Supplier may be used.

C. Tempering:

1. Water may be added if all following conditions are met.
   a. The mix design water/cement ratio is not exceeded.

b. The delivery ticket allows for addition of water based upon water/cement ratio.
c. The amount of water added is accurately measured to within 1 gallon of the design addition.
d. Water addition is followed by 3 minutes of mixing at mixing speed prior to discharge.
e. Supplier and CONTRACTOR mutually agree on who is authorized to add water.

2. **Do not add water after 1 cubic yard of concrete has discharged from the delivery vehicle.**

D. Super-plasticizer: Comply with manufacturer's requirements. If none, then as follows.

1. If added at site, add agent using injection equipment capable of rapidly and uniformly distributing the admixture to the concrete. Prior to discharge, mix for a minimum of 5 minutes at a drum rate not less than 12 rpm or more than 15 rpm.
2. If added at plant; do not deliver to site unless batch delivery ticket displays water/cement ratio prior to super-plasticizer addition.

3.4 CONCRETE PLACEMENT

A. Place concrete, ACI 301.

1. Hot Weather Placement: ACI 305. If the rate of evaporation approaches 0.2 lb./ft^2/hr. precautions against plastic shrinkage cracking are necessary. (i.e. dampening Subgrade and forms; placing concrete at the lowest possible temperature; erecting windbreaks and sunshades; fog sprays; use of evaporation retardants; or rescheduling time of placement).
2. Cold Weather Placement: ACI 306. Non-chloride accelerating admixture may be used in concrete work placed at ambient temperatures below 50 deg. F. Use of admixtures will not relax cold weather placement, curing, or protection requirements.

B. Concrete Temperature: Keep mixed concrete temperature at time of placement between 60 deg. F. and 90 deg. F.

C. Do not disturb reinforcement, inserts, embedded parts, and formed joints.

D. Do not break or interrupt successive pours such that cold joints occur.

E. Honeycomb or embedded debris in concrete is not acceptable.

3.5 JOINTS AND JOINT SEALING

A. Steel edging and jointing tools are acceptable. Preferred are magnesium, aluminum or wood tools

B. Pavement joint sealing, Section 32 13 73.

3.6 CONSOLIDATION

A. Keep spare vibrator available during concrete placement operations, ACI 309.

3.7 FINISHING

A. Section 03 35 00 and as follows.

3.8 CURING

A. Section 03 39 00. Use a membrane forming compound unless specified otherwise.

3.9 PROTECTION AND REPAIR

A. Protection: Section 01 66 00.

1. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, graffiti, and mechanical injury.
2. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

B. Repair:

1. Modify or replace concrete not conforming to required levels, lines, details, and elevations.
2. Structural analysis and additional testing may be required at no additional cost to OWNER when the strength of a structure is considered potentially deficient.
3. To patch imperfections refer to Section 03 35 00 requirements.
4. Remove graffiti and mechanical injury.

END OF SECTION

SECTION 03 35 00

CONCRETE FINISHING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Finishing interior and exterior concrete surfaces.

1.2 REFERENCES

A. ACI 303: Guide to Cast-in-Place Architectural Concrete Practice.

1.3 SUBMITTALS

A. Name, type, chemical analysis and manufacturer's recommended rate of application for liquid chemical hardener.

1.4 PROJECT CONDITIONS

A. Protect adjacent materials and finishes from dust, dirt and other surface or physical damage during finishing operations. Provide protection as required and remove from site at completion of Work.

PART 2 PRODUCTS

2.1 MATERIALS

A. Masonry Mortar and Grout: Section 04 05 16.

B. Dry Shake: Blend of metallic or mineral aggregate with Portland cement concrete in proportions recommended by manufacture.

C. Proprietary Materials: If permitted or required, proprietary compounds may be used in lieu of or in addition to foregoing materials. Use such compounds per manufacturer's recommendations.

D. Liquid-Chemical Hardener: Colorless, aqueous solution containing a blend of magnesium fluosilicate, zinc fluosilicate and a wetting agent. Mixture contains not less than 2 pounds fluosilicate per gallon and does not interfere with adhesives and bonding.

PART 3 EXECUTION

3.1 PREPARATION

A. Examine the areas and conditions under which work of this section will be performed.

B. Correct conditions detrimental to timely and proper finishing.

C. Do not proceed until unsatisfactory conditions are corrected.

3.2 FINISHING HORIZONTAL SLABS

A. **Do not apply water (i.e. sprinkle) to any surface of concrete when finishing slabs.**

B. Edges and Joints: Tools may be made out of steel. Preferred is wood, aluminum or magnesium.

C. Tolerances:

1. Class A: 1 in 1000.
2. Class B: 1 in 500.
3. Class C: 1 in 250.

D. Float Finish: After concrete has been placed, consolidated, struck-off, and leveled, do not work further until ready for floating.

1. Begin floating when water sheen has disappeared and surface has sufficient stiffness.
2. During or after first floating, check planeness of entire surface with a 10 feet long straightedge applied at 2 or more different angles.
3. Cut down high spots and fill low spots to the required tolerance.
4. Refloat slab immediately to a uniform sandy texture.

E. Trowel Finish:

1. Do not use steel trowel or a power trowel on exterior concrete or on concrete that contains more than 3 percent air.
2. First troweling shall produce smooth surface relatively free of defects but which may still show some trowel marks.
3. Second troweling after surface has stiffened shall make finished surface essentially free of trowel marks, uniform in texture and appearance.
4. On surfaces intended to support floor coverings, grind off defects that would show through floor covering.

F. Broom or Belt Finish: Sweep surface with brushes, rakes, tines or burlap belt before final set.

G. "Dry Shake" Finish: Give the surface a floated finish. Evenly apply approximately 2/3 of a blended unsegregated material.

1. Begin floating immediately after application of first "dry shake".
2. After material has been embedded by floating, apply remainder of blended material to surface at right angles to previous application.
3. Make second application heavier in any areas not sufficiently covered by first application.
4. Immediately follow with second floating.
5. After selected material has been embedded by second floating, complete operation with a broomed, floated, or troweled finish, as indicated.

H. Non-slip Finish: Give surface a "dry shake" application, using crushed ceramically bonded aluminum oxide particles. Apply at 25 pounds per 100 square feet.

I. Exposed Aggregate Finish: Immediately after surface of concrete has been leveled to tolerance and surface water has dissipated, spread aggregate uniformly over surface to provide complete coverage to the depth of a single stone.

1. Embed aggregate into surface by light tamping.
2. Float surface until embedded aggregate is fully coated with mortar and surface has been brought to tolerance.
3. Start exposure of aggregate after matrix has hardened sufficiently to prevent dislodgment.
4. Flow ample quantities of water, without force, over surface of concrete while matrix encasing aggregate is removed by brushing with a fine bristle brush.
5. Continue until aggregate is uniformly exposed.
6. An approved chemical retarder sprayed onto freshly floated surface may be used to extend working time.

J. Chemical-Hardener Finish: Apply liquid chemical-hardener finish to interior concrete floors where indicated. Do not apply liquid chemical hardener on floor areas scheduled to receive synthetic matrices terrazzo, setting beds for tile, terrazzo, vinyl flooring, or like items. Apply hardener after complete curing and drying of concrete surface per manufacturer's recommendations. Evenly apply each coat, and allow 24 hours for drying between coats. After final coat of chemical-hardener solution is applied and dried, remove surplus hardener by scrubbing and mopping with water.

3.3 FINISHING FORMED SURFACES

A. General:

1. Allow concrete to cure not more than 72 hours before commencing surface finish operations, unless approved otherwise.
2. Revise the finishes as needed to secure approval.

B. As-Cast Form Finish:

1. Rough: Patch defects, chip or rub off fins exceeding 1/4 inch height.
2. Smooth: Patch tie holes and defects and remove fins completely.
   a. When surface texture is impaired and form joints misaligned, grind, bush-hammer, or correct affected concrete.
   b. Slurry grout areas evidencing minor mortar Leakage to match adjacent concrete.
   c. Repair major mortar Leakage as a defective area.
   d. When workmanship is less than acceptable standard, provide one of rubbed finishes at no additional cost to OWNER.

C. Rubbed Finish:

1. Smooth Rubbed: Remove forms and perform necessary patching as soon after placement as possible.
   a. Finish newly hardened concrete no later than 24 hours following form removal.
   b. Wet surfaces and rub with carborundum brick or other abrasive until uniform color and texture are produced.
2. Grout Cleaned: Undertake no cleaning operations until all

contiguous surfaces are completed and accessible.

   a. Wet surface of concrete sufficiently to prevent absorption of water from grout.
   b. Apply grout uniformly.
   c. Immediately after grouting, scrub surface with cork float or stone to coat surface and fill voids.
   d. While grout is still plastic, remove excess grout by working surface with rubber float or sack.
   e. After surface whitens from drying, rub vigorously with clean burlap.
   f. Keep damp for at least 36 hours after final rubbing.
3. Cork Floated: Remove forms within 2 to 3 days of placement where possible.
   a. Remove ties.
   b. Remove all burrs and fins.
   c. Dampen wall surface.
   d. Apply mortar with firm rubber float or with trowel, filling all surface voids.
   e. Compress mortar into voids.
   f. If mortar surface dries too rapidly to permit proper compaction and finishing, apply a small amount of water with fog sprayer.
   g. Produce final texture with cork float using a swirling motion.

D. Unformed Finish:

1. After concrete is placed, strike smooth, tops of walls or buttresses, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces.
2. Float to texture that is reasonably consistent with formed surfaces.
3. Continue final treatment on formed surfaces uniformly across uniformed surfaces.

E. Blasted Finish:

1. Perform abrasive blasting within 24 to 72 hours after casting.
2. Coordinate with form work construction, concrete placement schedule, and formwork removal to ensure that surfaces are blasted at the same age for uniform results.
3. Reapply curing protection after blast finishing

F. Architectural Finish: Refer to ACI 303.

1. Tooled Finish:
   a. Dress thoroughly cured concrete surface with electric, air, or hand tools to uniform texture, and give a bush hammered surface texture.
   b. Remove sufficient mortar to exposed coarse aggregate in relief and to fracture coarse aggregate for tooled finish.

G. Patched Finish:

1. Repair defective areas.
   a. Remove honeycomb and defective concrete to sound concrete.
   b. Make edges perpendicular to surface or slightly undercut.
   c. Featheredges are not permitted.
   d. Dampen area to be patched and at least 6 inches surrounding it to prevent absorption of patching mortar water.

e. Prepare bonding grout.
f. Mix to consistency of thick cream.
g. Brush into surface.

2. Tie Holes: Unless indicated otherwise, after being cleaned and thoroughly dampened, fill tie hole solid with patching mortar.
3. Make any patches in concrete to closely match color and texture of surrounding surfaces. Determine mix formula for patching mortar by trial and obtain a good color match with concrete when both patch and concrete are cured and dry.
   a. Mix white and gray Portland cement as required to match surrounding concrete to produce grout having consistency of thick paint.
   b. Use a minimum amount of mixing water.
   c. Mix patching mortar in advance and allow to stand without frequent manipulation, without addition of water, until it has reached stiffest placeable consistency.
   d. After initial set, dress surfaces of patches manually to obtain same texture as surrounding surfaces.
4. After surface water has evaporated from patch area, brush bond coat into surface.
   a. When bond coat begins to lose water sheen, apply patching mortar.
   b. Thoroughly consolidate mortar into place and strike-off to leave patch slightly higher than surrounding surface.
   c. Leave undisturbed for at least 1 hour before final finish.
   d. Keep patched area damp for 72 hours or apply curing compound.
   e. Do not use metal tools in finishing an exposed patch.
5. Where as-cast finishes are indicated, total patched area may not exceed 1 in 500 of as-cast surface. This is in addition to form tie patches, if ties are permitted to fall within as-cast areas.
6. In any finishing process which is intended to expose aggregate on surface, patched areas must show aggregate.
   a. Outer 1 inch of patch shall contain same aggregates as surrounding concrete.
   b. For aggregate transfer finish, patching mixture shall contain same selected colored aggregates.
   c. After curing, expose aggregates together with aggregates of adjoining surfaces by same process.

END OF SECTION

SECTION 03 39 00

CONCRETE CURING

PART 1 GENERAL

1.1 **SECTION INCLUDES**
A. Concrete curing requirements.

1.2 **REFERENCES**
A. ACI 301: Specifications for Structural Concrete for Buildings
B. ACI 305: Hot Weather Concreting.
C. ACI306: Cold Weather Concreting
D. ASTM C 171: Standard Specification for Sheet Materials for Curing Concrete.
E. ASTM C 1315: Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.

1.3 **SUBMITTALS**
A. Curing agent data sheet.
B. Curing plan. Describe estimated cure quantity and procedure.
C. Manufacturer certificates, Section 01 33 00 that shows product meets performance criteria.
D. Manufacturer's recommended installation procedures which, when accepted by ENGINEER, will become the basis for accepting or rejecting installed product.

1.4 **QUALITY ASSURANCE**
A. Use workers knowledgeable of ACI 301, 305, 306.

1.5 **PRODUCT HANDLING**
A. Protect materials of this section before, during, and after installation.
B. Protect the work and materials of other trades.
C. In the event of damage, immediately make replacements and repair at no additional cost to OWNER.

1.6 **WEATHER LIMITATIONS**
A. Above 75 deg. F., ACI 305
B. Below 55 deg. F., ACI 306.

PART 2 PRODUCTS

2.1 **COVERS**

A. Water or Fog-spay: Clean, non-staining and non-detrimental to concrete.

B. Sheet Coverings: White waterproof paper, polyethylene film, or polyethylene coated burlap sheet complying with ASTM C 171.

C. Mat Coverings: Clean roll goods of cotton or burlap fabric.

D. Insulating Coverings: Non-staining curing blankets.

2.2 **MEMBRANE FORMING COMPOUND**

A. Material.

1. Styrene-acrylic.
2. Styrene-butadiene.
3. Alpha-methylstyrene.

B. Performance Criteria: ASTM C 1315 compound.

1. Type ID Class A (clear with fugitive dye), or
2. Type II Class A or B (white pigmented).

C. Volatile Organic Compounds (VOC): Comply with local, state and federal requirements.

PART 3 EXECUTION

3.1 **PREPARATION**

A. Do not use membrane forming curing compound on surfaces that are to receive hardeners.

B. Commence curing operation within 20 minutes after finishing.

3.2 **APPLICATION – COVERS**

A. Water: Apply water-fog spray or ponding.

B. Absorptive Mat: Place absorptive mat to provide coverage of concrete surfaces and edges. Lap over adjacent absorptive covers. Thoroughly saturate with water and keep continuously wet.

C. Moisture-Retaining Sheet: Place cover in widest practicable width with sides and ends lapped and sealed to prevent moisture loss. Repair any holes or tears during curing period.

D. Formed Surface Curing: Cure formed concrete surfaces, including underside of beams, supported slabs and other similar surfaces by moist curing with forms in place for full

curing period. If forms are removed prior to curing completion, applying cure film or penetrant or use methods indicated above, as applicable.

3.3 **APPLICATION – MEMBRANE FORMING COMPOUND**

A. Apply coating continuously and uniformly. Follow manufacturer's recommendations

B. Protect continuity of film coatings and repair damage during cure period.

C. If forms are removed before expiration of cure period, apply coating to unprotected areas.

3.4 **CONCRETE CURE TEMPERATURE**

A. During cure period, eliminate thermal shock of concrete by keeping cure temperature even throughout extent and depth of concrete.

3.5 **SCHEDULE**

A. Concrete Exposed to Potable Water (as in Water Storage reservoirs):

1. Moisture cover curing, or
2. Acrylic cure, or
3. Styreen acrylic silane co-polymer cure.

END OF SECTION

SECTION 03 61 00

CEMENTITIOUS GROUTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pre-mixed non-metallic shrinkage resistant grout, pre-mixed water stop hydraulic cement grout, epoxy grout, and portland cement grout.

1. Grout for leveling beds of structural steel plates.
2. Sealing of joints and gaps between piping and structures.
3. Sealing of joints between construction components.

1.2 REFERENCES

A. ASTM C 109: Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 in. or 50 mm Cube Specimens).

B. ASTM C 144: Standard Specification for Aggregate for Masonry Mortar.

C. ASTM C 150: Standard Specification for Portland Cement.

D. ASTM C 190: Standard Test Method for Tensile Strength of Hydraulic Cement Mortars.

E. ASTM C 207: Standard Specification for Hydrated Lime for Masonry Purposes.

F. ASTM C 472: Standard Methods for Physical Testing of Gypsum Plasters and Gypsum Concrete.

G. ASTM C 595: Standard Specification for Blended Hydraulic Cements.

H. ASTM C 881: Standard Specification for Epoxy -Resin -Base Bonding Systems for Concrete.

I. ASTM C 1090: Standard Test Method for Measuring Changes in Height of Cylindrical Specimens from Hydraulic-Cement Grout.

J. ASTM C 1107: Standard Specification for Packaged Dry Hydraulic Cement (Non-Shrink).

K. ASTM C 1157: Standard Performance Specification for Blended Hydraulic Cement.

L. ASTM D 570: Standard Test Method for Water Absorption of Plastics.

M. ASTM D 638: Standard Test Method for Tensile Properties of Plastics.

N. ASTM D 695: Standard Test Method for Compressive Properties of Rigid Plastics.

1.3 SUBMITTALS

A. Grout mix components. Indicate proportions used, environmental conditions, and admixture limitations. Indicate material "Type", "Grade", and "Class" which suits Project requirements.

B. Manufacturer's data for latex bonding agent.

PART 2 PRODUCTS

2.1 MATERIALS -GENERAL

A. Cement:

1. ASTM C 150 natural color Type II (normal) or Type IIA (air entrained).
2. ASTM C 595, or C 1157: Blended.

B. Lime: ASTM C 207, Type S, hydrated.

C. Water: Clean, non-staining and non-detrimental.

D. Grout Aggregate: ASTM C 144, standard masonry type.

2.2 PORTLAND CEMENT GROUT

A. Proportions by Volume: 1 part Portland cement, and sand equal to 2-1/2 to 3 times sum of volumes of cement and lime.

B. Mix thoroughly with water to form a stiff workable plastic putty.

C. Compressive Strength: ASTM C 109, 2800 psi in 28 days.

2.3 GYPSUM PLASTER GROUT

A. Premixed, prepackaged, wood fiber gypsum plaster with an ASTM C 472 minimum average dry compressive strength of 2000 psi in 28 days.

B. Mix with water per manufacturer's instructions for intended use to form a stiff plastic mix required for workability.

2.4 CEMENT BASED SHRINKAGE RESISTANT GROUT

A. Grade B or grade C premixed, non-metallic, non-gaseous product; ASTM C 1107 at a fluid consistency (flow cone) of 20 to 30 seconds. Thirty-minute-old grout shall flow through flow cone after slight agitation, in temperatures of 40 deg. F. to 90 deg. F.

B. Bleeding: None.

C. Compressive Strength: 6500 to 9000 psi, ASTM C 109 in 28 days.

D. Non-shrink percentage: 0.5 percent, ASTM C 1090.

2.5 EPOXY ADHESIVE GROUT

A. Two component material suitable for use on dry or damp surfaces, 100 percent solids, high modulus, moisture insensitive, complying with ASTM C 881.

1. Tensile Strength: ASTM D 638, 5000 psi, minimum in 14 days.
2. Tensile Elongation: ASTM D 638, 2 percent minimum.

3. Compressive Strength: ASTM D 695, 6500 psi minimum in 24 hours and 70 deg. F., 12,500 psi in 28 days and 70 deg. F.
4. Water Absorption: ASTM D 570, 1 percent maximum.
5. Bond Strength:
   a. Direct Shear: 400 psi.
   b. Direct Tension: 250 psi.
   c. Beam Break: 800 psi.
6. Pot Life: 5 minutes maximum at 70 deg. F.

2.6 **BONDING GROUT**

A. Of approximately 1 part cement to 1 part fine sand passing a No. 30 sieve with approved latex bonding agent when allowed.

2.7 **PNEUMATICALLY PLACED PLASTER ("GUNITE" OR "SHOTCRETE")**

A. Materials: Portland cement, lime, water and sand.

B. Compressive Strength: ASTM C 109, 2800 psi in 28 days.

C. Proportioning: 1 part cement to not more than 5 parts sand.

PART 3 EXECUTION

3.1 **INSTALLATION**

A. Fill joints, voids, and pockets, completely.

B. Comply with manufacturer's instructions and UBC Chapter 47.

C. Finish surfaces exposed to view smooth.

D. Pneumatically Placed Plaster: Screened and reused rebound material in an amount not greater than 25 percent of the total sand in any batch.

END OF SECTION

SECTION 31 05 10

BOUNDARY MARKERS AND SURVEY MONUMENTS

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Materials and procedures for installing boundary markers and survey monuments.

1.2 **PERFORMANCE REQUIREMENTS**

A. Identify the land surveyor who set the marker plates and reference marks.

B. For vertical control datum use Mean Sea Level datum adjusted by United States Coast and Geodetic Survey for the location of survey.

C. Vertical Accuracy: 3rd order.

D. Make all individual tape measurements to the nearest 0.01 of a foot, with tape corrections for temperature, sag, suspension, etc. noted on all field notes requiring such measurements.

E. Horizontal Accuracy:

1. 1:10,000 minimum for urban areas.
2. 1:20,000 minimum for metropolitan areas.

1.3 **SUBMITTALS**

A. Survey notes and drawings showing:

1. All monuments found, set, reset, or replaced, describing their kind, size, and location and giving other data relating thereto.
2. Lines of survey, concrete structures containing reference marks, types of marks installed, distances and angles from monument referenced.
3. Witness monuments, basis of bearings, bearings, length of lines to monuments or corners witnessed and scale of drawing.
4. Errors of closure and method of adjustment.
5. Memorandum of oaths and certificates.
6. Narrative describing purpose of survey.
7. Any other data necessary for the interpretation of the various items and locations of the points, lines, and areas shown.

B. Copies of plats filed with the County Recorder.

1.4 **QUALITY ASSURANCE**

A. Use a land surveyor who complies with Utah licensing law and who is acceptable to

the OWNER to supervise the setting or resetting of monuments and boundary markers.

B. Make surveys in conformance with the accepted practice of land surveying and comply with all pertinent Laws and Regulations of land survey regulatory agencies and authority having jurisdiction.

PART 2 PRODUCTS

2.1 MONUMENT

A. Monument Post: Minimum 3 feet long, precast or cast-in-place concrete. Make exposed surface of finished monument posts uniform, even texture, and free of holes, cracks, and chipped edges.

B. Marker Plate: Brass or bronze or as indicated.

2.2 FRAME AND COVER

A. Asphalt coated, heavy duty, cast iron, Section 05 56 00.

2.3 LOT LINE WITNESS MARKER

A. Brass surveyor's tag or brass nail set in a lead filled hole in concrete.

2.4 REBAR CORNER MARKER

A. No. 5 rebar, at least 18 inches long with the top fitted with a nonferrous survey cap and stamped with land surveyor's registration number.

2.5 PIPE CORNER MARKERS

A. 1 inch internal diameter galvanized steel pipe at least 18 inches long, or 2 inches internal diameter galvanized steel pipe at least 36 inches long.

B. Fit pipe with concrete or mortar plug, tagged with surveyor's license number.

C. Fix tag in concrete or mortar plug with a 1 inch minimum long bent brass brad.

2.6 FIELD NOTE PAPER

A. 20 pound bond paper minimum with format of documents acceptable to OWNER.

2.7 CONCRETE

A. Cast-in-place: Class 4000 minimum, Section 03 30 04 or

B. Precast: Class 5000 minimum, Section 03 40 00.

PART 3 EXECUTION

3.1 PREPARATION

A. Identify utility locations, Section 01 31 13.

B. Excavation, Section 31 23 16.

3.2 HORIZONTAL CONTROL

A. Set base horizontal ground control upon a minimum of 2 United States Coast and Geodetic Survey triangulation stations or equivalent, and tie to the Lambert Conformal Conic Projection for Establishment of the State Plane Coordinate System with Local Datum Adjustment within the Project area.

3.3 BEARING BASE

A. Refer all directional measurements to one "bearing base". Actual measurements may be equated to bearings and linear measurements shown on any record (i.e., plats, official maps, descriptions, or approved field notes of lines resurveyed that are shown on such records used in the survey).

3.4 TIE TO EXISTING MONUMENTS

A. Tie into a monument which has State Plane Coordinates if the monument is within 1/2 mile of the proposed survey site or at a selected location.

3.5 CORNER MARKERS

A. Site Boundary: Install pipe corner markers.

B. Lot Boundary: Install rebar corner markers for lot corners. Do not use rebar where pipe corner markers are installed as a boundary marker and a corner marker.

3.6 LOT LINE WITNESS MARKER

A. Witness all lot lines by installing 1/2 inch surveyor tags in sidewalk. If sidewalk does not exist, install tags in curb or mass concrete.

3.7 MONUMENTS

A. Locate monument post so reference point falls within 1 inch diameter circle in the center of marker plate. Install marker plate in survey monument post before the concrete has acquired its initial set.

B. Compact backfill soil; Section 33 05 05 to a Modified Proctor Density of 95 percent or greater.

C. Set top of frames and covers 1/4 inch lower than Pavement surface. Recess marker

plate a minimum of 4 inches below cover.

D. Install monument so frame and cover does not contact monument or marker plate.

3.8 **DAMAGED MONUMENTS**

A. Replace survey control monuments which are disturbed or destroyed by CONTRACTOR.

B. If OWNER allows replacement of project survey control monuments which are lost or destroyed, use a licensed land surveyor to re-establish control monuments based upon original survey control.

3.9 **REFERENCE MARKS**

A. Section 01 17 24.

END OF SECTION

SECTION 31 05 13

COMMON FILL

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Common fill materials.

1.2 **REFERENCES**

A. ASTM C 136: Standard Method for Sieve Analysis of Fine and Coarse Aggregates.

B. ASTM D 1883: Standard Test Method for CBR (California Bearing Ratio) of Laboratory-Compacted Soils.

C. ASTM D 2487: Standard Test Method for Classification of Soils for Engineering Purposes.

D. ASTM D 2844: Test Method for Resistance R-Value and Expansion Pressure of Compacted Soils.

E. ASTM D 3282: Standard Practice for Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes.

F. ASTM D 3740: Standard Recommended Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

1.3 **SUBMITTALS**

A. Prior to delivering material to site, identify.

1. Name of Supplier and source, And.
2. Gradation of common fill material.

B. If a change in source of material is required, submit name of Supplier, source and gradation analysis of material prior to delivery to site.

1.4 **QUALITY ASSURANCE**

A. Use a laboratory that follows and complies with Section 01 45 00 and ASTM D 3740.

B. Reject common fill products that do not meet requirements of this section.

C. Remove any product found defective after installation and install acceptable product at no additional cost to OWNER.

1.5 **ACCEPTANCE**

A. General:

1. Acceptance is by Lot. One Lot is one day's production.
2. Dispute resolution; Section 01 35 10.

B. Roadway Backfill: Sub-lot size is 5,000 tons.

PART 2 PRODUCTS

2.1 **BORROW**

A. Classifications A-1-a through A-4, ASTM D 3282.

2.2 **GRANULAR BORROW**

A. Classifications A-1-a, A-1-b, A-2-4, or A-3, ASTM D 3282.

B. Material meets design CBR-value (ASTM D 1883) or R value (ASTM D 2844) for suitability of source, not for project control testing.

2.3 **GRANULAR BACKFILL BORROW**

A. Classification A-1, ASTM D 3282.

B. Well graded.

C. Particle size; 2 inch maximum.

D. Material meets design CBR-value (ASTM D 1883) or R value (ASTM D 2844) for suitability of source, not for project control testing.

2.4 **RECYCLED FILL**

A. Material: Pulverized portland cement concrete, pulverized asphalt pavement or combination, either mixed with or not mixed with a new aggregate.

B. Gradation: Meet the requirements of this Section based upon use; e.g. borrow, granular borrow, granular backfill borrow, etc.

2.5 **NATIVE**

A. When allowed by ENGINEER, material obtained from Excavations may be used as fill, provided organic material, rubbish, debris, and other objectionable materials are removed and CONTRACTOR has submitted the appropriate Proctor data (see Section 33 05 05).

2.6 **CLAY**

A. Classification CL, CL-ML, or ML, ASTM D 2487.

B. Free of organic matter, frozen material, debris, rocks, and deleterious materials.

C. Homogeneous, relatively uniform.

2.7 **SAND**

A. Friable river or bank aggregate, free of loam and organic matter. Graded as follows:

Sieve	Percent Passing by Weight
3/8	100
100	1 - 10

2.8 **GRAVEL**

A. Material: Rock, stone, or other high quality mineral particle or combination.

B. Gradation: ASTM D 448 narrow band.

1. **Sewer Rock.**

Nominal Size	ASTM Size No.
3.5 to 1.5"	1
2.5 to 1.5"	2
2 to 1"	3
1.5 to 3/4"	4
1 to 1/2"	5

2. **Pea Gravel**.

Nominal Size	ASTM Size No.
3/4 to 3/8"	6
1/2 to No. 4	7
3/8 to No. 8	8
No. 4 to No. 16	9
No. 4 (screenings)	10

2.9 **TOPSOIL**

A. Chemical Characteristics:

1. Acidity/alkalinity range: pH 5.5 to 7.7
2. Soluble Salts: Less than 2.0 mmhos/cm.
3. Sodium Absorption Ratio (SAR): less than 3.0
4. Nitrogen (NO3N): 48 ppm minimum
5. Phosphorus (P): 11 ppm minimum
6. Potash (K): 130 ppm minimum

7. Iron (Fe): 5.0 ppm minimum

B. Physical Characteristics:
1. Fertile, loose, friable.

2. Containing more than 2 percent organic matter.

3. Free of weeds, subsoil, lumps or clods of hard earth, plants or their roots, sticks, toxic minerals, chemicals and stones greater than 1-1/2 inch diameter.

4. Composition

Material	Percent Passing
Sand	15 – 60
Silt	10 – 70
Clay	5 – 30

2.10 **SOURCE QUALITY CONTROL**

A. Verify gradation, ASTM C 136.

B. Select Samples on a random location and time basis.

C. If tests indicate materials do not meet specified requirements, change materials and retest at no additional cost to OWNER.

PART 3 EXECUTION

3.1 **INSTALLATION**

A. Trenches, Section 33 05 20.

B. Structures or landscaping, Section 31 23 23.

C. Pavements, Section 32 05 10.

END OF SECTION

SECTION 31 05 19

GEOTEXTILES

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Geotextile fabrics.

1.2 **REFERENCES**

A. ASTM D 146: Standard Methods of Sampling and Testing Bitumen-Saturated Felts and Woven Fabrics for Roofing and Waterproofing.

B. ASTM D 276: Standard Test Methods for Identification of Fibers in Textiles.

C. ASTM D 882: Standard Test Methods for Tensile Properties of Thin Plastic Sheeting.

D. ASTM D 3786: Standard Test Method for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics -Diaphragm Bursting Strength Tester Method.

E. ASTM D 4354: Standard Practice for Sampling of Geotextiles for Testing.

F. ASTM D 4355: Standard Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon -Arc Type Apparatus).

G. ASTM D 4491: Standard Test Methods for Water Permeability of Geotextiles by Permittivity.

H. ASTM D 4533: Standard Test Method for Trapezoid Tearing Strength of Geotextiles.

I. ASTM D 4632: Standard Test Method for Breaking Load and Elongation of Geotextiles (Grab Method).

J. ASTM D 4751: Standard Test Method for Determining Apparent Opening Size for a Geotextile.

K. ASTM D 4759: Standard Practice for Determining Specification Conformance of Geosynthetics.

L. ASTM D 4833: Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.

M. ASTM D 4873: Standard Guide for Identification, Storage, and Handling of Geotextiles.

N. ASTM E 96: Standard Test Methods for Water Vapor Transmission of Materials.

O. ASTM E 154: Standard Methods of Testing Materials for Use as Vapor Barriers Under Concrete Slabs and as Ground Cover in Crawl Spaces.

1.3 **DEFINITIONS**

A. MARV (acronym for minimum average roll value): A statistical value of a particular test

property embracing 95 percent confidence level of all possible values of that property. For a normally distributed set of data, it is approximately the mean value plus and minus two standard deviations.

1.4 **SUBMITTALS**

A. Submit prior to use:

1. Sample of geotextile.
2. Manufacture's certificate that each fabric complies with requirements of this section.

1.5 **DELIVERY STORAGE AND HANDLING**

A. Label fabric, ASTM D 4873.

B. Deliver geotextile dry, in a wrapping that protects it from the elements during shipping and storage. Keep fabric dry.

C. Protect geotextile from ultraviolet light and temperature greater than 140 deg. F. until application.

1.6 **QUALITY ASSURANCE**

A. Provide manufacturer's on-site technical supervision and assistance.

PART 2 PRODUCTS

2.1 **GEOTEXTILE -GENERAL**

A. Stated values are for non-critical, non-severe applications.

B. Fabric consists of synthetic fibers at least 85 percent by weight of polyolefins, polyesters or polyamides.

C. Resistant to chemical attack, rot and mildew.

D. No tears or defects that adversely alter fabric's physical properties.

E. All numerical values represent minimum average roll values in the weaker principal direction.

2.2 **STABILIZATION-SEPARATION GEOTEXTILES**

A. Woven or non-woven fabric. Meet the following properties and survivability ratings.

Table 1 – Stabilization-Separation Geotextile

Property	ASTM	MARV			
		Moderate		High	
		Woven	Non-woven	Woven	Non-woven
Grab Tensile Strength, lbs.	D 4632	180	115	270	180
Grab Elongation, percent	D 4632	<50	>50	<50	>50
Trapezoid Tear, lbs.	D 4533	70	40	100	75
Puncture Resistance, lbs.	D 4833	70	40	100	60
Apparent Opening Size, (AOS-US Sieve)	D 4751	≥30	≥60	≥30	≥60
Construction Survivability					
Subgrade, CBR		1		1 – 2	
Tire Pressure, psi		<50	>50	<50	>50
6 inches Cover		NR	NR	H	H
12 inches Cover	18	NR	NR	H	M
inches Cover		H	M	M	M

Where H = High; M = Medium; NR = Not Recommended

Property	ASTM	MARV	
		Standard	High
Grab Tensile Strength, lbs. (a)	D 4632	90	120
Grab Elongation, percent	D 4632	< 40	< 40
Flux, gal/min/ft2	D 4491	15	90
Apparent Opening Size, (AOS-US sieve)	D 4751	> 20	> 30
Ultraviolet Degradation, percent	D 4355	70	90

NOTES
(a) Percent of tensile strength retained determined after weathering, ASTM D 4355 for 500 hours.

2.3 **SILT FENCE GEOTEXTILE**

A. Use woven fabric. Meet standard or high performance properties.

Table 2 – Silt Fence Geotextile

B. High performance fence to have tape yarns in one principle direction only.

C. Add stabilizers or inhibitors to make the filaments resistant to sunlight or heat deterioration.

D. Finish edges to prevent outer yarn from pulling away from the fabric.

E. Sheets of fabric may be sewn or bonded together. Provide minimum width recommended by manufacturer.

F. No deviation from any requirement in Table 2 due to the presence of seams.

G. Manufactured with pockets for posts, hems with cord, or with posts pre-attached using staples or button head nails.

2.4 **EROSION CONTROL GEOTEXTILES**

A. Use woven or non-woven fabric.

Table 3 – Erosion Control Geotextile

Property	ASTM	MARV		
		Class A	Class B	Class C
Grab Tensile Strength, lbs. (a)	D 4632	300	200	100
Grab Elongation, percent	D 4632	>15	>50	>50
Puncture Resistance, lbs.	D 4833	100	60	30
Trapezoid Tear, lb.	D 4533	80	50	40
Flux, gal/min/ft^2	D 4491	25	25	25
Apparent Opening Size, (AOSUS sieve)	D 4751	>59	>59	>59
Ultraviolet Degradation, percent	D 4355	70	70	70
Permittivity, sec.$^{-1}$ (b)	D 4491	0.1	0.1	0.1

NOTES
(a) Percent of tensile strength retained determined after ultraviolet weathering, ASTM D 4355 for 500 hours.
(b) This number reflects typical not minimum values for this test method only. The k value of the geotextile shall be greater than the k value of the soil.

B. Class A erosion control applications are those where the geotextile is used under conditions where installation stresses are greatest (more severe than Class B, i.e., stone placement height should be no more than 5 feet and stone weights should not exceed 250 pounds.

C. Class B erosion control applications for geotextiles are used under conditions where

installation stresses are more severe than Class C, i.e., stone placement height should be less than 3 feet and stone weights should not exceed 250 pounds.

D. Class C erosion control applications are those where the geotextile is used in structures or under conditions where the geotextile is protected by a sand cushion or by "zero drop height" placement of stone.

2.5 **ROADWAY PAVEMENT GEOTEXTILES**

A. Sheet Fabric: Non-woven. Heat bonded only on one side to assist in preventing bleed through of tack coat and sticking of fibers to wheels of laydown equipment.

Table 4 – Roadway Paving Geotextile

Property	ASTM	MARV	
		Standard	Heavy Duty
Grab Tensile Strength, lbs. (a)	D 4632	80	120
Grab Elongation, percent	D 4632	50	50
Asphalt Retention, gal/yd2		0.2	0.3
Melting Point, deg. F.	D 276	300	300
Ultraviolet Degradation	D 4355	70	70
Apparent Opening Size, (AOSUS sieve)	D 4751	60	60

NOTES
(a) Percent of tensile strength retained determined after ultraviolet weathering, ASTM D 4355 for 500 hours.

B. Crack Patch Fabric: Needle-punched non-woven coated with asphalt cement and a rubberized asphalt adhesive.

Table 5 – Crack Patching Geotextile

Property	ASTM	MARV
Strip Tensile, lbs/in (a)	D 882	50
Puncture resistance, lb	E 154	200
Permeance, perms	E 69 Method B	0.10 (max)
Pliability (b)	D 146	No crack in fabric or rubberized asphalt

NOTES
(a) Using 12 in/min test speed and 1" initial distance between grips.
(b) Using 180 degree bend on 1/4" mandrel at –25 deg. F.

2.6 **DRAINAGE GEOTEXTILES**

A. Use non-woven fabric.

Table 6 – Drainage Geotextile

Property	ASTM	MARV	
		Class A	Class B
Grab Tensile Strength, lbs. (a)	D 4632	200	100
Grab Elongation, percent	D 4632	>50	>50
Puncture Strength, lbs.	D 4833	60	30
Trapezoid Tear, lbs.	D 4533	50	40
Flux, gal/min/ft2	D 4491	25	25
Apparent Opening Size,(AOS -US Sieve)	D 4751	>59	>59
Permittivity, sec. -1 (b)	D 4491	0.1	0.1

NOTES

(a) Percent of tensile strength retained determined after ultraviolet weathering, ASTM D 4355 for 500 hours.
(b) The k value of the geotextile shall be greater than the k value of the soil. This number reflects typical not minimum values for this test method only.

B. Class A drainage applications are for fabrics where installation stresses 399 are more severe than Class B, i.e. very coarse sharp angular aggregate is used, a heavy degree of compaction (greater than or equal to 95 percent Standard Proctor, Section 31 23 36) is specified or depth of Trench is greater than 10 feet deep.

C. Class B drainage applications are those where fabric is used with smooth graded surfaces having no sharp angular projections, no sharp angular aggregate, compaction requirements are light, (less than 95 percent Standard Proctor, Section 31 23 36), and Trenches are less than 10 feet deep.

2.7 **WEED BARRIER GEOTEXTILE**

A. Use non-woven fabric.

Table 7 – Weed Barrier Geotextile

Property	ASTM	MARV
		Standard
Grab Tensile Strength, lbs. (a)	D 4632	90
Grab Elongation, percent	D 4632	>50
Puncture Strength, lbs.	D 4833	25
Trapezoid Tear, lbs.	D 4533	30
Apparent Opening size (AOS -US Sieve)	D 4751	>49
Ultraviolet Degradation, percent	D 4355	70

NOTES
(a) Percent of tensile strength retained determined after ultraviolet weathering, ASTM D 4355 for 500 hours.

2.8 **POSTS**

A. Minimum length: 4 feet.

B. Steel: Round, U shaped, T shaped, or C shaped with a minimum weight of 1.3 pounds per foot, and have projections for fastening wire.

C. Wood as follows:

1. Soft wood posts at least 3 inches in diameter, or nominal 2 x 4 inches and straight to provide a fence without noticeable misalignment.
2. Hard wood post providing a minimum cross sectional area of 2.25 square inches.

D. Fasteners for Wooden Posts:

1. Wire staples No. 17 gage minimum with a crown at least 3/4 inches wide and legs at least 1/2 inch long. Nails 14 gage minimum, 1 inch long with 3/4 inch button heads.

2.9 **SOURCE QUALITY CONTROL**

A. Sampling practices, ASTM D 4354.

B. Conformance verification, ASTM D 4759.

PART 3 EXECUTION

3.1 **STABILIZING POOR LOAD BEARING SOILS**

A. Remove all organic material larger than 1 inch in diameter from the Subgrade and grade to elevations required for overlaying backfill.

B. Compact Subgrade to the extent allowed by the condition of the substrate.

C. Roll fabric onto Subgrade so Subgrade remains smooth. Do not drag.

D. Fold or overlap geotextile in direction of drainage.

E. Provide fabric overlap joints as follows.

Table 8 – Geotextile Overlap

Soil CBR Rating	Overlap Required	
	Unsewn, inches	Sewn, inches
Less than 1	–	4
1-2	36	4
2-3	30	3
3-5	24	–
Greater than 5	18	–

NOTES
(a) Sewn seams, both factory and field seams shall conform to 90 percent of the grab tensile strength requirements.

F. Place granular material on top of fabric and spread carefully to insure no puncture. Minimum backfill lift on fabric; 6 inches.

G. Cover fabric with 12 inches of sand before placing rock larger than 4 inches diameter on top of fabric.

H. Avoid sudden stops or turning motions by equipment operating on aggregate placed over the fabric.

I. Compact backfill soils over fabric; Section 33 05 05 to a Standard Proctor Density of 95 percent or greater.

J. Repair any puncture by covering with new fabric using the same overlap dimensions indicated in Table above.

3.2 **SILT FENCE**

A. Beginning work means acceptance of existing conditions.

B. The quantity of temporary silt fences may be increased, decreased, or eliminated entirely

at CONTRACTOR's discretion at no additional cost to OWNER. Maintain the silt fence until the Work is accepted or until the fence and silt accumulations are removed.

C. Clear area of any debris and obstructions that may damage geotextile.

D. Place post in all low points.

E. Install posts a maximum of 8 feet apart with at least 18 inches in the ground. If not possible to achieve depth, secure posts to prevent overturning.

F. Attach filter fabric by wire, cord, pockets, staples, nails, or other effective means.

1. When using a wire support fence, provide at least 6 horizontal wires with a minimum of 12 gage wire. Space vertical wires 6 inches maximum. Secure geotextile to the up slope side of the post. Extend wire into the Trench a minimum of 2 inches and extend a maximum or 36 inches above the ground surface.

G. Install fabric so 6 to 8 inches of fabric is left at the bottom to be buried. Splice together only at support posts with any a minimum overlap of 18 inches. Extend buried portion 6 inches deep and the rest upstream of the fabric fence.

H. Sediment Removal: Remove sediment before deposit reaches 1/2 of the height of the silt fence, or extend height of silt fence. After removal of sediment, dress landscape.

I. Schedule of Locations: Typical locations include the toe of fill slopes, the downhill side of fill slopes, the downhill side of large cut areas, and at natural drainage areas. Limit geotextile materials to handle an area equivalent to 1,000 square feet per 10 feet of fence. Use caution should site slope be steeper than 1:1, and water flow rates exceed 1 cubic foot per second per 10 feet of fence face.

3.3 EROSION CONTROL

A. Install fabric in locations shown on the Drawings.

B. Unless otherwise specified, the geotextile shall be overlapped a minimum of 2 feet at all longitudinal and transverse joints, or the geotextile shall be sewn.

C. If overlapped, the geotextile shall be placed so that the upstream sheet overlaps the downstream sheet.

D. For placement on slopes, each strip shall overlap the next downhill strip.

E. The geotextile shall be anchored using key Trenches or aprons at the crest and toe of the slope.

F. Pins, usually 18 inches in length, may be helpful in securing the geotextile during installation.

G. Repair: Place patch over damaged area and extend 3 feet beyond the perimeter of the tear or damage.

3.4 ROADWAY PAVING FABRICS

A. Preparing Asphalt Concrete Surface:

1. Brush road surface clean of debris, dust and gravel. Remove all water from surface and allow to dry.
2. Patch holes and level any uneven areas with asphalt concrete.
3. Fill cracks between 1/8 inch to 1/2 inch with asphalt cement. Allow cement to cure prior to geotextile placement.
4. Clean cracks larger than 1/2 inch to a depth of 3 inches and fill with asphalt concrete. Where Pavement is severely cracked, rutted, deformed or distressed, secure approval for providing an asphalt concrete leveling course prior to geotextile placement.

B. Tacking Asphalt Surface for Pavement Fabric: Use tack asphalt recommended by fabric manufacturer. Apply tack as follows:

1. Dry Pavement surface; 0.20 to 0.30 gallons per square yard. Within street intersections, on steep grades and in zones where vehicle speed changes are commonplace, reduce the application rate to no less than 0.20 gallons per sq.yard.
2. Heavy duty fabrics; 0.30 to 0.40 gallons per square yard.
3. Provide a tack width equal to geotextile width plus 6 inches.
4. Apply tack only as far in advance of geotextile installation as is appropriate to insure a tacky surface at the time of geotextile placement.
5. Allow tack time to cure with no moisture remaining prior to placing the geotextile and overlay.
6. Clean excess tack material from the road surface.

C. Placement of Fabric:

1. Place paving fabric into the asphalt with a minimum amount of wrinkling or folding. Wrinkles or folds in excess of 1 inch shall be slit and laid flat.
2. Shingle-lap all transverse joints and slit folds or wrinkles in the direction of the paving operation.
3. Maximize geotextile contact with the Pavement surface by brooming or pneumatic rolling.
4. Additional hand-placed asphalt may be required at laps and repairs.

D. Protection and Repair:

1. Do not allow traffic except necessary construction equipment and emergency vehicles to drive on the fabric.
2. Turn paver and other vehicles gradually and keep turning to a minimum to avoid movement and damage to the geotextile. Do not permit abrupt starts and stops.
3. Remove and replace damaged geotextile with the same type of geotextile, and shingle-lap the overlaps in the direction of paving. Restrict overlaps to a maximum of 6 inches.

3.5 SUBSURFACE DRAINAGE

A. Excavate Trench to size and depth indicated.

B. Cut fabric to width required and place in Trench. Prevent damage to geotextile.

C. Overlap geotextile 12 inches or the full width of the Trench, whichever is less at the top of the Trench.

D. Overlap successive pieces of geotextile a minimum of 12 inches in the direction of

flow.

E. Place fill to hold fabric in place.

F. Repair any damage to geotextile by placing patches extending 3 feet in all directions beyond the damaged area.

3.6 **WEED BARRIER**

A. Preparation:

1. Remove sharp objects, large stones and undesirable vegetation.
2. If placing geotextile over existing bed, cut an "X" over each plant and push geotextile under plant base. If placing over new bed, roll geotextile over soil and cut an "X" for each plant hole. Fold excess geotextile under and cover with specified landscaping materials.

B. Surface Cover: Provide a minimum of 4 inches of cover on all areas on the geotextile unless otherwise specified by ENGINEER. If using large landscape rock, increase thickness of cover material over geotextile to 3 times the diameter of the largest rock material. Do not leave any portion of geotextile exposed to direct sunlight.

C. Repair: Repair immediately. Clear the damaged area plus an additional 3 feet and apply geotextile patch.

D. Maintenance: Maintain surfaces and supply additional landscape materials where necessary, including areas affected by erosion.

3.7 **FIELD QUALITY CONTROL**

A. Reject fabric at the time of installation, if it has defects, rips, holes, flaws, deterioration, or damage incurred during manufacture, transportation, handling or storage.

END OF SECTION

SECTION 31 23 16

EXCAVATION

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Excavation and disposal of excavated materials.

B. Protection of existing facilities, utilities, and structures affected by excavation.

1.2 **DEFINITIONS**

A. Extra Excavation: Upper limit of Excavation is proposed excavation limit. Lower and lateral limits are as authorized by ENGINEER.

B. Classified Excavation: The excavation of specified materials.

C. Incidental Excavation: Excavation done for CONTRACTOR's benefit, excavation error, dewatering of Excavation, slough, or over-break.

D. Unclassified Excavation: The excavation of all materials encountered regardless of the nature, size, or manner in which they are removed. Presence of isolated boulders or Rock fragments will not be sufficient cause to change classification of surrounding materials.

1.3 **STORAGE AND HANDLING**

A. Stockpile excavated material to cause a minimum of inconvenience to public and provide for emergency services as necessary.

B. Provide free access to all existing fire hydrants, water and gas valves, and meters.

C. Provide free flow of storm water in all gutters, conduits, and natural water courses.

D. Utilize traffic control signs, markers, and procedures in product storage and handling activities.

E. Promptly remove other material from site.

1.4 **SITE CONDITIONS**

A. Prior to excavation, photograph existing surfaces along which work may take place in order to determine, after construction is completed, whether any damage to existing improvements occurred prior to construction operations. Refer to construction photograph requirements, Section 01 78 39.

B. Perform Incidental Excavation at no additional cost to OWNER.

PART 2 PRODUCTS

2.1 **MATERIALS FOR OVER EXCAVATED AREAS**

A. Common fill, Section 31 05 13.

B. Crushed aggregate base, Section 32 11 23.

C. Stabilization fill, crushed aggregate base or common fill with maximum rectilinear particle size of 2 inches.

D. Stabilization fabric, Section 31 05 19.

PART 3 EXECUTION

3.1 **PREPARATION**

A. Use white paint and mark the proposed Excavation.

B. Call the one-call center and wait the required amount of time. Color of one call center marks indicate the following.

1. White: Proposed Excavation
2. Pink: Temporary survey markings
3. Red: Electric power lines, cables, conduit and lighting cables
4. Yellow: Gas, oil, steam, Petroleum or gaseous materials
5. Orange: Communications, alarm, signal, cables or conduits.
6. Blue: Potable water.
7. Purple: Reclaimed Water, irrigation and slurry lines
8. Green: Sewer and storm drain lines

3.2 **PROTECTION**

A. Identify required lines, grades, contours, and benchmarks, Section 01 71 23.

B. Pothole, expose or otherwise locate utilities as necessary to give utility company at least 4 days notice to protect, preserve, or relocate a utility that interferes with or may be damaged by excavation work.

C. Where utilities or structures conflict with design grades, report conflict to the appropriate utility company and ENGINEER 14 days prior to the initiation of work within the conflict area.

D. For temporary controls, refer to Section 01 57 00.

E. Support and protect from damage any existing facility and structure that exists in, passes through, or passes under the site.

F. No Contract Time extension shall be granted and no additional compensation shall be made if CONTRACTOR fails to pothole and identify buried utilities or structures which conflict with the Work.

3.3 **TOPSOIL**

A. Excavate topsoil only to depth that will preserve topsoil quality.

B. Do not mix topsoil with subsoil during stockpiling or spreading.

3.4 **LANDSCAPE SPRINKLER SYSTEMS**

A. Protect existing landscape sprinkler systems.

B. When disturbance of existing sprinkler system is required, interrupt and repair system so operation of system is maintained.

3.5 **SHORING**

A. .Slope, shore, sheet, brace or otherwise support Excavations over 4 feet deep, Section 31 41 00.

B. When soil conditions are unstable, Excavations shallower than 4 feet deep must also be sloped, supported or shored.

3.6 **DEWATERING**

A. Keep Excavation free from surface and ground water.

B. If ground water table is in the intended construction operations, dewater Excavations.

C. If there are no olfactory or visual indications of contamination in the water, discharge according to requirements of Federal, State or local agency having jurisdiction.

D. If any evidence of contamination in the water, based on olfactory or visual indications, cease excavation work until potential risks are evaluated. During evaluation, handle water as a contaminated material.

E. Pay for damages and costs resulting from dewatering operations.

3.7 **GENERAL EXCAVATION REQUIREMENTS**

A. Excavate topsoil from areas to be relandscaped or regraded and other marked areas.

B. Excavate site to line and grade indicated.

C. Carefully excavate soils in vicinity of buried utility marks placed by the one-call center.

D. Where soil has been softened or eroded by flooding or hardened by drying during unfavorable weather, rework all damaged areas or replace with approved material at no additional cost to OWNER.

E. Notify ENGINEER of unexpected subsurface conditions.

F. Underpin adjacent structure, service utilities and pipe chases that may be damaged by Excavation work.

G. Protect Excavation walls as required. If conditions permit, slope Excavation Sides to maintain a safe and clean working area. Remove loose materials.

H. Where ENGINEER deems Subgrade material to be susceptible to frost heave or

otherwise unsatisfactory, excavate additional depth.

3.8 **ROADWAY EXCAVATION**

A. In advance of setting line and grade stakes, clean Subgrade area of brush, weeds, vegetation, grass, and debris. Drain all depressions or ruts that contain water.

B. Backfill and compact over excavation, Section 33 05 05.

3.9 **STRUCTURAL AND LANDSCAPE EXCAVATION**

A. Provide Shoring, cribs, cofferdams, caissons, pumping, bailing, draining, sheathing, bracing, and related items.

B. For piling work, coordinate special requirements for piling. Protect Excavation walls.

C. If conditions permit, slope Excavation Sides as excavation progress. Maintain a safe and clean working area.

D. Support Excavations. Do not interfere with the bearing of adjacent foundations, pipelines, etc.

3.10 **TRENCH EXCAVATION**

A. Grade bottom of Trenches to provide uniform bearing surface.

B. If necessary, make bellholes and depressions required to complete joining of pipe or box.

C. Limit width of Trench excavations to the dimensions suitable for worker access per pipe manufacturer's recommendation. Provide enough space for compaction equipment. Notify ENGINEER if excavation operations exceed any indicated line and grade limits.

D. In public thoroughfares and regardless of Trench depth, limit length of open Trenches to 200 lineal feet day or night. Provide barricading, Section 01 55 26. Protect Trenches over night.

3.11 **EXTRA EXCAVATION**

A. If unstable material is encountered at the bottom or face of any Excavation, do not perform extra excavation without written consent.

B. Correct excavations beyond the specified lines and grades by filling and compacting the resulting voids with acceptable fill.

C. Volume of Excavation within any specified pay limit will be determined by the method of average-end-areas in the original position.

3.12 **TOLERANCE**

A. Grading: Top surface of Subgrade = plus or minus 1 inch.

END OF SECTION

SECTION 31 23 17

ROCK REMOVAL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Requirements for Rock removal and the use of explosives to assist in Rock removal.

1.2 REFERENCES

A. NFPA 495: Code for the Manufacture, Transportation, Storage, and Use of Explosive Materials.

1.3 DEFINITIONS

A. Rock: Solid mineral material that cannot be removed with equipment reasonably expected to be used in the Work without cutting, drilling or blasting.

1.4 SUBMITTALS

A. Submit proposed method of blasting, delay pattern, explosive types, type of blasting mat cover, and intended Rock recovery method.

B. Submit photographs of existing site conditions and facilities in vicinity of Work prior to blasting. Refer to construction photographic requirements, Section 01 78 39.

1.5 QUALITY ASSURANCE

A. Seismic Survey Firm: Company specializing in seismic surveys with 2 years documented experience.

B. Explosive Firm: Company specializing in explosives for disintegration of Rock with 2 years documented experience.

PART 2 PRODUCTS

2.1 EXPLOSIVES

A. Type recommended by explosives firm following seismic survey and required by authorities having jurisdiction.

2.2 DELAY DEVICES

A. Type recommended by explosives firm.

2.3 BLASTING MAT MATERIALS

A. Type recommended by explosives firm.

PART 3 EXECUTION

3.1 PREPARATION

A. Verify site conditions and note irregularities affecting work of this section.

B. Obtain permits from authorities having jurisdiction before explosives are brought to site or drilling is started.

C. Verify utility locations, Section 01 31 13.

D. Beginning work of this section constitutes acceptance of existing conditions.

E. Comply with NFPA 495.

3.2 STORAGE OF BLASTING MATERIALS

A. Securely store all explosives in compliance with Laws and Regulations.

B. Mark all storage places clearly.

C. Where no local Laws or Regulations apply, provide storage not closer than 1,000 feet from any road, building, camping area or place of human occupancy.

3.3 ROCK REMOVAL -NONEXPLOSIVE METHOD

A. Cut away Rock at Excavation bottom to form level bearing.

B. Remove shaled layers to provide sound and unshattered base for foundations.

C. Remove and legally dispose of excess excavated material and debris off-site unless indicated otherwise.

D. Correct unauthorized Rock removal at no additional cost to OWNER.

3.4 ROCK REMOVAL -EXPLOSIVE METHOD

A. Provide a qualified explosives expert to act as an advisor and consultant during drilling and blasting operations.

B. Advise owners of adjacent buildings or structures and utility companies in writing prior to setting up seismographs. Describe blasting and seismic operations.

C. Obtain and pay for a seismic survey prior to Rock excavation to determine maximum charges that can be used at different locations in area of Excavation without damaging adjacent properties and utilities.

D. Provide seismograph monitoring during progress of blasting operations.

E. Disintegrate and remove Rock from excavation operations.

END OF SECTION

SECTION 31 23 23

BACKFILLING FOR STRUCTURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Structural backfill materials.
B. Structural backfilling requirements.

1.2 SUBMITTALS

A. Submit maximum laboratory dry density and optimum laboratory moisture content for:
   1. Subgrade material, and
   2. Each type of fill to be used.
B. Upon ENGINEER's request, submit a written quality control Inspections and testing report describing source and field quality control activities performed by CONTRACTOR and its Supplier.

1.3 QUALITY ASSURANCE

A. Do not change material sources, or aggregate without ENGINEER's knowledge.
B. Reject backfill material that does not comply with requirements specified in this section.

1.4 STORAGE

A. Safely stockpile backfill materials.
B. Separate differing materials, prevent mixing, and maintain optimum moisture content of backfill materials.
C. Avoid displacement of and injury to Work while compacting or operating equipment.
D. Movement of construction machinery over Work at any stage of construction is solely at CONTRACTOR's risk.

1.5 SITE CONDITIONS

A. Do not place, spread, or roll any backfill material over material that is damaged by water. Remove and replace damaged material at no additional cost to OWNER.
B. Control traffic and erosion. Keep area free of trash and debris. Repair settled, eroded, and rutted areas.
C. Reshape and compact damaged structural section to required density.

1.6 **ACCEPTANCE**

A. General:

1. Native material may be wasted if there is no additional cost to substitute material acceptable to ENGINEER.
2. For material acceptance refer to.
   a. Common fill, Section 31 05 13.
   b. Crushed aggregate base, Section 32 11 23.
   c. Cement treated fill, Section 31 05 15.

B. Structure Backfilling: One test per Lot.

Table 1 – Lot Size for Structural Backfilling Operations

Structure Type	Test Criteria	Lot Size
Strip Footings	Standard (a)	Subgrade: 200 lineal feet
	Modified (a)	Crushed aggregate base: 200 lineal feet per lift.
Structure Footing excluding strip footings	Standard (a)	Subgrade: 225 square feet.
	Modified (a)	Crushed aggregate base: Each 225 square feet per lift
Embankments	Standard (a)	Fill: 625 square feet per lift
Miscellaneous small structures (e.g. Manholes, drainage boxes, etc.)	Standard (a)	Subgrade: Each footprint area Fill: Each lift
	Modified (a)	Crushed aggregate base: Each lift
NOTES (a) Proctor density, Section 33 05 05 (b) Lift thickness before compaction is 8 inches.		

1.7 **WARRANTY**

A. Restore incidentals damaged by settlement at no additional cost to OWNER.

PART 2 PRODUCTS

2.1 **BACKFILL MATERIALS**

A. Common fill, Section 31 05 13.

B. Crushed aggregate base, Section 32 11 23.

C. Cement treated fill, Section 31 05 15.

2.2 **ACCESSORIES**

A. Water:

1. Make arrangements for sources of water during construction and make arrangements for delivery of water to site.
2. Comply with local Laws and Regulations at no additional cost to OWNER when securing water from water utility company.

PART 3 EXECUTION

3.1 **PREPARATION**

A. Verify:

1. Stockpiled fill meets gradation requirements.
2. Foundation walls are braced to support surcharge forces imposed by backfilling operations, areas to be backfilled are free of debris, snow, ice or water.
3. Ground surface is not frozen.

B. If subgrade is not readily compactable secure written authorization for extra excavation and backfill, Section 31 23 16.

C. Identify required line, levels, contours, and datum.

D. Stake and flag locations of underground utilities.

E. Upon discovery of unknown utility or concealed conditions, notify ENGINEER.

3.2 **PROTECTION**

A. Protect existing trees, shrubs, lawns, existing structures, fences, roads, sidewalks, paving, curb and gutter and other features.

B. Protect above or below grade utilities. Contact utility companies to repair damage to utilities. Pay all cost of repairs.

C. Protect Subgrade from desiccation, flooding and freezing.

D. Do not fill adjacent to structures until Excavation is checked by ENGINEER.

E. Do not use compaction equipment adjacent to walls or retaining walls that may cause wall to become over-stressed or moved from alignment.

F. Do not disturb or damage foundation perimeter drainage, foundation, damp-proofing, foundation waterproofing and protective cover, or utilities in Trenches.

G. Restore any damaged structure to its original strength and condition.

3.3 **LAYOUT**

A. Maintain all benchmarks, control monuments and stakes, whether newly established by surveyor or previously existing. Protect from damage and dislocation.

B. If discrepancy is found between Contract Documents and site, ENGINEER shall make such minor adjustments in the Work as necessary to accomplish the intent of Contract Documents without increasing the Cost of the Work to CONTRACTOR or OWNER.

3.4 **FOUNDATIONS AND SLABS ON GRADE**

A. Place backfill materials in lifts not exceeding 8 inches after compaction.

B. Do not backfill against walls until concrete has obtained 14 day strength. Backfill against foundation walls simultaneously on each side.

C. Fill unauthorized excavations with material acceptable to ENGINEER at no additional cost to OWNER.

D. Do not damage adjacent structures or service lines.

E. Where flowable fill is used, use fill that flows easily and vibration for compaction is not required.

3.5 **MODIFIED BACKFILL LAYER METHOD**

A. Refer to Section 33 05 20.

3.6 **COMPACTION**

A. Compact backfill; Section 33 05 05 to the following maximum dry densities.

1. Under Footings: 98 percent.
2. Interior Crawl Spaces: 90 percent.
3. Interior Slab-On-Grade: 98 percent.
4. Side of Foundation Walls and Retaining Walls:
   a. Exterior: 95 percent.
   b. Interior: 98 percent.
5. Miscellaneous Structures: 95 percent.

3.7 **CLEANING**

A. Remove stockpiles from the site. Grade site surface to prevent free standing surface water.

B. Leave borrow areas clean and neat.

END OF SECTION

SECTION 31 23 26

COMPACTION

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Compaction of granular fill materials.

1.2 **REFERENCES**

A. ASTM D 698: Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3)).

B. ASTM D 1557: Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3))

C. ASTM D 2216: Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock.

D. ASTM D 2922: Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

E. ASTM D 3017: Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

F. ASTM D 3282: Standard Practice for Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes.

G. ASTM D 3740: Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

1.3 **DEFINITIONS**

A. A-1 Soil: Defined in ASTM D 3282.

B. Modified Proctor Density: The maximum laboratory density, as defined in and determined by ASTM D 1557 using procedure A, B or C as applicable.

C. Relative Density (or Relative Compaction): The ratio of field dry density to the maximum laboratory density expressed as a percentage.

D. Standard Proctor Density: The maximum laboratory density, as defined in and determined by ASTM D 698 using procedure A, B or C as applicable.

1.4 **QUALITY ASSURANCE**

A. Use a laboratory that follows and complies with ASTM D 3740.

PART 2 PRODUCTS Not Used **PART 3 EXECUTION**

3.1 **COMPACTION**

A. Moisten or dewater backfill material to obtain optimum moisture for compaction.

B. Correct deficient compaction conditions. Replace or repair materials and damaged facilities.

C. When no density compactive effort is specified, compact the entire area to eliminate unstable zones.

3.2 **FIELD QUALITY CONTROL**

A. Testing: Perform control testing of materials. Perform additional testing at no additional cost to OWNER.

1. Because of changes in source of materials or proportions requested by CONTRACTOR.
2. Because of Failure of materials to meet specification requirements.
3. For other testing services needed or required by CONTRACTOR.

B. Report: For each material tested, record the following.

1. Vertical and horizontal location of the test.
2. Optimum laboratory moisture content.
3. Field moisture content.
4. Maximum laboratory dry density.
5. Field density.
6. Percent compaction results.
7. Certification of test results by testing agency.

C. Optimum Soil Density: Use ASTM D 2216 and the following industry standards.

1. For A-1 Soils: Use test method C of ASTM D 1557 (Modified Proctor)
2. For All Other Soils: Use test method C of ASTM D 698 (Standard Proctor).

D. Field Density:

1. Use ASTM D 3017 and test method C of ASTM D 2922 for shallow depth nuclear testing.
2. No density determinations are required on any material containing more than 65 percent material retained on the number 10 sieve or more than 60 percent material retained on the number 4 sieve. In lieu of reporting densities in such cases, report the sieve analysis to document the material type.

END OF SECTION

SECTION 31 25 00

EROSION AND SEDIMENTATION CONTROL

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Erosion control and slope protection facilities including blankets or mulches.

B. Construction of drainage facilities to protect work area.

1.2 **SUBMITTALS**

A.Submit prior to using:

1. Sample of blanket or geotextile materials.
2. Mulch formula.
3. Grass mixture listing.
4. Plant list.
5. Geotextile manufacturer's certification.

B. Application rate of fiber mulches recommended by tackifier manufacturer.

1.3 **DELIVERY, STORAGE AND HANDLING**

A. Deliver seed in original containers with certified germination test results showing analysis of seed mixture, percentage of pure seed, year of production, and date of packaging. Damaged packages are not acceptable. Store seed free of moisture.

B. Deliver fertilizer in waterproof bags showing weight, chemical composition and name of manufacturer.

C. Deliver blanket in original wrapping showing name of manufacturer and product weight.

D. Deliver plant materials immediately prior to placement.

E. Replace plant when original root protection system (burlap bag wrap of earth ball, plastic container with special plant bedder, etc.) has been broken or displaced prior to planting.

PART 2 PRODUCTS

2.1 **MATERIALS**

A. Riprap: Rock, Section 31 37 00.

B. Blankets: Uniform open weave jute, wood fiber, biodegradable or photodegradable synthetic fiber matting.

C. Geotextiles: Refer to fabric in Section 31 05 19.

D. Erosion Control Vegetation Mats: Permanent three dimensional mats which allow for

revegetation where high water flows are expected.

E. Fiber Mulches: Straw, hay, wood or paper free from weeds or foreign matter detrimental to plant life.

F. Mulch Binder: Vegetable based gel tackifier with growth stimulant.

G. Topsoil and Fertilizer: Refer to Section 31 05 13 and Section 32 92 00.

PART 3 EXECUTION

3.1 **PREPARATION**

A. Remove foreign materials, roots, rocks, and debris.
B. Grade to eliminate rough spots, and ponding areas.
C. Grade soil to drain perimeter water away from protected areas.
D. As applicable.
1. Temporary controls, Section 01 57 00.
2. Grass, Section 32 92 00.

3.2 **SLOPE PROTECTION BLANKET**

A. Cover seeded slopes where grade is greater than 3 horizontal to 1 vertical with blanket. Roll down over slopes carefully and loosely without stretching or pulling.

B. Lay blanket smoothly on prepared soil surface. Bury top end of each section in a narrow Trench. Leave 24 inches overlap from top roll over bottom roll. Leave 12 inches overlap over adjacent section.

C. Toe-in top end of each section in narrow Trench at least 12 inches deep. Toe-wrap fabric at bottom of slope.

D. Staple loosely the outside edges and overlaps.

E. In ditches, lay matting in upstream direction. Overlap and staple ends 6 inches with upstream section on top.

F. If natural drainage water traverses protected or controlled area; construct a channel or riprap according to Drawings and Section 31 37 00.

G. Lightly dress slopes with topsoil to ensure close contact between cover and soil.

H. Present alternative methods of protection for approval prior to starting any work.

3.3 **GEOTEXTILE**

A. Placement, Section 31 05 19.

3.4 **MULCHES**

A. Apply mulches at the rate indicated.

B. When installed with a tackifier, apply at the rate recommended by the tackifier Supplier.

3.5 **SURFACE COVER**

A. Grass, Section 32 92 00.
B. Ground cover, Section 32 93 13.

3.6 **MAINTENANCE**

A. Maintain surfaces and supply additional topsoil where necessary, including areas affected by erosion.

B. Protect and repair geotextiles, Section 31 05 19.

C. Keep surface of soil damp only as necessary for seed germination.

D. Apply water slowly so surface of soil will not puddle and crust.

E. Replant damaged grass areas showing root growth Failure, deterioration, bare or thin spots, and eroded areas.

F. Re-fertilize 60 days after planting.

G. Remove weeds that are over 3 inches high.

END OF SECTION

SECTION 31 41 00

SHORING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Shoring for open Excavations requiring a Protective System.
B. Underpinning to stabilize adjacent structure.

1.2 UNIT PRICE -MEASUREMENT AND PAYMENT

A. In trenching, two Protective Systems are required if each Side of the Trench is to be shored. The use of a Trench Box shall be classified as one Protective System.

B. Payment covers the cost of the Protective System to a depth of 3 feet below the Excavation elevations indicated. Allowance for extra cost may be made, based upon the actual cost to the CONTRACTOR of constructing, extending or reconstructing any Protective System that may be necessary to carry the excavation to the required depth which is greater than 3 feet below the Excavation elevations indicated. The extra cost will be paid for by **Change Order**.

C. Excavation in Lieu of Protective System: When Protective Systems are indicated and with the written approval of the ENGINEER the actual installation of the Protective Systems are not made, the CONTRACTOR will be paid in full for the Protective System bid item, which includes all extra excavation, extra backfill, backfill compaction, or other incidental work performed by CONTRACTOR in lieu of constructing the Shoring or underpinning.

1.3 DEFINITIONS

A. Accepted Engineering Practices: Those requirements or practices that are compatible with standards required by a duly licensed or recognized authority.

B. Benching: A method of protecting persons and property against cave-ins by excavating the Sides of an Excavation to form one or a series of horizontal levels or steps, usually with vertical or near-vertical surfaces between levels.

C. Excavation: Any man-made cut, cavity, or depression in an earth surface, including Trenches, formed by earth removal and producing unsupported earth conditions (Sides). If installed forms or similar structures reduce the depth-to-width relationship, an excavation may become a Trench.

D. Failure: The permanent deformation or breakage of a structural member or connection; or the collapse of all or part of an Excavation.

E. Protective System: Any recognized method of protecting persons and property against cave-ins, the collapse of adjacent structures, or material that may fall or roll from an Excavation Side or into an Excavation. Protective systems include Support Systems, Sloping and Benching systems and Shield systems.

F. Shield: A structure that is able to withstand the forces imposed on it by a cave-in and thereby protect persons and property within the structure without preventing a cave-in. Shields may be permanent structures or may be designed to be portable and moved along as work progresses. Portable Shields used in Trenches are usually referred to as "trench boxes" or "trench shields".

G. Shoring: A structure that supports the Sides of an Excavation and thereby protects persons and property by preventing cave-ins.

H. Side: Vertical or inclined earth surface formed at the outer edges of an Excavation.

I. Sloping: A method of protecting persons and property against cave-ins by excavating to form Sides that are inclined away from the Excavation, the angle of incline being of such a degree for the conditions of exposure that a cave-in will not occur.

J. Support System: A structure that protects persons and property by providing support to an adjacent structure, underground installation, or the Sides of an Excavation.

K. Trench: A narrow Excavation made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench is not greater than 15 feet.

L. Trench Box: See Shield.

M. Unfractured Rock: Rock that can be excavated with vertical Sides and remain intact while exposed. Fractured Rock is considered equivalent to unfractured Rock when the material on the Side or Sides of the Excavation is secured against cave-in or movement by Rock bolts, netting, or other means approved by a professional engineer.

1.4 DESIGN OF PROTECTIVE SYSTEMS

A. Design Support Systems, Shield systems, and the structural components of these systems, and Sloping and Benching systems to resist all loads that are intended to be imposed or transmitted to them.

B. Design system for any hydrostatic pressure in the Sides of an Excavation.

1.5 SUBMITTALS

A. Submit a Protective System plan when requested.

PART 2 PRODUCTS

2.1 MATERIALS

A. CONTRACTOR's choice.

PART 3 EXECUTION

3.1 PREPARATION

A. Make safe or remove trees, surface encumbrances which are hazardous to Shoring operations.

B. Provide adequate ventilation of Excavations.

C. Control dust and groundwater.

3.2 STABILITY OF ADJACENT STRUCTURES

A. Support adjoining buildings, walls, sidewalks, Pavements, or other structures endangered by excavation operations.

B. Excavation below level of base of footing of any structural foundation or wall shall not be permitted except as follows:

1. Underpinning or other Support Systems is provided to ensure stability of structure, or
2. Excavation is in Unfractured Rock, or
3. A professional engineer determines in writing that such work will in no way pose a hazard to persons and property or the integrity of the structure.

3.3 PROTECTION OF PERSONS AND PROPERTY

A. Protect from cave-ins. Install a Support System, by Sloping, by Benching, by use of a Shield system, or by use of a combination of these methods.

B. Scale to remove loose material. Use Rock bolting, wire mesh, installation of protective barricades, or provide equivalent protection.

C. Stairway, Ladder, Ramp: Comply with OSHA.

D. Protect against cave-ins from vibratory loads adjacent to excavation operations.

3.4 INSPECTIONS

A. Inspect Excavations daily for evidence of possible cave-ins, indications of Failure of Protective Systems, or other hazardous conditions.

B. Upon discovery of hazardous conditions, cease all work in the Excavations until additional precautions have been taken to ensure persons and property safety.

3.5 SHIELD SYSTEMS

A. Minimize the time the Sides of the Excavation remain unsupported.

B. Do not subject Shield systems to loads other than those considered for in their design.

C. Remove persons and property from Excavation when portable Shields are being relocated.

3.6 INSTALLATION AND REMOVAL OF SUPPORT SYSTEMS

A. Do not overload Support Systems.

B. Install additional members to carry the loads imposed upon the Support System when temporary removal of individual members is necessary.

C. When removing the Support System, release member by member slowly to avoid Failure of the remaining members or cave-ins.

D. Coordinate backfilling to minimize time an unsupported Excavation remains open.

END OF SECTION

SECTION 32 01 05

INFORMATION, REGULATORY, AND WARNING SIGNS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Information, regulatory, and warning signs but not street name signs or construction signs.

1.2 REFERENCES

A. MUTCD: Manual on Uniform Traffic Control Devices for Streets and Highways.

B. APA: American Plywood Association.

C. ASTM B 209: Standard Specification for Aluminum and Alumin-um-Alloy Sheet and Plate.

D. FS L-P 380: Plastic Molding Material Methacrylate.

E. FS L-S-300: Sheeting and Tape, Reflective: Nonexposed Lens.

F. PS 1: Construction and Industrial Plywood.

1.3 DEFINITIONS

A. For definition purposes, the various types of signs are identified by a combination of letter and number. The letter represents the type of sign panel construction and the number represents the type of lettering and symbols to be used as follows:

1. Panel Type:
   a. Panel Type A: Reflectorized sheeting on sheet aluminum.
   b. Panel Type B: Reflectorized sheeting on plywood.
2. Letter Type:
   a. Letter Type 1: Reflectorized demountable cutout letters, symbols, and borders with prismatic reflectors.
   b. Letter Type 2: Opaque legend and borders.
   c. Letter Type 3: Reflectorized permanently attached cutout letters, symbols, and borders or reflectorized screen processed letters, symbols, and borders.

1.4 SUBMITTALS

A. Submit shop drawings of support structures prior to fabrication.

B. Submit sample of each color of reflective sheeting including manufacturer's name and product number.

PART 2 PRODUCTS

2.1 MATERIALS

A. Sheet Aluminum Sign Blank: 0.1 inch thick ASTM B 209 alloy 6061-T6.

B. Aluminum Extrusion Sign Blank: 0.1 inch thick ASTM B 209 alloy 6063-T5 and 6063-T6.

C. Softwood Plywood Sign Blank: PS 1 Group 1 with each panel bearing initials DFPA Grade -Trademark of the American Plywood Association; painted to ENGINEER's choice of color unless indicated.

D. Posts: Galvanized structural steel, U-shaped, T-shaped, C-shaped, box-shaped, or round tube, Section 05 12 00, with 3/8 inch diameter mounting holes.

E. Fabricated Supports: Galvanized steel, Sections 05 12 00 and 05 05 10.

F. Reflective Sheeting: Reflective per FS L-S-300 requirements with 2,200 hours minimum durability.

G. Nonreflective Sheeting: Nonchalking, weather resistant transparent plastic having a protected adhesive backing and a smooth flat outer surface with glass spheres embedded within.

H. Prismatic Reflectors: Methyl methacrylate lens meeting FS L-P-380 requirements with aluminum frame.

I. Bolts, Nuts, Accessories: Galvanized steel, Section 05 05 23.

J. Cast-in-place Concrete: Class 3000, Section 03 30 04.

2.2 COLORS AND FORMAT

A. Sign Colors and Format: Conform to MUTCD.

B. Provided colors of same reflectorized hue in daylight and night under artificial white illumination.

PART 3 EXECUTION

3.1 PREPARATION

A. Indentify utility location, Section 01 31 13.

B. Excavation, Section 31 23 16.

3.2 INSTALLATION

A. Do not remove a sign that is being replaced until the new sign is placed and uncovered.

B. Unless indicated otherwise use clearance and locations shown in MUTCD. Install posts plumb and in proper alignment.

C. Establish proper elevation and orientation of all signs, structures, and determine proper sign post lengths as dictated by construction slopes.

D. Cover signs that require temporary covering with a porous cloth or fiber material folded over the sign edges and secured at the rear of the sign in such a manner that the sign is not damaged. Maintain covering until oremoval.

E. Construct sign post foundations with concrete conforming to indicated dimensions. Finish foundations flush with or below natural ground.

F. Construct overhead support structures where indicated. Support sign by mounting posts on anchor bolts placed in reinforced concrete foundations. Construct signs horizontal and perpendicular to roadway. The minimum allowable vertical clearance from the high point of Pavement is 16.5 feet.

3.3 **WORKMANSHIP**

A. Carefully fabricate and erect signs. Damage signs will be rejected.

B. Make all vertical joints and cuts flat and true.

C. Elevator bolts may be used or bolt holes relocated where conflict exists with sign border, legend, or copy.

D. Lay out and properly balance on the sign face all Type 1 legend and copy before fastening. Plug holes left by shifting of copy or legend with the same type screw used to fasten the legend.

E. Wash all sign faces prior to Final Inspection, Section 01 74 13.

END OF SECTION

SECTION 32 01 06

POST MOUNTED SIGNS

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Requirements for street name sign and components.

1.2 **REFERENCES**

A. ASTM B 209: Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

B. FS L-S-300: Sheeting and Tape, Reflective: Nonexposed Lens.

PART 2 PRODUCTS

2.1 **MATERIALS**

A. Sheet Aluminum Sign Blanks: 0.1 inch thick ASTM B 209 alloy 6061-T6, of the height indicated with length required to spell the street name (18, 24, 30, 36, 42, 48 inches).

B. Nonmetallic Sign Blanks: Fiberglass reinforced composite bonded with a thermosetting polymer and the following properties.

1. Tensile strength (transverse), 5,000 psi minimum.
2. Tensile strength (longitudinal), 25,000 psi minimum.
3. Lengths as required to spell the street name (18, 24, 30, 36, 42, 48 inches).
4. Height as indicated.

C. Posts: Galvanized structural steel, U-shaped, T-shaped, C-shaped, box-shaped, or round tube per Sections 05 12 00 and 05 05 10 requirements, with 3/8 inch diameter mounting holes.

D. Reflective Sheeting: Reflective per FS L-S-300 requirements with 2,200 hour minimum durability.

E. Sign Lettering: White upper case and lower case letters, reverse silk screened on white with specified background color transparent ink.

F. Letter Composition: Spell out street name and give numerical coordinate on the right hand side; include neighborhood logo, if applicable, on the left hand side. Font as indicated.

G. Rail for Sign Blank: Tensile strength 40,000 psi minimum.

H. Bolts, Nuts, Accessories: Galvanized steel, Section 05 05 23.

I. Cast-in-place Concrete: Class 3000, Section 03 30 04.

PART 3 EXECUTION

3.1 **PREPARATION**
A. Identify utility location, Section 01 31 13.
B. Excavation, Section 31 23 16.

3.2 **INSTALLATION**
A. Set posts 2 feet deep and anchored in concrete.
B. Provide 10 feet high clearance from the ground level to the bottom of sign.
C. Install posts plumb so closest edge of sign is 2 feet from vertical projection of the curb face at the point of curve (PC) of the intersection approach curb.
D. Restore all surfaces damaged during installation.

END OF SECTION

SECTION 32 01 07

RELOCATE POST MOUNTED SIGNS AND MAIL BOXES

PART 1 GENERAL

1.1 **SECTION INCLUDES**
A. Relocate post mounted signs.
B. Relocate mail boxes to supports which are approved by USPS.

1.2 **REFERENCES**
A. USPS: United States Postal Service, mailbox requirements.

1.3 **DEFINITIONS**
A. Post Mounted Signs: Street name signs and traffic control signs such as regulatory signs, warning signs, guide signs, detour and closure signs.

PART 2 PRODUCTS

2.1 **CONCRETE**
A. Cast-in-place Concrete: Class 3000 minimum, Section 03 30 04.

2.2 **MAIL BOX SUPPORTS**
A. Wood: Salt treated fir, hemlock or pine for post, shelf and brace. Grade: No. 2 or better.
B. Metal: Galvanized or dark epoxy painted steel post, shelf and brace with no defects.

PART 3 EXECUTION

3.1 **PREPARATION**
A. Coordinate utility location, Section 01 31 13.
B. Excavate, Section 31 23 16.
C. Reuse existing mail boxes, street signs and posts unless indicted otherwise.

3.2 **EXISTING TRAFFIC CONTROL SIGNAGE**
A. Maintain all existing street signs in full view of the intended traffic.
B. Coordinate relocations such that view of post mounted sign is maximize.

3.3 **SIGN RELOCATION**

A. Maintain existing signs until construction requires removal. Coordinate with ENGINEER 24 hours in advance of removal of any sign.

B. Relocate existing street signs as indicated or ordered by the ENGINEER.

C. Remove concrete from existing posts where posts are to be reused.

D. Protect new signs and posts until Project is accepted.

E. Reset post in concrete, 8 inches in diameter to the depth indicated or ordered by ENGINEER.

F. Completely fill and compact hole left by removing sign post. Match adjacent surface.

3.4 **MAIL BOX RELOCATION**

A. Completely remove all designated mail box posts and footings.

B. Furnish and install new posts, shelf, and brace.

C. Relocate existing mail boxes indicated or ordered by the ENGINEER.

D. Attach box firmly to shelf and post.

E. Repair any damage done to the mail box during moving or replace if irreparable to ENGINEER's and mail box owner's satisfaction.

F. Compact soil around post and provide firm support.

G. Provide support for temporary mail box as required during construction at no extra cost to OWNER, with temporary mail box located in accordance with United States Postal Service requirements.

H. Restore original location of box to condition equivalent to adjacent area.

3.5 **PAVEMENT MARKINGS**

A. Section 32 17 23.

END OF SECTION

SECTION 32 01 10

RELOCATE FENCES AND GATES

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Moving and resetting existing fences and gates to locations indicated or directed by ENGINEER.

PART 2 PRODUCTS

2.1 **MATERIALS**

A. Nails, Spikes and Staples: Galvanized steel for exterior, high humidity locations, and treated wood, Size and type to suit applications.

B. Chain Link Fences and Gates: Section 32 31 13.

C. Wire Fences and Gates: Section 32 31 16.

D. Cast-in-place Concrete: Class 3000 minimum, Section 03 30 04.

PART 3 EXECUTION

3.1 **PREPARATION**

A. Coordinate locating utilities, Section 01 31 13.

B. Excavation, Section 31 23 16.

3.2 **INSTALLATION**

A. Completely remove all existing posts, footings, wires, gates, and other items used in fencing.

B. Remove concrete on posts. Reuse posts, wire, and gates from existing fence unless directed otherwise by ENGINEER.

C. Replace any fencing materials and gates that are damaged, lost, or broken during fence and gate relocations. Provide new materials as required which meets Specifications, for fence and gates of the same type.

D. Set relocated fences and gates straight and true.

E. Fill in old post holes unless they become part of new construction.

F. Reset posts in concrete, 8 inches in diameter to depth indicated or 2 feet minimum.

END OF SECTION

SECTION 32 01 91

TREE ROOT CUTTING

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Cutting and removing tree roots.

B. Protecting surface improvements from future tree root growth.

1.2 **REFERENCES**

A. International Society of Arboriculture. (ISA).

1.3 **PROJECT CONDITIONS**

A. Provide written watering instructions to neighbors in property abutting the tree root cuts to advise them of the tree's watering requirements.

1.4 **QUALITY ASSURANCE**

A. Provide an ISA certified arborist to observe tree root cutting. Upon ENGINEER's request, provide a copy of the arborist's ISA certificate and registration number on file with the State Division of Commercial Code.

PART 2 PRODUCTS Not Used

PART 3 EXECUTION

3.1 **AVOIDING ROOT CUTS**

A. When placing or replacing concrete sidewalk;

1. Adjust alignment to curve around, over or away from tree trunks. Do not proceed in this work until alignment has been reviewed by ENGINEER.
2. Adjust thickness and concrete contraction score marks.

B. When replacing concrete curb and gutter.

1. Adjust thickness and concrete contraction score marks over tree roots.
2. Do not vary gutter invert from straight grade.

3.2 **CUTTING TREE ROOTS**

A. Never cut buttress roots [i.e. roots at the broadened base of the tree trunk] without written authorization of arborist. Avoid injury to trunk.

B. Keep root cutting at least 4 feet away from tree trunk. Limit cutting to one side of tree unless authorized otherwise in writing by arborist.

C. Cut roots clean and straight (no ragged or torn edges). Use an axe, saw, or appropriate equipment that properly cuts roots. Do not make partial root cuts.

D. Do not injure roots to remain.

E. Cut roots back to root laterals.

3.3 **BACKFILLING**

A. Backfill all cut and exposed roots the same day of root cutting, or cover with wood chips, mulch and water until backfilling is accomplished.

B. Place soil below root cut.

C. To prevent vertical root growth, place an impermeable membrane over root cuts. Bend membrane edges to plane below cut root. Place backfill materials adjacent to and above impermeable membrane.

3.4 **PROTECTION**

A. After cutting roots of tree.

1. Immediately water tree after backfilling.
2. Apply a minimum of 1 inch of water over the entire area under the tree canopy and well beyond over a period of 4 hours.
3. Restrict water runoff.

END OF SECTION

SECTION 32 01 93

PRUNING TREES

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Pruning branches of existing trees.

1.2 **REFERENCES**

A. ANSI A 300: Tree Care Operation-Tree, Shrub, and Other Woody Plants.

B. ANSI Z 133.1: Pruning, Trimming, Repairing, Maintaining, and Removing Trees, and Cutting Brush-Safety Requirements.

C. International Society of Arboriculture. (ISA) -Current Standards for Pruning.

D. Utah Community Forest Council: Utah Shade Tree Pruning Standards

1.3 **SUBMITTALS**

A. Tree protection plan that identifies trees to be pruned and reasons for pruning.

B. Upon ENGINEER's request, submit a copy of the arborist's certificate from ISA and registration number on file with the State Division of Commercial Code.

1.4 **QUALITY ASSURANCE**

A. Provide an ISA certified arborist to observe tree pruning. Upon ENGINEER's request, provide a copy of the arborist's ISA certificate and registration number on file with the State Division of Commercial Code.

PART 2 PRODUCTS

2.1 **PRUNING PAINT**

A. Formulated for horticultural application to cut or damaged plant tissue.

2.2 **DISINFECTANT**

A. Chlorine based.

PART 3 EXECUTION

3.1 **PREPARATION**

A. Pruning work in any publicly owned right of way requires CONTRACTOR notifying the adjacent property owner and giving them a brief description of why and how the work will be done. Notification needs to be given at least 2 weeks before any work is done so the property owner has a chance to respond if they choose to do so. The arborist selected to provide pruning service shall provide the notices. A written record of delivery dates of notices by address is required of the arborist.

B. Pruning trees on private property require tree owner approval. ENGINEER and CONTRACTOR shall jointly contact the owners for approval prior to performing any work.

3.2 **TREE PRUNING**

A. Adhere to safety requirements, ANSI A133.1

B. Conform to ANSI A300 and the Utah Shade Tree Pruning Standards when pruning.

C. Conform to OSHA 1910.269 if there are power or communication lines within the area occupied by the tree's branches or adjacent to the tree.

D. Remove tree branches extending over the roadway to provide a clear height of

1. 16 feet over the travel lane.*
2. 14 feet over the Driveway.
3. 12 feet over finished grade.
4. 6 feet over street light.
5. 12 feet over signal light.

* The travel lane means the lane vehicles typically use for travel which is different than the parking lane which is the lane adjacent to the street along the curb normally used for parking.

E. The contracted arborist may need to reduce the above referenced clearances based on tree size, species, or location.

F. Remove dead, diseased, damaged, broken, hanging, obstructing, crossing or weak branches.

G. Prune trees to make them shapely, symmetrical, and typical of the natural form of the species being pruned. Thin no more than 25 percent of the live canopy. Do not remove branches that would deform the appearance of the tree.

H. Cut deadwood back to existing callous growth. **Do not remove callous growth.**

I. Reduce length of limbs as ordered by ENGINEER.

J. Do not remove any live branch larger than 6 inches in diameter unless authorized by ENGINEER.

K. pre-cut branches to reduce weight of final cut. Select final cuts by the location of the branch bark ridge and branch collar.

L. No intermodal final cuts permitted unless authorized by ENGINEER.

M. The use of climbing spurs (gaffs) are prohibited.

N. Disinfect pruning equipment that comes in contact with diseased plant material. Remove disinfectant from equipment prior to proceeding with work.

O. Use the "Natural Target" or "Drop Crotch" pruning method when removing limbs.

P. Do not top, pollard, stub or dehorn any tree.

Q. Make all pruning cuts sufficiently close to the trunk or parent limbs without cutting into or removing the "branch collar" or the "branch bark ridge".

3.3 **BRANCH DISPOSAL**

A. Remove branches from site.

B. Remove all wood chips.

END OF SECTION

SECTION 32 05 10

BACKFILLING ROADWAYS

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Roadway backfill materials.

B. Roadway backfilling requirements.

1.2 **DEFINITIONS**

A. Embankment: A raised earthen structure to carry a roadway.

B. Pavement: Artificially covered surfaces including but not limited to roadway surfaces, parking lot surfaces, sidewalks, curb, gutter, curb ramps, Driveway ramps, etc.

C. Subgrade: A surface of earth or Rock leveled off as to receive backfill materials.

1.3 **SUBMITTALS**

A. Submit maximum laboratory dry density and optimum laboratory moisture content for:

1. Subgrade material, and
2. Each type of fill to be used.

B. Submit aggregate batch delivery tickets showing name of material source, Serial number of ticket; date and truck number; name of Supplier; job name and location; volume of material delivered, And aggregate classification.

C. Upon ENGINEER's request, submit a written quality control Inspections and testing report describing source and field quality control activities performed by CONTRACTOR and its Suppliers.

1.4 **QUALITY ASSURANCE**

A. Do not change material sources, or aggregate without ENGINEER's knowledge.

B. Reject backfill material that does not comply with requirements specified in this section.

1.5 **STORAGE**

A. Safely stockpile backfill materials.

B. Separate differing materials, prevent mixing, and maintain optimum moisture content of backfill materials.

C. Avoid displacement of and injury to Work while compacting or operating equipment.

D. Movement of construction machinery over Work at any stage of construction is solely at CONTRACTOR's risk.

1.6 **SITE CONDITIONS**

A. Do not place, spread, or roll any backfill material over material that is damaged by water. Remove and replace damaged material at no additional cost to OWNER.

B. Control traffic and erosion. Keep area free of trash and debris. Repair settled, eroded, and rutted areas.

C. Reshape and compact damaged structural section re required density.

D. Soil Cement: Do not spread soil cement mixture when air temperature is less than 40 deg. F. in the shade.

E. Drainage: Immediately prior to suspension of construction operations for any reason, provide proper and necessary drainage of Work area.

1.7 **ACCEPTANCE**

A. General:

1. Native material may be wasted if there is no additional cost to substitute material acceptable to ENGINEER.
2. For material acceptance refer to.
   a. Common fill, Section 31 05 13.
   b. Crushed aggregate base, Section 32 11 23.
   c. Cement treated fill, Section 31 05 15.

B. Backfilling: One test per Lot.

Table No.1 – Lot Sizes

Material	Test Criteria	Lot Size
Subgrade	Standard (a)	1000 square yards
Common Fill	Standard (a)	PCC or AC Surface Course: 1,000 square yards per lift Driveway Approach: 400 square feet per lift Sidewalk: 400 lineal feet per lift
Crushed Aggregate Base	Modified (a)	PCC or AC Surface Course: 1,000 square yards per lift Driveway Approach: 400 square feet per lift Sidewalk: 400 lineal feet per lift Curb, Gutter, and Waterways: 200 lineal feet per lift
Flowable Fill	Strength (b)	250 cubic yards

NOTES
(a) Proctor density, Section 33 05 05
(b) Cement treated fill, Section 31 05 15
(c) Lift thickness before compaction, 8 inches.

1.8 **WARRANTY**

A. Any settlement noted in Embankment or Pavement construction will be considered to be caused by improper compaction methods and shall be corrected at no cost to the OWNER.

B. Restore incidentals damaged by settlement at no additional cost to OWNER.

PART 2 PRODUCTS

2.1 **BACKFILL MATERIALS**

A. Common Fill, Section 31 05 13.

B. Crushed aggregate base, Section 32 11 23.

C. Cement treated fill, Section 31 05 15.

2.2 **ACCESSORIES**

A. Water:

1. Make arrangements for sources of water during construction and make arrangements for delivery of water to site.
2. Comply with local Laws and Regulations at no additional cost to OWNER when securing water from water utility company.

B. Geotextile Fabric, Section 31 05 19.

PART 3 EXECUTION

3.1 **PREPARATION**

A. Verify.

1. Backfill material meets gradation requirements.
2. Areas to be backfilled are free of debris, snow, ice or water, and
3. Bearing surfaces are not frozen.

B. If extra excavation is required, secure ENGINEER’s written permission and follow Section 31 23 16 requirements.

C. Place geotextile fabrics, Section 31 05 19.

3.2 **SUBGRADE PREPARATION**

A. Protect Subgrade from desiccation, flooding, and freezing.

B. If ground water table is in the intended construction operations, dewater.

C. Before beginning backfilling operations over Subgrade, secure ENGINEER's review of Subgrade surface preparations.

3.3 **EMBANKMENTS**

A. Place backfill material in lifts not exceeding 8 inches after compaction.

B. Build shoulders to a grade higher than that of adjacent fills. Provide surface runoff at all times.

C. Commence compaction along edge of area to be compacted and gradually advance toward center.

D. Operate compaction equipment along lines parallel or concentric with the center-line of the Embankment being constructed.

E. Do not damage subsurface structures or utilities.

3.4 **BASE COURSES**

A. Place backfill material in lifts not exceeding 8 inches before compaction.

B. Maintain moisture content in compaction operations.

C. Avoid segregation when spreading backfill. Keep surfaces free from pockets of coarse and fine aggregate.

D. Rework fills which do not conform to compaction requirements until requirements are met.

E. Protect cement treated fill against freezing and traffic for 7 days.

3.5 **MODIFIED BACKFILL LAYER METHOD**

A. Section 33 05 20.

3.6 **COMPACTION**

A. Compact backfill, Section 33 05 05 as follows.

1. A-1 soils: greater than or equal to 95 percent of a Modified Proctor Density.
2. Other soils: greater than or equal to 95 percent of a Standard Proctor Density.

3.7 **COMPRESSIVE STRENGTH**

A. Where a flowable fill is used, provide compressive strength indicated in Section 31 05 15.

3.8 **PROOF ROLLING TEST**

A. Prior to placing fill material for roadbed backfills, proof roll Subgrade using gross weight of 18,000 pounds/tandem axle, with a tire pressure at least 90 psi.

B. All proof roll passes will traverse the Subgrade parallel to the roadbed centerline. All

subsequent passes will be offset 1/2 the vehicle width until the entire Subgrade is tested.

C. ENGINEER will analyze, determine, designate and measure the areas, if any, requiring additional compaction or reconstruction.

D. Once Subgrade passes the proof rolling test, protect the surface from construction operations and traffic damage. Repair all cuts, ruts, and breaks. Keep surface in a satisfactory condition until geotextile fabric or base course has been placed.

3.9 **CLEANING**

A. Remove stockpiles from the site upon Work Completion. Grade site to prevent free standing surface water.

B. Leave borrow areas clean and neat.

END OF SECTION

SECTION 32 11 23

CRUSHED AGGREGATE BASE

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Treated or untreated base course requirements.

1.2 **REFERENCES**

A. ASTM C 29: Standard Test Method for Unit Weight and Voids in Aggregate.

B. ASTM C 131: Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

C. ASTM C 136: Standard Method for Sieve Analysis of Fine and Coarse Aggregates.

D. ASTM D 75: Standard Practice for Sampling Aggregates.

E. ASTM D 448: Standard Classification for Sizes of Aggregate for Road and Bridge Construction.

F. ASTM D 1883: Standard Test Method for CBR (California Bearing Ratio) of Laboratory-Compacted Soils.

G. ASTM D 2419: Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.

H. ASTM D 3665: Standard Practice for Random Sampling of Construction Materials.

I. ASTM D 3740: Standard Recommended Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

J. ASTM D 4318: Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

K. ASTM D 5821: Standard Test Method for Determining the percentage of Fractured Particles in Coarse Aggregate.

1.3 **DEFINITIONS**

A. Aggregate Grading Band: Allowable deviation from Target Gradation Curve based upon the number of gradation tests in a Lot. It is possible that gradation for any sieve may lie outside of its respective Master Grading Band limits.

B. Master Grading Band: Gradation limits allowed for various sieve sizes ranging from the maximum size sieve to the No. 200 sieve.

C. Mean of Deviations: The sum of the absolute values of the variance between each screen target value and each measured value divided by the number of tests in the Lot.

D. RAP (acronym for reclaimed asphalt pavement): See Section 32 01 16.

E. Target Gradation Curve: A smooth locus of points within the limits of the Master Grading Band.

1.4 **SUBMITTALS**

A. Name of Supplier and aggregate source.

B. Target Gradation Curve.

1.5 **QUALITY ASSURANCE**

A. Use a laboratory that follows and complies with Section 01 45 00 and ASTM D 3740.

1.6 **ACCEPTANCE**

A. General:

1. Defective work, Section 01290.
2. Dispute resolution, Section 01460.

B. Treated or Untreated Base Course: Lot size is one day's production. Sub-lot size is 500 tons.

1. ENGINEER is not obligated to accept changes in Target after any material is delivered to site.
2. Lot is acceptable if gradation test deviations are within pay factor 1.00 limits. At ENGINEER's discretion, a Lot with a sub-lot test deviation greater than pay factor 0.70 limits may stay in place at 50 percent cost.
3. Suitability of Source: Meet Table 2 properties. A reduction in aggregate class will be accepted providing any costs for difference in excavation, backfill, and alternate design for CBR does not increase the Contract Price.

Table 1-Pay Factors for Price Determination						
Criteria	**Pay Factor**	**Mean of Deviations of Acceptance Tests From the Target Gradation Curve Expressed in Percentage Points**				
		1 Sample	**2 Samples**	**3 Sample**	**4 Sample**	**5 or More Sample**
1/2" Sieve	1.00 0.95 0.90 0.80 0.70	0 – 15 16 – 17 18 – 19 20 – 21 22 – 23	0.0 – 12.1 12.2 – 13.9 14.0 – 15.1 15.2 – 17.2 17.3 – 18.8	0.0 – 10.8 10.9 – 12.4 12.5 – 13.5 13.6 – 15.3 15.4 – 16.7	0.0 – 10.0 10.1 – 11.5 11.6 – 12.5 12.6 – 14.2 14.3 – 15.5	0.0 – 9.5 9.6 – 11. 11.1 – 11.9 12. – 13.5 13.6 – 14.7
3/8" Sieve	1.00 0.95 0.90 0.80 0.70	0 – 15 16 – 17 18 – 19 20 – 21 22 – 23	0.0 – 11.5 11.6 – 13.2 13.3 – 14.4 14.5 – 16.3 16.4 – 17.9	0.0 – 9.8 9.9 – 11.3 11.4 – 12.3 12.4 – 13.9 14.0 – 15.2	0.0 – 8.8 8.9 – 10.1 10.2 – 11 11.1 – 12.5 12.6 – 13.6	0.0 – 8.0 8.1 – 9.2 9.3 – 10.0 10.1 – 22.4 11.5 – 12.4
No. 4 Sieve	1.00 0.95 0.90 0.80 0.70	0 – 14 15 – 17 18 19 – 20 21 – 22	0.0 – 10.5 10.6 – 12.1 12.2 – 13.1 13.2 – 14.9 15.0 – 16.3	0.0 – 8.8 8.9 – 10.1 10.2 – 11 11.1 – 12.5 12.6 – 13.6	0.0 – 7.8 7.9 – 9.0 9.1 – 9.8 9.9 – 11.1 11.2 – 12.1	0.0 – 7.0 7.1 – 8.0 8.1 – 8.7 8.8 – 10.0 10.1 – 10.8
No. 16 Sieve	1.00 0.95 0.90 0.80 0.70	0 – 11 12 – 13 14 15 – 16 17	0.0 – 8.2 8.3 – 9.4 9.5 – 10.3 10.4 – 11.6 11.7 – 12.7	0.0 – 6.9 7.0 – 7.9 8.0 – 8.6 8.7 – 9.8 9.9 -10.7	0.0 – 6.2 6.3 – 7.1 7.2 – 7.8 7.9 – 8.8 8.9 – 9.6	0.0 – 5.6 5.7 – 6.4 6.5 – 7.0 7.1 – 8.0 8.1 – 8.7
No. 50 Sieve	1.00 0.95 0.90 0.80 0.70	0 – 9 10 11 12 – 13 14	0.0 – 7.0 7.1 – 8.0 8.1 – 8.8 8.9 – 10.0 10.1 -10.9	0.0 – 6.1 6.2 – 7.0 7.1 – 7.6 7.7 – 8.7 8.8 – 9.5	0.0 – 5.5 5.6 – 6.3 6.4 – 6.9 7.0 – 7.8 7.9 – 8.5	0.0 – 5.2 5.3 – 6.0 6.1 – 6.5 6.6 – 7.4 7.5 – 8.1
No. 200 Sieve	1.00 0.95 0.90 0.80 0.70	0 – 4.5 4.6 – 5.2 5.3 – 5.6 5.7 – 6.4 6.5 – 7.0	0.0 – 3.4 3.5 – 3.9 4.0 – 4.3 4.4 – 4.9 4.9 – 5.3	0.0 – 2.9 3.0 – 3.3 3.4 – 3.6 3.7 – 4.1 4.2 – 4.5	0.0 – 2.5 2.6 – 2.9 3.0 – 3.1 3.2 – 3.6 3.7 – 3.9	0.0 – 2.3 2.4 – 2.6 2.7 – 2.9 3.0 – 3.3 3.5 – 3.6

PART 2 PRODUCTS

2.1 **UNTREATED BASE COURSE**

A. Material: Crushed rock, gravel, sand or other high quality mineral particle, or combination.

Table 2 - Properties					
Physical Property	**Units**	**Aggregate Class**			**ASTM Test**
		A	**B**	**C**	
Dry Rodded Unit Weight, min.	lb/ft^3	75			C 29
Liquid Limit, max.		25			D 4318
Plastic Index, max.		0	0	6	D4318
Sand Equivalent, min.	percent	35			D2419
Wear (hardness), max.	percent	50			C131
Gradation		Table 3			C 136
Two Fractured Faces, min	percent	90	50	50	D 5821
CBR, min.		70	55	40	D 1883

Notes:
(a) Liquid limit, plastic limit, sand equivalent: Passing No. 40 sieve.
(b) Wear: Retained on No. 8 sieve.
(c) CBR: Use 10 lb surcharge measured at 0.20 inch penetration at 95 percent of modified Proctor.
(d) Faces: Retained on No. 4 sieve.

Table 3 – Gradation		
US Sieve Size	Master Grading Bands Limits	
	Grade 1-1/2	Grade 1
2"	–	–
1-1/2"	100	–
1"	–	100
3/4 "	81 – 91	–
1/2 "	67 – 77	79 – 91
3/8"	–	–
No. 4	43 – 53	49 – 61
No. 16	23 – 29	27 – 35
No. 200	6 – 10	7 – 11

2.2 **ASPHALT TREATED BASE COURSE**

A. Meet requirements of this Section Article 2.1 and the following.

1. Sand equivalent and fractured face measured after asphalt residue is burned off.

2. Plasticity and wear requirements apply to virgin aggregate portion only.

3. Allowable asphalt content is controlled by CBR.

B. If aggregate contains RAP.

1. Screen crushed RAP to remove debris.

2. Mechanically blend virgin and RAP aggregates. Do not use windrows for blending.

2.4 **SOURCE QUALITY CONTROL**

A. Sample, ASTM D 75 on a random basis, ASTM D 3665.

B. Reject crushed aggregate base products that do not meet requirements of this Section.

PART 3 EXECUTION

3.1 **INSTALLATION**

A. Trenches, Section 33 05 20.

B. Structures, Section 31 23 23.

C. Landscaping, Section 32 92 19.

D. Pavements, Section 32 05 10.

3.2 **FIELD QUALITY CONTROL**

A. Remove any product found defective after installation and install acceptable product at no additional cost to the OWNER.

END OF SECTION

SECTION 32 12 03

PAVING ASPHALTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Performance graded asphalt, asphalt cement, cutback asphalt, emulsified asphalt, recycle asphalt, and crack patch asphalt.

B. Requirements for accepting non-complying paving asphalts.

1.2 REFERENCES

A. ASTM D 113: Standard Test Method for Ductility of Bituminous Materials.

B. ASTM D 977: Standard Specification for Emulsified Asphalt.

C. ASTM D 2026: Standard Specification for Cutback Asphalt (Slow-Curing Type).

D. ASTM D 2027: Standard Specification for Cutback Asphalt (Medium-Curing Type).

E. ASTM D 2028: Standard Specification for Cutback Asphalt (Rapid-Curing type).

F. ASTM D 2397: Standard Specification for Cationic Emulsified Asphalt.

G. ASTM D 3381: Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction.

H. ASTM D 4552: Standard Practice for Classifying Hot-Mix Recycling Agents.

I. ASTM D 5710: Standard Specification for Trinidad Lake Modified Asphalt.

J. ASTM D 6373: Standard Specification for Performance Graded Asphalt Binder.

1.3 SUBMITTALS

A. Submit bill of lading for each shipment of paving asphalt from vendor. Identify the following.

1. Source of product (manufacturer);
2. Type and grade of asphalt, And
3. Type and amount of additives in the product.

1.4 QUALITY ASSURANCE

A. Reject paving asphalts which are not uniform in appearance and consistency or which foam when heated to mixing temperature.

B. Do not use storage containers contaminated with other types or grades of Petroleum products.

C. Do not use Petroleum product that does not comply with contract requirements.

1.5 ACCEPTANCE

A. General:

1. Acceptance is by Lot. One Lot is one day's production.
2. If non-complying material has been installed and no price for the material is specified, apply price adjustment against cost of work requiring material as part of its installation. Section 01 29 00
3. Dispute resolution, Section 01 35 10.

B. Performance Graded Asphalt Binder (PGAB): Sub-lot size is 20,000 gallons. Collect sub-lot Sample randomly from oil storage unit.

1. Refer to limits identified in Section 209 of UDOT's "Manual of Instruction Part 8 Materials". Pay factors are as follows.

a. If none of the critical properties are outside rejection limit a composite price adjustment of 25 percent or less is allowed.
b. If one or more of the critical properties falls outside the rejection limit or if a composite price adjustment is more than 25 percent, paving asphalt will be rejected.

C. Asphalt Cement (AC) Binder: Sub-lot size is 20,000 gallons. Collect sub-lot Sample randomly from oil storage unit.

1. Ductility: Meet this Section's requirements, or
2. Viscosity or Penetration: Meet graphics published in Section 955 of UDOT's "Manual of Instructions, Part 8 Materials".
   a. Lot may be accepted using the published graphics. If price adjustment exceeds 30 percent, reject paving asphalt, or
   b. If allowed to remain after placement, price adjustment will be 50 percent.

D. Cut-back Binder: Meet this Section's requirements for ductility.

E. Trinidad Lake Modified Asphalt: Supplier's certificate for ASTM compliance.

F. Emulsifie Asphalt: Supplier's certificate for ASTM compliance.

G. Recycle Asphalt: Identity of source (asphalt cement or tar products).

H. Crack Patch: Meet material requirements in Section 32 01 17.

PART 2 PRODUCTS

2.1 PERFORMANCE GRADE ASPHALT BINDER (PGAB)

A. Petroleum asphalt that complies with ASTM D 6373. Blending the paving asphalt with polymers or natural asphalts is CONTRACTOR's choice.

2.2 ASPHALT CEMENT (AC)

A. Petroleum asphalt that complies with Table 2 of ASTM D 3381 except as follows:

1. Replace ductility at 77 deg. F. (25 deg. C.) with ductility at 39.2 deg. F. (4 deg. C.). Use the following values.

- AC-5: greater than 25.
- AC-10: greater than 15.
- AC-20: greater than 5.

2. Delete the loss on heating requirement on residue from "Thin-Film Oven Test".

B. AC-5 Latex Additive: Anionic emulsion of butadiene-styrene low-temperature copolymer consisting of 2 percent by weight (solids basis), stabilized with fatty-acid soap for storage stability.

2.3 **TRINIDAD LAKE MODIFIED ASPHALT (TLA)**

A. Petroleum asphalt that complies with ASTM D 5710 (a blend of natural asphalts).

2.4 **SLOW CURE CUT-BACK ASPHALT (SC)**

A. Petroleum asphalt that complies with ASTM D 2026 (fluxed with a light oil) except if penetration of residue is more than 200 and its ductility at 77 deg. F (25 deg. C) is less than 100 cm., the material will be acceptable if the ductility at 59 deg. F. (15 deg. C) is greater than 100.

2.5 **MEDIUM CURE CUT-BACK ASPHALT (MC)**

A. Petroleum asphalt that complies with ASTM D 2027 (fluxed or blended with a kerosene-type solvent, non-foaming when heated to application temperature) except if penetration of residue is more than 200 and its ductility at 77 deg. F. (25 deg. C) is less than 100 cm., the material will be acceptable if the ductility at 59 deg. F. (15 deg. C) is greater than 100.

2.6 **RAPID CURE CUT-BACK ASPHALT (RC)**

A. Petroleum that complies with ASTM D 2028 asphalt (fluxed or blended with a naphtha-solvent, non-foaming when heated to application temperature).

2.7 **EMULSIFIED ASPHALT**

A. Petroleum asphalt uniformly emulsified with water, homogeneous throughout, and when stored, shows no separation within 30 days after delivery. Frozen emulsions not accepted.

1. Anionic, ASTM D 977 (breaks by evaporation).
2. Cationic, ASTM D 2397 (breaks chemically).

2.8 **RECYCLE ASPHALT (RA)**

A. Petroleum asphalt that complies with ASTM D 4552 (homogeneous, free-flowing at pumping temperature made from maltene fractions of asphalt cement for surface revitalization or from tar products to make Pavements resistant to fuel spillage.

1. RA-1, RA-5, RA-25 or RA-75 for recycling RAP when less than 30 percent virgin aggregate is added.
2. RA-250 or RA-500 when more than 30 percent virgin aggregate is added to the RAP.

PART 3 EXECUTION

3.1 **INSTALLATION**

A. Prime coat, Section 32 12 13.
B. Tack coat, Section 32 12 14.
C. Plant mix paving, Section 32 12 17.
D. Road mix paving, Section 32 12 17.
E. Seal coating, Section 32 01 13.
F. Crack patch, Section 32 01 17.

END OF SECTION

SECTION 32 12 05

ASPHALT CONCRETE

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Composition of asphalt -aggregate mix.

B. This specification does not apply to polymer modified asphalt concrete. Refer to Section 32 12 06.

1.2 **REFERENCES**

A. AI Manual Series No. 2: Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types.

B. AASHTO T 324: Hamburg Wheel-track Testing of Compacted Hot-Mix Asphalt (HMA).

C. ASTM C 29: Standard Test Method for Unit Weight and Voids in Aggregate.

D. ASTM C 88: Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.

E. ASTM C 117: Standard Test Method for Materials Finer Than 0.075mm (No. 200) Sieve in Mineral Aggregates by Washing.

F. ASTM C 131: Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

G. ASTM C 136: Standard Method for Sieve Analysis of Fine and Coarse Aggregate.

H. ASTM C 142: Standard Test Method for Clay Lumps and Friable Particles in Aggregates.

I. ASTM D 75: Standard Practice for Sampling Aggregates.

J. ASTM D 140: Standard Practice for Sampling Bituminous Materials.

K. ASTM D 242: Standard Specification for Mineral Filler for Bituminous Paving Mixtures.

L. ASTM D 979: Standard Methods for Sampling Bituminous Paving Mixtures.

M. ASTM D 2419: Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.

N. ASTM D 3203: Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures.

O. ASTM D 3381: Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction.

P. ASTM D 3515: Standard Specification for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.

Q. ASTM D 3665: Standard Practice for Random Sampling of Construction Materials.

R. ASTM D 3666: Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Bituminous Paving Materials.

S. ASTM D 4318: Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

T ASTM D 4552: Standard Practice for Classifying Hot-Mix Recycling Agents.

U. ASTM D 4791: Standard Test Method for Flat or Elongated Particles in Coarse Aggregate.

V. ASTM D 4867: Standard Test Method for Effect of Moisture on Asphalt Concrete Paving Mixtures.

W. ASTM D 5444: Standard Test Method for Mechanical Size Analysis of Extracted Aggregate.

X. ASTM D 5581: Standard Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus (6-jnch_Diameter Specimen)

Y. ASTM D 5821: Standard Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate.

Z. ASTM D 6307: Standard Test Method for Determining Asphalt Content of Hot-Mix Asphalt by Ignition Method.

AA. ASTM D 6373: Standard Specification for Performance Graded Asphalt Binder.

1.3 **DEFINITIONS**

A. Asphalt-Aggregate Designator: Alpha-numeric code that indicates type and grade of asphalt, and type and grade of aggregate in an asphalt-aggregate mix. For example;

1. "*AC-20-DM-3/4*" means asphalt-aggregate mix shall be composed of AC-20 type and grade asphalt cement and DM-3/4 type and grade aggregate.
2. "*RA-1-DM-1*" means asphalt-aggregate mix shall be composed of RA-1 type and grade asphalt recycling agent and DM-1 type and grade aggregate.
3. "*RS-1-SS-II*" means asphalt-aggregate mix shall be composed of RS-1 type and grade asphalt emulsion and SS-II type and grade aggregate.

B. Mean of Deviations: Defined in Section 32 11 23.

1.4 **SUBMITTALS**

A. **Quality Assurance**: Submit names, certification levels, and years of experience of testing agency's field technicians that are assigned to the Work. Verify laboratory complies with ASTM standards.

B. **Mix Design**: Submit.

1. Date of mix design. If older than 365 days, recertify mix design.

2. Asphalt cement source, type and chemical composition.
3. Aggregate gradation target.
4. Asphalt cement target, dust to asphalt ratio, moisture sensitivity (tensile strength) stability, flow and voids in the bituminous mix.
5. Paving asphalt grade if RAP is used in the mix.
6. RAP, mineral filler, antistrip, and recycle agent percentages.

C. **Pre-approved mix design**, submit name and address of Supplier.

D. **Before changing mix design**, submit a new design and give ENGINEER 10 days to evaluate the changes.

E. **Source Quality Control Inspections and Testing Report**: If requested, submit report describing CONTRACTOR's and Supplier's quality control activities and test results.

1.5 **QUALITY ASSURANCE**

A. Use a laboratory that follows and complies with ASTM D 3666.

B. Do not change aggregate source or paving asphalt source without ENGINEER's written approval.

C. Do not use non-complying sources.

1.6 **ACCEPTANCE**

A. General:

1. Acceptance is by Lot. One Lot is one day's production.
2. If non-complying material has been installed and no price for the material is specified, apply price adjustment against cost of work requiring material as part of its installation, Section 01 29 00.
3. Dispute resolution, Section 01 35 10.

B. Installation: Accepted as specified in Section 32 12 16.

C. Materials:

1. At the Source:
   a. Aggregate: Verify gradation. Collect sample from conveyor belt or stockpile if belt is not accessible.
   b. Paving Asphalt: See Section 32 12 03 provisions.
   c. Mix: 325 deg. F. maximum in transport vehicle.
2. At the Site:
   a. One sub-lot is 500 tons.
   b. Sampling: Two random samples per sub-lot. Location as follows.
      1) Behind paver before compaction, or
      2) Where sub-lot exhibits non-uniform appearance.
3. At the Laboratory:
   a. Air Voids:
      1) Basis of evaluation is laboratory compacted samples (not field compacted

samples).

2) If test results are not within this Section's limits, options include correction of production procedures or alternate mix design acceptable to ENGINEER.

b. Dust to asphalt ratio.

c. Asphalt Content, Aggregate Gradation: Lot is acceptable if test deviations are within pay factor 1.00 limits. At ENGINEER's discretion, a Lot with a sub-lot test deviation greater than pay factor 0.85 limits may stay in place at 50 percent cost.

Table 1 – Pay Factors for Non-complying Materials

Criteria	Pay Factor	Range of Mean of Deviations of Tests Results from the Design Mix Target in Percentage Points				
		500 Tons	1,000 Tons	1,500 Tons	2,000 Tons	≥ 2,500 Tons
Asphalt Content	1.00	0.00–0.70	0.00–0.54	0.00–0.46	0.00–0.41	0.00–0.38
	0.975	0.71–0.80	0.55–0.61	0.47–0.52	0.42–0.46	0.39–0.43
	0.95 0.90	0.81–0.90	0.62–0.68	0.53–0.58	0.47–0.52	0.44–0.47
	0.85	0.91–1.00	0.69–0.75	0.59–0.64	0.53–0.56	0.48–0.52
		1.01–1.10	0.76–0.82	0.65–0.69	0.57–0.61	0.53–0.56
1/2" and larger Sieve	1.00	0.0–10.9	0.0–7.3	0.0–6.5	0.0–5.6	0.0–5.2
	0.975	11.0–12.9	7.4–8.3	6.4–7.1	5.7–6.3	5.3–5.8
	0.95 0.90	13.0–13.9	8.4–9.3	7.2–7.9	6.4–7.0	5.9–6.4
		14.0–14.9	9.4– 10.3	8.0–8.7	7.1–7.7	6.5–7.1
	0.85	15.0–16.0	10.4–11.3	8.8–9.5	7.8–8.4	7.2–7.7
3/8" Sieve	1.00	0.0–9.9	0.0–6.9	0.0–5.9	0.0–5.3	0.0–4.9
	0.975	10.0–10.9	7.0–7.8	6.0–6.6	5.4–6.9	5.0–5.5
	0.95 0.90	11.0–11.9	7.9–8.7	6.7–7.3	6.0–6.6	5.6–6.1
		12.0–13.9	8.8–9.6	7.4–8.0	6.7–7.2	6.2–6.6
	0.85	14.0–15.0	9.7–10.5	8.1–8.9	7.3–7.9	6.7–7.2
No. 4 Sieve	1.00	0.0–9.9	0.0–6.7	0.0–5.7	0.0–5.2	0.0–4.8
	0.975	10.0–11.0	6.8–7.6	5.8–6.3	5.3–5.8	4.9–5.4
	0.95 0.90	11.1–11.9	7.7–8.5	6.4–6.9	5.9–6.4	5.5–5.9
		12.0–12.9	8.6–9.4	7.0–7.5	6.5–7.0	6.0–6.5
	0.85	13.0-14.0	9.5–10.2	7.6–8.0	7.1–7.6	6.6–7.0
No. 8 Sieve	1.00	0.0–7.9	0.0–5.6	0.0–4.8	0.0–4.3	0.0–4.0
	0.975	8.0–8.9	5.7–6.3	4.9–5.4	4.4–4.8	4.1–4.5
	0.95 0.90	9.0–9.9	6.4–7.0	5.5–6.0	4.9–5.3	4.6–4.9
		10.0–10.9	7.1–7.7	6.1–6.6	5.4–5.8	5.0–5.4
	0.85	11.0–12.0	7.8–8.5	6.7–7.2	5.9–6.4	5.5–5.8
No. 16 Sieve	1.00	0.0–7.9	0.0–5.2	0.0–4.6	0.0–4.2	0.0–3.9
	0.975	8.0–8.9	5.3–5.8	4.7–5.1	4.3–4.6	4.0–4.3
	0.95 0.90	9.0–9.9	5.9–6.4	5.2–5.6	4.7–5.1	4.4–4.7
		10.0–10.9	6.5–7.0	5.7–6.1	5.2–5.5	4.8–5.1
	0.85	11.0–12.0	7.1–7.6	6.2–6.6	5.6–5.9	5.2–5.4

No. 50 Sieve	1.00	0.0–6.9	0.0–4.3	0.0–3.8	0.0–3.4	0.0–3.2
	0.975	7.0–7.9	4.4–4.8	3.9–4.1	3.5–3.8	3.3–3.5
	0.95 0.90	8.0–8.9	4.9–5.3	4.2–4.5	3.9–4.1	3.6–3.8
		9.0–9.9	5.4–5.8	4.6–4.9	4.2–4.4	3.9–4.1
	0.85	10.0–11.0	5.9–6.4	5.0–5.5	4.5–4.9	4.2–4.5
No. 200 Sieve	1.00	0.0–3.0	0.0–2.4	0.0–2.0	0.0–1.8	0.0–1.7
	0.975	3.1–3.5	2.5–2.7	2.1–2.2	1.9–2.0	1.8–1.9
	0.95 0.90	3.6–4.0	2.8–3.0	2.3–2.4	2.1–2.2	2.0–2.1
	0.85	4.1–4.5	3.1–3.3	2.5–2.7	2.3–2.4	2.2–2.3
		4.6–5.0	3.4–3.6	2.8–3.0	2.5–2.6	2.4–2.5

NOTES
(a) Test paving asphalt content using a burn-off oven, ASTM D 6307.
(b) Determine aggregate gradation be extraction, ASTM D 5444.

PART 2 PRODUCTS

2.1 **PAVING ASPHALT**

A. Asphalt Cement: Section 32 12 03. Substitutes for asphalt cement are as follows.

ASTM D 3381	ASTM D 6373
AC 10	PG 64-22 or PG 70-28
AC 20	PG 70-28

B. Recycle Asphalt: Section 32 12 03.

2.2 **AGGREGATE**

A. Material: Clean, hard, durable, angular, sound, consisting of crushed stone, crushed gravel, slag, sand, or combination.

B. Source: Use the following requirements to determine suitability of aggregate source and not for project control.

1. Coarse Aggregate:
   a. Angularity (fractured faces), ASTM D 5821: 50 percent maximum by weight of particles with at least 2 fractured faces.
   b. Hardness (toughness), ASTM C 131: 40 percent minimum wear of aggregate retained above the No. 4 sieve unless specific aggregates having higher values are known to be satisfactory.
   c. Flat or Elongated Particles, ASTM D 4791: 20 percent maximum retained above 3/8 inch sieve has a 3:1 length to width ratio.
2. Fine Aggregate:
   a. Friable Particles, ASTM C 142: 2 percent maximum passing No. 4 sieve.
   b. Plasticity, ASTM D 4318: Aggregate passing No. 40 sieve is non-plastic even when filler material is added to the aggregate.
      1) Liquid limit: Less than 25.

      2) Plastic limit: Less than 6.

2.3 **ADMIXTURES**

A. Reclaimed Asphalt Pavement (RAP) Aggregate: Restrictions include.
   1. 15 percent by weight maximum providing grading and voids in the bituminous mix are met.
   2. Greater than 15 percent requires separate mix design.

B. Mineral Filler: ASTM D 242.

C. Recycle Agent: ASTM D 4552.

D. Antistrip: Heat stable cement slurry or lime slurry.

2.4 **MIX DESIGN**

A. Selection of Materials:
   1. Paving Asphalt, Section 32 12 03:
      a. AC-10 or AC-20: Light traffic pavement.
      b. AC-20: Medium traffic pavement.
      c. RA: For hot-laid recycled asphalt pavement. Choice by CONTRACTOR.
   2. Aggregate: This Section Article 2.2.

B. Selection of Design Aggregate Structure:
   1. Gradation: Maximum particle size is 1/2 compacted lift thickness.
      a. Target Gradation Curve must lie within one of the Master Grading Bands in the following table, or
      b. If acceptable to ENGINEER, use fractionated proportioning to select or adjust gradation.

Table 2 – Master Grading Bands

Sieve Size	Dense				Open	Friction	
	DM-1	DM-3/4N	DM-3/4	DM-1/2	OM-1/2	FM-1	FM-2
1 inch	100	-	-	-	-	-	-
3/4 inch	-	100	100	-	-	100	-
1/2 inch	75 – 91	74 – 99	-	100	100	90 –100	100
3/8 inch	-	69 – 91	75 – 91	-	93 – 100	60 – 100	90 – 100
No. 4	47 – 61	49 – 65	46 – 62	60 – 80	36 – 44 14	15 – 40 4	30 – 50
No. 8	-	33 – 47	-	28 – 42	– 21	– 12	5 – 15
No. 16	23 – 33	21 – 35	22 – 34	-	-	-	-
No. 50	12 – 22	6 – 18	11 – 23 3	11 – 23	-	2 – 5	2 – 5
No.200	3 – 7	2 – 6	– 7	3 – 7	2 – 4		-

NOTES
(a) Gradation expressed in percent passing by weight, ASTM C 136.
(b) It is assumed fine and coarse aggregate have same bulk specific gravity.
(c) Friction Mixture: See ASTM D 3515.

(d) DM -3/4N is 100% crushed.
(e) Percentage of fines passing No. 200 sieve determined by washing, ASTM C 117.

2. Aggregate Blend:
   a. Dry-rodded Unit Weight, ASTM C 29: 75 pounds per cubic foot minimum.
   b. Weight Loss (soundness), ASTM C 88: 16 percent maximum using sodium sulfate.
   c. Clay Content (cleanliness), ASTM D 2419: Sand equivalent value after going through the dryer or prior to the drum mixer.
      1) 45 percent minimum if Medium Traffic Classification.
      2) 60 percent minimum if Heavy Traffic Classification.
         The sand equivalent requirement is waived for the RAP aggregate but applies to the remainder of the aggregate blend.

C. Selection of Admixture: CONTRACTOR's choice.

1. RAP: Adjust paving asphalt grade to account for RAP binder viscosity.
2. Cement or Hydrated Lime: Add if mix is moisture sensitive.

D. Selection of Mix Properties: Use AI Manual Series No. 2 procedure for stability, flow and voids.

1. Stability, Flow Voids: If traffic classification is not specified elsewhere, use Medium Traffic Classification.

Table 3 – Stability, Flow, Voids Limits

Criteria	Traffic Classifications		
	Light	Medium	Heavy
Number of compaction blows each end of specimen	50	75	112
Stability, lbs., minimum	750	1200	1800
Flow, in 0.01 inch units	10 – 18	10 – 18	10 – 18
Voids in Mineral Aggregate (VMA), percent minimum			
1" nominal maximum particle size	13	13	13
3/4" nominal maximum particle size	14	14	14
1/2" nominal maximum particle size	15	15	15
3/8" nominal maximum particle size	16.5	16.5	16.5
Voids in Bituminous Mix, percent	3 – 5	3 – 5	3 – 5

NOTES
(a) Traffic Classifications:
Light: (ESAL <104 per year) Class I: Parking lots, Driveways, light traffic residential streets, light traffic farm roads.
Medium: (ESAL between 104 and 106 per year) Class II: Residential streets, rural farm and residential roads. Class III: Urban minor collector streets, rural minor collector roads.
Heavy: (ESAL >106 per year) Class IV: Urban minor arterial and light industrial and light industrial streets, rural major collector and minor arterial highways. Class V: Urban major arterial and heavy industrial streets, freeways, expressways, arterial highways, rural interstate and other principal arterial highways.
(b) Stability, Flow, Voids: ASTM D 5581.
(c) VMA: ASTM D 3203
(d) Nominal maximum particle size is the largest sieve size listed in this Section upon which any material is retained.

2. Dust to Asphalt Ratio: 0.8 to 1.6.
3. Moisture Sensitivity, ASTM D 4867: Tensile strength ratio less than 0.80 using freeze-thaw conditioning. Test specimen shall be 150 mm in diameter and 95 mm in height and compacted at 7 percent plus or minus 1 percent air voids)
4. Rut Susceptibility, AASHTO T 324: Maximum rut depth is 10 mm at 20,000 passes.

2.5 **SOURCE QUALITY CONTROL**

A. General: Collect samples, ASTM D 3665. Do not change sampling points.
   1. Aggregate sampling, ASTM D 75.
   2. Paving asphalt sampling, ASTM D 140. Test for viscosity and penetration.
B. Asphalt-Aggregate Mix: Sample, ASTM D 979. Test for the following.
   1. Air voids, ASTM D 3203 or ASTM D 5581.
   2. Paving asphalt content, ASTM D 6307.
   3. Aggregate gradation, ASTM D 5444.
   4. Tensile strength of bitumen-aggregate mixtures, ASTM D 4867.
C. Mixing Plant: ASTM D 3515.

PART 3 EXECUTION

3.1 **INSTALLATION**

A. Roadway paving, Section 32 12 17.
B. Patching, Section 33 05 25.

END OF SECTION

SECTION 32 12 14

TACK COAT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Application of asphaltic material to existing asphalt concrete or portland cement concrete surfaces preparatory to placing an asphalt concrete Pavement.

1.2 SUBMITTALS

A. Certificate showing asphaltic material complies with Section 32 12 03.
   1. Identify water/asphalt dilution ratio.
   2. Identify tack coat application rate.

B. Identify asphalt material recommended by fabric manufacturer.

1.3 WEATHER

A. Apply tack coat only when air and roadbed temperatures in the shade are greater than 40 deg. F. The temperature restrictions may be waived only upon written authorization from ENGINEER.

B. Do not apply tack coat during rain, fog, dust, or other unsuitable weather. Do not apply coat to wet surfaces.

1.4 NOTICE

A. Send written notice to residents or business owners 24 hours prior to applying coat.

PART 2 PRODUCTS

2.1 ASPHALT MATERIAL

A. Select from the following.
   1. Emulsified Asphalt: Grade MS-1, SS-1 or SS-1h, Section 32 12 03.
   2. Cationic Emulsified Asphalt: Grade CSS-1 or CSS-1h, Section 32 12 03.
   3. Rapid Cure Cutback Asphalt: Grade RC-70, Section 32 12 03.

PART 3 EXECUTION

3.1 PREPARATION

A. Select and advise ENGINEER of the type of tack material to be used.

B. Clean the surface to be treated free of dust and other foreign material. If flushed, allow surface to dry. If leaves from trees, blow clean.

C. Provide surface for pedestrian access across tack coat.

D. Prevent pedestrians, vehicles, pets, etc., access to tack surfaces.

3.2 APPLICATION

A. General:
   1. Triple coverage by spray bar required. Stop application if any nozzle is not working properly.
   2. Apply tack only to area covered with asphalt concrete in the same day.

B. Application rate: Typically as follows.
   1. Emulsions, 0.05 to 0.15 gallons per square yard.
   2. Cutback, CONTRACTOR's choice.

C. Tack Substrate for Fabric Application: Comply with manufacturer's recommendation. If none, then as follows.
   1. Dry Pavement surface, 0.20 to 0.30 gallons per square yard. Within street intersections, on steep grades and in zones where vehicle speed changes are commonplace reduce the application rate to no less than 0.20 gallons per square yard.
   2. Heavy duty fabrics, 0.30 to 0.40 gallons per square yard.

3.3 PROTECTION

A. Protect all surfaces exposed to public view from being spattered or marred. Remove any spattering, over-coating, or marring.

B. Do not discharge bituminous material into borrow pits or gutters.

3.4 OPENING TO TRAFFIC AND MAINTENANCE

A. Do not permit traffic to travel over the tacked surface until bituminous tack coat has cured or is not picked up by traffic.

B. If detours cannot be provided, restrict operations to a width suitable at least for one-way traffic over the remaining portion of the road.

C. If one-way traffic is provided, control traffic appropriately.

END OF SECTION

SECTION 32 12 16

PLANT-MIX -ASPHALT PAVING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Place Superpave or plant-mix asphalt concrete in base, leveling and surface courses, or overlay.

1.2 REFERENCES

A. AASHTO T 324: Hamburg Wheel-track Testing of Compacted Hot-Mix Asphalt (HMA).

B. ASTM D 979: Standard Practice for Sampling Bituminous Paving Mixtures.

C. ASTM D 2041: Standard Test Method for Theoretical Maximum Specific Gravity of Bituminous Paving Mixtures.

D. ASTM D 3549: Standard Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens.

E. ASTM D 3665: Standard Practice for Random Sampling of Construction Materials.

F. ASTM E 950: Standard Test Method for Measuring the Longitudinal Profile of Traveled Surfaces with an Accelerometer Established Inertial Profiling Reference.

G. ASTM E 1274: Standard Test Method for Measuring Pavement Roughness Using a Profilograph.

1.3 SUBMITTALS

A. Before Delivery:
1. Traffic control plan, Section 01 55 26.
2. Type and number of rollers.
3. Manufacturer's certificate of compliance for paving geotextiles, Refer to Section 31 05 19.
4. Location and name of asphalt concrete production facility.
5. Proof of profilograph and profilograph operator certification.

B. At Delivery: Supply batch ticket identifying.
1. Serial number of ticket.
2. Date and truck number.
3. Job name, location, and mix identification.
4. Type, grade, and weight of asphalt.
5 Type, grade, and weight of aggregate.
6. Mix design method.

C. After Delivery:
1. Profile deviation report.
2. Profile roughness index report.
3. Quality Control Inspections and Testing Report: Upon ENGINEER’s request, submit report describing source and field quality control activities and test results performed by CONTRACTOR and CONTRACTOR’s Suppliers.

1.4 QUALITY ASSURANCE

A. Do not change asphalt or aggregate sources until ENGINEER accepts new source and new mix design.

B. Reject product and work that does not meet requirements of this Section.

C. Remove product found defective after installation and install acceptable product at no additional cost to OWNER.

D. Foreman of paving crew has completed at least three (3) projects of similar size and nature.

1.5 WEATHER

A. Do not pave until air temperature is 45 deg F. and rising.

B. Cease paving if air temperature falls below 50 deg F.

C. Do not pave if surface is wet or weather is unsuitable.

D. Do not pave if wind or ground cools mix material before compaction.

1.6 NOTICE

A. Send written notice to residents and businesseswithin affected area at least 3 days before start of paving.

B. Indicate paving time and when new surface can be used.

C. Warn of potential vehicle tow away and other construction issues affecting neighborhood.

D. Should work not occur on specified day, send a new notice.

1.7 ACCEPTANCE

A. General:
1. Acceptance is by Lot. Lot size is specified below.
2. If non-complying material has been installed and no price for the material is specified, apply price adjustment against cost of work requiring material as part of its installation. Section 01 29 00.
3. Dispute resolution, Section 01 35 10.
4. Opening a paved surface to traffic does not constitute acceptance.

B. Mix: Accepted as specified in Section 32 12 05, or Section 32 12 06.

C. Installation:

1. Mix Temperature:
   a. Reject mixes exceeding 325 deg F. in transport vehicle.
   b. Dispose of cold mix in paver hopper as thin spread underlay.
2. Compaction and Thickness:
   a. Lot size is 1,000 square yards or part thereof.
   b. Verify with at least 2 tests per Lot.
   c. Select test locations by ASTM D 3665 and sample per ASTM D 979 after compaction.
   d. Compaction determinations are full core depth or overlay depth in overlay construction.
   e. Thickness measurement will not apply in overlay construction.
   f. Based upon core samples, compaction and thickness is acceptable if test deviations are within pay factor 1.00 limits. At ENGINEER's discretion, a Lot with a sub-lot test deviation greater than Reject may stay in place at 50 percent cost.

Table 1 – Compaction Pay Factors

Pay Factor	Density, in Percent (ASTM D 2041)	
	Average	Lowest Test
0.70	More than 96	–
1.00	92 to 96	89 or greater
0.90	92 to 96	Less than 89
Reject	Less than 92	–

NOTES
a) At CONTRACTOR's discretion and expense, do Hamburg wheel track test (AASHTO T 324) on 3 additional random core samples from a non-complying sub-lot. The sub-lot will be accepted if average rut depth is less than 10 mm at 20,000 passes.

Table 2 – Thickness Pay Factor

Pay Factors	Thickness Deficiency, in Inches (ASTM D 3549)
1.00	0.00 to 0.25
0.90	0.26 to 0.50
0.70	0.51 to 0.75
Reject	0.76 to 1.00

3. Grade, Cross Slope: Verify tolerance is not exceeded.
4. Roughness: Verify "must grind" bumps are removed and tolerance for profile roughness index is not exceeded.

PART 2 PRODUCTS

2.1 **MATERIALS**

A. Asphalt concrete, Section 32 12 05.
B. Superpave, Section 32 12 06.
C. Prime coat, Section 32 12 13.
D. Tack coat, Section 32 12 14.
E. Paving geotextile, Section 31 05 19.
F. Paving geogrid, Section 31 05 21.

PART 3 EXECUTION

3.1 **CONSTRUCTION EQUIPMENT**

A. Lay Down Machine: Use track equipment when operating on fabrics, geogrids or Pavement mats hotter than 180 deg. F.

B. Compactors: Steel wheel static or vibratory. Use pneumatic tire roller for intermediate rolling only.

3.2 **PREPARATION**

A. General:

1. Coordinate utility location, Section 01 31 13. Contact utility companies and other agencies, for dangerous concentration of combustible, flammable, or explosive matter.
2. Lower Street Fixtures if paving machine is not capable of passing over the fixtures.
3. Remove vegetation from cracks, edges and joints. Sweep surface clean. Blow cracks clean. Remove leaves.
4. Fill cracks and fix Potholes, Section 32 01 17.
5. Stabilize concrete Subgrade slabs.

B. Trees, Plants, Ground Cover:

1. Protect trees, plants and other ground cover from damage.
2. Prune trees, Section 32 01 93 to allow equipment passage underneath. Repair tree damage at no additional cost to OWNER.

C. Traffic Control:

1. Provide worker and public safety, Section 01 55 26.
2. Apply temporary traffic and lane marking tape or paint after layout has been verified with ENGINEER.

D. Aggregate Base Course:

1. Verify base course is placed to grade and compacted.
2. If indicated, follow Section 31 25 00 for herbicide treatment or Section 32 12 13 for prime coat.

E. Tack Coat: Apply tack coat, Section 32 12 14 if inlay or subbase Pavement surface is dirty or older than 24 hours.

3.3 **TEMPORARY SURFACING**

A. Place, roll, maintain, remove and dispose of temporary surfaces.

B. In sidewalk areas construct temporary Pavements at least 1 inch thick and in all other areas at least 2 inches thick. At major intersections and other critical locations a greater thickness may be required.

3.4 **PLACE PAVING FABRIC**

A. Section 31 05 19.

3.5 **PLACE PAVEMENT MIXTURE**

A. General:

1. Provide continuous forward movement such that minimum temperature 10 feet behind paver is as follows:

Table 3 – Minimum Temperature, Degrees F.

Air Temperature Deg F.	Compacted Mat Thickness					
	3/4"	1"	1-1/2"	2"	3"	4"+
45 – 50	–	–	–	–	280	265
50 -59	–	–	–	280	270	255
60 -69	–	–	285	275	265	250
70 -79	285	285	280	270	265	250
80 -89	280	275	270	265	260	250
90 +	275	270	265	260	250	250

2. Do not leave unsafe butt joints if paving operation stops.
3. Barricade or eliminate fall off edges.

B. Overlays or Subsequent Lifts:

1. Allow new base Pavement or new inlay Pavement to harden (cure) prior to placing overlays.
2. Apply tack coat per Section 32 12 14 if inlay or sub-base pavement surface is dirty or older than 24 hours.

C. Irregular Areas: Handwork is acceptable if specified grades, slopes, compaction and smoothness is achieved.

D. Compaction:

1. Do not over compact or under compact.
2. Complete compaction before temperature drops to 180 deg. F.

E. Joints:

1. Construct joints to have same texture, density and smoothness as other sections of new Pavement course.

2. Clean contact surfaces and apply tack coat. Ensure continuous bond between old and new Pavements, or between successive day's work.
3. Offset longitudinal joints a minimum of 12 inches in succeeding courses and at least 6 feet transversely to avoid a vertical joint through more than one course. In the top course restrict longitudinal joint to 1 foot either side of lane lines.
4. Prevent traffic, including construction traffic, from crossing vertical edges. Apply tack coat to vertical edges prior to making another pass with the paver if the mix has cooled to 90 deg. F.

3.6 **TOLERANCES**

A. Compaction: 94 percent plus or minus 2 percent of theoretical maximum specific gravity, ASTM D 2041 (Rice Method).

B. Lift Thickness:

1. Not less than 2 times the maximum aggregate size in compacted asphalt concrete mixes.
2. Not less than 4 times the nominal maximum aggregate size in compacted SUPERPAVE mixes.
3. Not more than limits established by pneumatic or vibratory compactor equipment manufaturer.

C. Grade: 1/8 inch in 10 feet parallel to centerline.

D. Cross Slope: 1/4 inch in 10 feet perpendicular to centerline except at cross section grade breaks.

E. Roughness:

Table 4 – Roughness Tolerance

Speed and Traffic Class		Profile Roughness Index (PRI), Inches / Mile				Profile Deviation Inches / 25 Feet Maximum
		IRI		PI		
		Min	Max	Min	Max	
0 to 29 mph	I or II	–	–	–	–	0.4
	III or IV	129	177	46	66	0.4
30 to 44 mph	I or II	90	115	35	50	0.4
	III or IV	70	90	21	35	0.4
45 mph +	All Classes	-	70	-	21	0.3

NOTES
(a) Use a zero blanking band.
(b) As a minimum, trace right wheel path in direction of travel
(c) Traffic class is defined in Table 3 of Section 32 12 05.
(d) IRI (International Roughness Index), ASTM E 950.
(e) PI (Profile Index), ASTM E 1274.

1. Profile Deviation: Begin traces 50 feet before edge of new pavement and end traces 50 feet after edge of new pavement. Areas exceeding profile deviation tolerance are “must grind” areas.

2. Profile Roughness Index: (PRI)

   a. Lot is 0.1 lane mile (528 feet long one lane wide). Add segments shorter than 250 feet to preceding Lot. Treat partial segments longer than 250 feet as a Lot.

   b. Exclude from the Lot are turn lanes, parking lanes, medians, street fixtures, crowns of intersecting streets, bridge decks, grades greater than 8 percent, and vertical curves less than 1,000 feet radius (including super-elevation transitions).

3.7 **PROTECTION AND REPAIR**

A. General: All expenses are at no cost to OWNER.

B. Protection.

1. Protect all structures, including curb, gutter, sidewalks, guard rails and guide posts.
2. Remove spatter, over-coat, or mar.
3. Do not discharge bituminous materials into borrow pits or gutters.
4. Protect hot pavement from traffic until mixture has cooled enough not to become marked.
5. Protect neighborhood, storm drains and down-stream fish habitat.

C. Repair.

1. Corrective Action for Profile Deviations (“Must Grinds”): Grinding is acceptable, Section 02 41 14. Apply Section 32 12 03 cationic or anionic emulsion and sand friction blotter over grind areas.
2. Corrective Action for Profile Roughness Index: Grinding is acceptable. Skin patch for depressions is not acceptable. Raise depressions by milling and inlay. Re-profile corrected segments to verify index meets tolerance. Apply a Section 32 12 03 cationic or anionic emulsion and sand friction blotter over grind areas.
3. When thickness is deficient, place additional material over deficient areas. DO NOT skin patch. Mill for inlay if necessary.
4. Defective Joints, Seams, Edges: Repair.
5. Unacceptable Paving: Remove and replace.

END OF SECTION

SECTION 32 16 13

DRIVEWAY, SIDEWALK, CURB, GUTTER

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Concrete flatwork such as but not limited to waterways, waterway transition structures, sidewalks, curbs, gutters, Driveway Approaches.

1.2 **REFERENCES**

A. American Public Works Association (Utah Chapter).

1. Plan 205: Curb and Gutter.
2. Plan 209: Curbs.
3. Plan 211: Waterway.
4. Plan 213: Waterway Transition Structure.
5. Plan 215: Dip Driveway Approach.
6. Plan 216: Mountable curb driveway approach.
7. Plan 221: Flare Driveway Approach.
8. Plan 225: Open Driveway Approach.
9. Plan 229: Pipe Driveway Approach.
10. Plan 231: Concrete Sidewalk.

B. ASTM A 36: Standard Specifications for Structural Steel.

C. ASTM C 39. Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

D. ASTM C 172: Standard Method of Sampling Freshly Mixed Concrete.

1.3 **DEFINITIONS**

A. Driveway: A paved or unpaved vehicular thoroughfare outside of, but connected to a public road right-of-way or highway right-of-way.

B. Driveway Approach: (1) A vehicular thoroughfare connecting a public road or highway to a driveway. (2) A concrete structure composed of sidewalk, apron and any curb and gutter abutting the apron. When an apron is built as a bridge over curb and gutter, the bridge is included in this definition.

1.4 **SUBMITTALS**

A. Traffic control plan, Section 01 55 26.

B. Concrete mix design, Section 03 30 04.

C. Batch ticket, Section 03 30 10.

D. Quality Control Inspections and Testing Report: Upon ENGINEER’s request, submit a

report describing source and field quality control activities and test results performed by CONTRACTOR and CONTRACTOR's Suppliers.

1.5 **NOTICE**

A. Send written notice to residents and businesses within affected area at least 3 days before work starts.

B. Indicate when concrete work will take place and when driveway approach can be used.

C. Warn of potential vehicle tow away and other construction issues affecting neighborhood.

D. Should work not occur on specified day, send a new notice.

1.6 **ACCEPTANCE**

A. General:

1. Acceptance is by Lot. One Lot is one day's production.
2. If non-complying material has been installed and no price for the material is specified, apply price adjustment against cost of work requiring material as part of its installation. Section 01 29 00.
3. Dispute resolution, Section 01 35 10 and Section 03 30 05.

B. Concrete Mix:

1. Testing Frequency: Section 03 30 05. Sample per ASTM C 172.
2. Temperature, Slump, Air: Lot size is 1 random batch. Reject noncomplying batches until 2 consecutive batches are compliant then proceed in random batch testing for acceptance.
3. Strength: ASTM C 39. Lot size is 50 cubic yards. At ENGINEER's discretion, a Lot with sub-lot test deviations greater than Reject may stay in place at 50 percent cost.

Pay Factor	**PSI Below 28 day Compressive Strength**
0.98	1 to 100
0.94	101 to 200
0.88	201 to 300
0.80	301 to 400
Reject	Greater than 400

C. Placement, finishing and protection, Section 03 30 10

1. Verify line, grade, cross slope and finish.
2. No standing water in curb and gutter.

PART 2 PRODUCTS

2.1 **MATERIALS**

A. Concrete Mix.:

1 Cast-in-place: Class 4000, Section 03 30 04.
2. Maximum slump per mix design.

B. Reinforcement: Grade 60 ksi galvanized or epoxy coated steel per Section 03 20 00.

C. Expansion Joint Filler: F1 sheet 1/2 inch thick per Section 32 13 73.

D. Contraction Joint Filler (Backer Rod): Closed cell, Type 1 round Section 32 13 73.

E. Contraction Joint Sealer: HAS1 or HAS4 hot applied per Section 32 13 73.

F. Curing Compound: Membrane forming compound per Section 03 39 00.

G. Plate Steel: ASTM A 36 galvanized per Section 05 05 10.

PART 3 EXECUTION

3.1 **CONSTRUCTION EQUIPMENT**

A. Slip Form Machines.

1. Placement must produce required cross-section, lines, grades, finish, and jointing as specified for formed concrete.
2. If results are not acceptable, remove and replace work with formed concrete.

3.2 **PREPARATION**

A. Control pedestrian and vehicular traffic, Section 01 55 26.

B. Examine surfaces scheduled to receive concrete formwork for defects.

C. Do not start work until defects are corrected.

D. Check slopes on each side of the work to ensure drainage. Failure to check and verify will result in CONTRACTOR repairing any drainage deficiencies at no additional cost to OWNER.

3.3 **LAYOUT**

A. Curb, Gutter, Curb and Gutter: Plan 205, 209, 211, 213.

1. Line: Less than 1/2 inch variance in 10 feet and not more than 1 inch from true line at any location.
2. Grade: Not more than 1/4 inch variance in 10 feet. Flood curb and gutter with water after final cure has been reached. Remove and replace any area where ponding is found.

B. Sidewalk: Plan 231.

1. Cross slope 2 percent.

2. Landing slope 2 percent maximum in any direction.
3. Ramp slope, Section 32 16 14.

C. Driveway Approaches: Plan 215, 216, 221, 225, 229.

3.4 **CONCRETE PLACEMENT**

A. Section 03 30 10.

B. Make sure base course is uniformly damp at time of concrete placement.

C. Obtain ENGINEER's review of base course and forms before placing concrete.

D. Do not use methods that segregate the mix.

E. Place concrete so time between end of placement and beginning of finishing is less than 15 minutes.

F. Consolidate concrete with vibrator or other acceptable method. Do not use mechanical vibrators. Prevent dislocation of inserts.

3.5 **CONTRACTION JOINTS**

A. Geometrics:

1. Tooled Joints (Score Lines):
   - Depth = T/4. T is the depth of the concrete slab in inches.
   - Top radius = 1/2 inch.
2. Saw Cut Joints: Saw joints before uncontrolled shrinkage cracking occurs. Do not tear or ravel concrete during sawing.
3. Template Joints: 1/8 to 3/16 inch wide 1/4-depth of slab.

B. Sidewalks.

1. At intervals equal to the width of the sidewalk and transverse to the line of walk.
2. Radial at curbs and walk returns.
3. Place longitudinal joints in walks when width of walk in feet is greater than 2 times the walk thickness in inches. (e.g. maximum width of a 4 inch thick walk before placement of a longitudinal contraction joint is 8 feet). Make longitudinal joints parallel to, or concentric with, the lines of the walk.
4. In walk returns make 1 joint radially midway between the beginning of curb returns (BCR) and end of curb returns (ECR). Match longitudinal and traverse joints with the adjacent walks.

C. Curb, Gutter, Waterway.

1. Place joints at intervals not exceeding 12 feet.
2. At curb radius and walk returns make the joints radial.
3. Where integral curb and gutter is adjacent to concrete Pavement, align the joints with the Pavement joints where practical.

D. Additional Contraction Joint Requirements: Section 32 13 73.

3.6 **EXPANSION JOINTS**

A. Geometrics: 1/2 inch wide full depth filler that is flush with concrete surface. Do not place seal over top of filler

B. Sidewalks, Sidewalk Ramps.

1. Place expansion joints to separate sidewalk from utility poles, hydrants, Manhole frames, buildings and abutting sidewalks.
2. Place expansion joints between the sidewalk and the back of curb returns and between the sidewalk and sidewalk ramps.
3. Do not place expansion joints in sidewalk ramp surfaces.
4. Expansion joints are not required when using slip form method to place concrete except where sidewalk changes direction or where it joins foundation walls or structures.

C. Curb, Gutter, Waterway.

1. Do not place longitudinal joints in drain gutter flow-lines.
2. Where drain gutter transitions extend beyond the curb return, place expansion joints at the ends of the drain gutter transition.
3. Place expansion joints at beginning of curb radius (BCR) and end of curb radius (ECR).

D. Slip Form Work: Expansion joints are not required except at BCR or ECR.

E. Driveway Approach: Do not place expansion joints in curb returns.

F. Street Intersection Corner: Place expansion joints at BCR and ECR.

G. Additional Expansion Joint Requirements: Section 32 13 73.

3.7 **FINISH**

A. Section 03 35 00.

B. Round edges exposed to public view to a 1/2 inch radius.

C. Apply broom finish longitudinal to curb and gutter flowline.

D. Apply broom finish transverse to sidewalk centerline as follows.

1. Fine hair finish where grades are less than 6 percent.
2. Rough hair finish where grades exceed 6 percent.

E. Remove form marks or irregularities from finish surfaces.

3.8 **CURING**

A. Section 03 39 00.

B. Type ID Class A (clear with fugitive dye) membrane forming compound. Apply total coverage in 2 directions after texturing.

C. Eliminate thermal shock of concrete by keeping cure temperature even throughout extent and depth of concrete slab.

3.9 **PROTECTION AND REPAIRS**

A. General: All expenses are at no cost to OWNER.

B. Protection: Section 03 30 10.

1. Protect concrete work from deicing chemicals during the 28 day cure period.
2. Immediately after placement, protect concrete from graffiti or other types of mechanical injury.

C. Repair: Section 03 30 10.

1. Correct all humps or depressions.
2. Secure ENGINEER’s acceptance of method of correction.

END OF SECTION

SECTION 32 17 23

PAVEMENT MARKINGS

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Paints for Pavement striping.
B. Words and other markings in paint or plastic film.
C. One or two-way prismatic reflectors for Pavement marking.

1.2 **REFERENCES**

A. AASHTO M 237: Standard Specification and Recommended Practice for Epoxy Resin Adhesive for Bonding Traffic Markers to Hardened Concrete.
B. AASHTO M 247: Standard Specification for Glass Beads Used in Traffic Paint.
C. AASHTO M 248: Standard Specification for Ready-Mixed White and Yellow Traffic Paints.
D. AASHTO M 249: Standard Specification for White and Yellow Reflective Thermoplastic Striping Material (Solid Form).
E. ASTM D 638: Standard Test Method for Tensile Properties of Plastics.
F. ASTM E 303: Standard Method for Measuring Surface Frictional Properties Using the British Pendulum Tester.
G. FS L-S-300: Sheeting and Tape, Reflective: Nonexposed Lens.
H. Federal Standard 141: Paint, Varnish, Lacquer and Related Materials, Methods of Inspection, Sampling, and Testing.
I. Federal Standard 370: Instrumental Photometric Measurements of Retroflective Materials and Retroreflective Devices.
J. MUTCD: Manual on Uniform Traffic Control Devices for Streets and Highways.

1.3 **SUBMITTALS**

A. Specifications of primer to be used for tape applications.
B. Manufacturer's affidavit certifying paint products meet or exceed material requirements of this section.
C. Sample of prismatic reflector to be used along with manufacturer's statement of the reflector's minimum reflective area and specific intensity at the 0.2 degree observation angle.
D. Manufacturer's recommendation for type of epoxy to be used when installing prismatic reflectors and markers.
E. Samples of each thermoplastic or preformed plastic Pavement markings along with a

statement of how the materials will be applied.

PART 2 PRODUCTS

2.1 **ALKYD RESIN PAINT**
A. White or yellow Type F (Fast dry) ready-mixed, AASHTO M 248.

2.2 **THERMOPLASTIC PAINT**
A. White or yellow, AASHTO M 249.

2.3 **GLASS BEADS**
A. Type 1, AASHTO M 247.

2.4 **REFLECTIVE TAPE**
A. Type II white or yellow with a Class 1 (pressure-sensitive) adhesive, FS L-S-300.

2.5 **PREFORMED PLASTIC FILM MATERIALS**
A. Film: A retroflective pliant polymer with white or yellow pigments selected and blended to conform to standard highway colors throughout the expected life of the film and glass beads distributed throughout its base cross-sectional area, with a reflective layer of beads bonded to the top surface and composed of the following materials.

	Minimum Percent
Materials	**By Weight**
Resin and Plasticizers	20
Pigments and Extenders	30
Graded Glass Beads	33

1. Type 1: Subjected to high traffic volume and severe wear conditions such as repeated shear action from crossover, encroachment on edge and channelization lines, and stop, start, or turn movements.
   a. Class 1: Without precoated adhesive, for application with epoxy cement.
   b. Class 2: With precoated pressure sensitive adhesive.
2. Type 2: Subjected to lower traffic volumes and less severe wear action such as most highway edge lines, markings on rural highways, lane lines in well-channelized areas and transverse and word/symbols subjected primarily to free rolling traffic.
   a. Class 1: Without precoated adhesive, for application with epoxy cement.
   b. Class 2: With precoated pressure sensitive adhesive

B. Tensile Strength: Sample 6 x 1 x 0.06 inches at a temperature between 70 deg. F. and 80

deg. F. using a jaw speed of 10 inches to 12 inches per minute tested per ASTM D 638 requirements.

1. Type 1: 150 pounds per square inch of cross-section.
2. Type 2: 40 pounds per square inch of cross-section.

C. Elongation: 75 percent minimum at break when tested per ASTM D 638 requirements using a Sample 6 x 1 x 0.06 inches at a jaw speed of 10 inches to 12 inches per minute.

D. Skid Resistance: Initial minimum skid resistance values are 35 BPN as measured by the British Portable Skid Test, ASTM E 303 requirements.

E. Reflectance: Minimum reflectance values at 0.2 degrees and 0.5 degrees observation angles and 86.0 degrees entrance angle as measured per the testing procedures of Federal Standard 370.

Film Type	**Observation Angles**			
	White		**Yellow**	
	0.2°	**0.5°**	**0.2°**	**0.5°**
Type 1: SL (mcd/sf/fc)	550	380	410	250
Type 2: SL (mcd/sf/fc)	960	760	680	510

1. The photometric quantity is measured in specific luminance (SL), and expressed as millicandelas per square foot per footcandle (mcd/sf/fc).
2. Use a test distance 50 feet and a Sample size of 2. x 2.5 feet.
3. Use an angular aperture of both the photoreceptor and light projector of 6 minutes of arc.
4. The reference center is the geometric center of the Sample, and the reference axis is taken perpendicular to the test Sample.

F. Film Reflectivity Retention: Not more than 15 percent of the beads lost due to popout and the predominate mode of Failure is "wear down" of the beads, when subjected to
200 cycles of a Taber Abraser Simulation test using an H-18 wheel and 125 gram load.

G. Thickness: 0.06 inch without adhesive.

H. Effective Performance Life: The film, when applied according to the recommendations of the manufacturer, will provide a neat, durable marking that will not flow or distort due to temperature if the Pavement surface remains stable. Although reflectivity is apply wear, the pliant polymer will provide a cushioned, resilient substrate that reduces bead crushing and loss. Use a film that shows no appreciable fading, lifting, or shrinkage throughout the useful life of the marking, and shows no significant tearing, roll back, or other signs of poor adhesion.

I. Abrasion Resistance: Use a material that when tested will not wear through to the conformable backing surface in less than 5,000 cycles when tested per Federal Standard 141, Method 6192, using a CS-17 wheel and a 1,000 gram load.

J. Acid Resistance: Use a material that will show resistance to etching, hazing, or delamination of bead surface after exposure to a 1 percent solution of sulfuric acid.

2.6 **PRISMATIC REFLECTORS**

A. Unless indicated otherwise, provide single lens snowplow resistant reflectors of the color indicated.

1. With a cast iron housing and acrylic prismatic reflector.
2. With an overall size not less than 9 inches long, 5 inches wide, and 1-3/4 inch thick with a 7/16 inch maximum projection above the roadway.
3. With a minimum reflective area of 1.6 square inches per face.

B. Reflector Specific Intensity:

Color	Intensity at 0.2 Degree Observation Angle	
	0 Degree Entrance Angle	20 Degree Entrance Angle
White	3.0	1.2
Yellow	1.8	0.72

2.7 **EPOXY ADHESIVE**

A. Epoxy, AASHTO M 237 requirements and as recommended by the manufacturer of the reflector. Provide a minimum adhesion value of 1.1 pounds per inch width.

PART 3 EXECUTION

3.1 **CONSTRUCTION EQUIPMENT**

A. Use equipment manufactured for Pavement marking. Use workers experienced in operating such equipment.

B. Use equipment capable of applying a strip, or strips with a width tolerance of plus or minus 1/4 inch. Equip the machine with an automatic skip control giving a 10 feet long marked segment and a 30 feet long gap within a linear tolerance of 6 inches over that cycle.

C. If applying glass beads, locate bead applicator directly behind and synchronized with marking applicator.

D. For thermoplastic paint materials, use equipment that is designed to agitate the paint to prevent scorching, discoloration, or excessive high temperatures.

3.2 **PREPARATION**

A. Broom or flush the surface to remove dirt, loose stones, or other foreign material immediately prior to applying.

B. Prior to applying, mark roadway between control points established by ENGINEER. ENGINEER will establish points on tangent at least every 100 feet and at 25 feet long intervals on curves. Maintain the line within 1 inch of the established control points. ENGINEER may also designate other Pavement striping locations such as stop bars, crosswalks, zebra striping, etc.

C. Markings that adhere to asphalt concrete or Portland cement concrete by either a pressure sensitive precoated adhesive or an epoxy cement shall mold to the Pavement contours by traffic action at normal Pavement temperatures and shall be ready for traffic immediately after application.

D. Begin Pavement painting and marking operations not later than 24 hours after receipt of written order by ENGINEER.

E. Apply striping and markings per MUTCD requirements.

F. Apply all materials in accordance with manufacturer's and ENGINEER's directions.

3.3 **APPLICATION**

A. Apply Pavement paintings and markings only when Pavement surface is dry and air temperature is above 40 deg. F. during daylight hours.

B. Do not apply paints and markings when rain is anticipated within 12 hours.

3.4 **ALKYD RESIN PAINT STRIPING**

A. Adjust Pavement striping machine to apply paint at rate recommended by paint manufacturer.

B. Glass Bead Application Rate: 5.9 to 6.1 pounds per gallon of paint.

C. Protect the markings until dry by placing approved guarding or warning device wherever necessary. Remove any markings not authorized or smeared or otherwise damaged, or correct as approved by ENGINEER.

3.5 **THERMOPLASTIC PAINT STRIPING**

A. Clean off dirt, glaze, and grease before prestriping.

B. Prestripe the application area with a binder material that will form, when sprayed, a continuous film over the Pavement surface, and will dry rapidly and mechanically adhere to the Pavement surface. Install the material in varying widths if indicated.

C. Extrude the thermoplastic material at a temperature of 412 plus or minus 12 deg. F. from approved equipment to produce a line 1/8 inch to 3/16 inch thick, continuous and uniform in shape, and have clean and sharp dimensions.

D. Do not use material which produce fumes that are toxic, obnoxious, or injurious to persons or property.

E. Apply so that finished lines have well-defined edges free of waviness.

F. Glass Beads Application Rate: 6 pounds of glass beads to every 100 square feet of marking.

3.6 **TAPE STRIPING**

A. Apply Pavement marking tape as indicated or directed. ENGINEER will establish control points.

B. Apply the tape only on surfaces that are dry and free of oils, grease, dust and dirt, and primed at the rate of approximately 1 quart per 60 feet with an approved primer material.

C. Maintain the line on established control points. Apply intermittent Pavement marking tape 24 inches long, spaced approximately 100 feet on tangents, and approximately 25 feet on curves unless otherwise directed. The ENGINEER will designate other Pavement striping locations such as stop bars, crosswalks, zebra striping, etc.

D. Press down the tape immediately after application until it adheres and conforms to the surface of the Pavement.

E. Completely remove all tape on sections where tape conflicts with revised traffic lanes prior to opening new lanes to traffic.

3.7 **PAVEMENT MARKING FILMS**

A. Use Pavement marking films that are capable of being applied to new, dense, and open-graded asphalt concrete wearing courses during the paving operation in accordance manufacturer's instructions, and that are capable of conforming to Pavement contours through the action of traffic at normal Pavement temperatures.

B. Use a Pavement marking film that is capable of use for patching worn areas of the same type film.

C. Apply before traffic is allowed on the freshly paved surface.

D. Unless indicated otherwise, provide Type C, Class II, polymer film markings in specified widths and shapes. Provide and layout words and marking symbol configurations per MUTCD requirements and as indicated.

E. When indicated, inlay the markings in fresh asphalt surface by a compaction roller during the paving operation.

F. Apply all markings in accordance with manufacturer's recommendations.

3.8 **PRISMATIC REFLECTOR INSTALLATION**

A. Install reflectors by cutting Pavement and partially filling cut area with epoxy adhesive. Place reflector housing in the adhesive and apply pressure to properly seat. Allow epoxy to completely set before allowing traffic on markers.

B. Install marker so that housing edges are flush with Pavement and so that the angle formed by the longitudinal axis of the marker and the adjacent Pavement stripe does not

exceed 5 degrees.

3.9 **WORDS AND OTHER MARKINGS**

A. Wet sandblast existing or temporary Pavement markings that may be confusing. Removal of markings by high-pressure water may be used if approved by ENGINEER.

B. Apply word markings, letters, numerals and symbols with indicated stencils and templates. In the absence of such information all stencils and templates shall be identical to those currently used by OWNER.

3.10 **TEMPORARY PAVEMENT MARKINGS**

A. Renew when stripes and markings have lost 50 percent of their original visual effectiveness.

END OF SECTION

SECTION 32 91 19

LANDSCAPE GRADING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Landscaping grading requirements.
B. Backfill materials.

1.2 SUBMITTALS

A. Submit maximum laboratory dry density and optimum laboratory moisture content for:
   1. Subgrade material, and
   2. Each type of fill to be used.
B. Upon ENGINEER's request, submit a written quality control Inspections and testing report describing source and field quality control activities performed by CONTRACTOR and its Suppliers.

1.3 QUALITY ASSURANCE

A. Do not change material sources, or aggregate without ENGINEER's knowledge.
B. Reject backfill material that does not comply with requirements specified in this section.
C. Landscape grading is aesthetic by nature and subject to continual monitoring and modification during the backfilling process. Work closely with ENGINEER particularly when grading and construction berms, channels, or other aesthetic considerations.

1.4 STORAGE

A. Safely stockpile backfill materials.
B. Separate differing materials, prevent mixing, and maintain optimum moisture content of backfill materials.
C. Avoid displacement of and injury to Work while compacting or operating equipment.
D. Movement of construction machinery over Work at any stage of construction is solely at CONTRACTOR's risk.

1.5 SITE CONDITIONS

A. Do not place, spread, or roll any backfill material over material that is damaged by water. Remove and replace damaged material at no additional cost to OWNER.

B. Control traffic and erosion. Keep area free of trash and debris. Repair settled, eroded, and rutted areas.
C. Reshape and compact damaged structural section to required density.

1.6 ACCEPTANCE

A. Native material may be wasted if there is no additional cost to substitute material acceptable to ENGINEER.
B. For material acceptance refer to.
   1. Common fill, Section 31 05 13.
   2. Crushed aggregate base, Section 32 11 23.
   3. Cement treated fill, Section 31 05 15.

1.7 WARRANTY

A. Any settlement noted in landscaped surfaces will be considered to be caused by improper compaction methods and shall be corrected at no cost to the OWNER.
B. Restore incidentals damaged by settlement at no additional cost to OWNER.

PART 2 PRODUCTS

2.1 BACKFILL MATERIALS

A. Common fill, Section 31 05 13.
B. Crushed aggregate base, Section 32 11 23.
C. Cement treated fill, Section 31 05 15.

2.2 ACCESSORIES

A. Water: Make arrangements for sources of water during construction and make arrangements for delivery of water to site. Comply with local Laws and Regulations at no additional cost to OWNER when securing water from water utility company.

PART 3 EXECUTION

3.1 PREPARATION

A. Identify required line, levels, contours, and datum.
B. Stake and flag locations of underground utilities.
C. Upon discovery of unknown utility or concealed conditions, notify ENGINEER.
D. Verify stockpiled fill meets gradation requirements, areas to be backfilled are free of debris, snow, ice or water, and ground surface is not frozen.

E. If subgrade is not readily compactable secure written authorization for extra excavation and backfill. Refer to Section 31 23 16.

3.2 **PROTECTION**

A. Protect existing trees, shrubs, lawns, existing structures, fences, roads, sidewalks, paving, curb and gutter and other features.

B. Protect above or below grade utilities. Contact utility companies to repair damage to utilities. Pay all cost of repairs.

C. Protect Subgrade from desiccation, flooding and freezing.

D. Do not fill adjacent to structures until Excavation is checked by ENGINEER.

E. Do not use compaction equipment adjacent to walls or retaining walls that may cause wall to become over-stressed or moved from alignment.

F. Do not disturb or damage foundation perimeter drainage, foundation, damp-proofing, foundation waterproofing and protective cover, or utilities in Trenches.

G. Restore any damaged structure to its original strength and condition.

3.3 **LAYOUT**

A. Maintain all benchmarks, control monuments and stakes, whether newly established by surveyor or previously existing. Protect from damage and dislocation.

B. If discrepancy is found between Contract Documents and site, ENGINEER shall make such minor adjustments in the Work as necessary to accomplish the intent of Contract Documents without increasing the Cost of the Work to CONTRACTOR or OWNER.

3.4 **GRADING**

A. Grading Intent: Spot elevations and contours indicated are based on the best available data. The intent is to maintain constant slopes between spot elevations. If a spot elevation is determined to be in error, or the difference in elevation between points change, then the minimum percentage of slope as a result of field adjustment of specific spot elevations is as follows:

1. Pavement Areas: 1 percent.
2. Concrete or Brick Areas: 0.30 percent.
3. Lawn or Planted Area: 0.75 percent.

B. Conduct Work in an orderly manner. Do not create a nuisance. Do not permit soil accumulation on streets or sidewalks. Do not allow soil to be washed into sewers and storm drains.

C. Grade slopes to provide adequate drainage after compaction. Do not create water pockets or ridges. Use all means necessary to prevent erosion of freshly graded areas during construction until surfaces have been constructed and landscaping areas have taken hold.

D. Remove surface stones greater than 1 inch from finished grading.

E. In planting areas, provide a finished grade that conforms to Section 32 92 00 and Section 32 93 13.

3.6 **MODIFIED BACKFILL LAYER METHOD**

A. Refer to Section 33 05 20.

3.7 **COMPACTION**

A. Compact backfill, Section 33 05 05

3.8 **SURFACE RESTORATION**

A. Restore paved surfaces, Section 33 05 25.

B. Finish landscaped surfaces with grass, Section 32 92 00 or with other ground cover, Section 32 93 13.

1. Backfill areas to contours and elevations indicated. Do not use frozen materials.
2. Make smooth changes in grade. Blend slopes into level areas.
3. Remove surplus backfill materials from site.
4. Leave stockpile areas completely free of excess fill materials.
5. Slope grade away from building at a minimum of 3 inches in 10 feet unless specified otherwise.

3.9 **CLEANING**

A. Remove stockpiles from the site. Grade site surface to prevent free standing surface water.

B. Leave borrow areas clean and neat.

END OF SECTION

SECTION 32 92 00

TURF AND GRASSES

PART 1 GENERAL

1.1 SECTION INCLUDES
A. Seed and sod requirements.
B. Soil preparation and fertilizers.

1.2 REFERENCES
A. FS O-F-241: Fertilizers, Mixed, Commercial.
B. ASPA: Guideline Specifications for Sodding.

1.3 SUBMITTALS
A. Submit name of sod Supplier or location.
B. Submit laboratory analysis of top soil, if requested by ENGINEER.

1.4 DELIVERY, STORAGE, AND HANDLING
A. Deliver grass seed in original containers showing analysis of seed mixture, percentage of pure seed, year of production, net weight, date and location of packaging. Damaged packages are not acceptable.
B. Strip sod no more than 24 hours prior to laying.
C. Deliver fertilizer in containers showing weight, chemical analysis, and name of manufacturer. Store fertilizer in a weatherproof location.

PART 2 PRODUCTS

2.1 SEED
A. Furnish grass seed that is fresh, clean, and new crop composed of varieties indicated and tested to have minimum of 90 percent purity and minimum of 80 percent germination.
B. Use seed that conforms to applicable Laws and Regulations.
C. Do not use wet, moldy or otherwise damaged seed.

2.2 SOD
A. Obtain all shipments of sod from approved sources.
B. Mowed regularly and carefully maintained from planting to harvest to assure reasonable quality and uniformity.
C. Free of grassy and broadleaf weeds, and bare or burned spots.

D. Clean, strongly rooted sod of variety indicated.
E. Cut sod in pieces not exceeding 1 square yard. Limit depth of cut to 1/2 inch minimum and 1 inch maximum.

2.3 TOP SOIL
A. Section 31 05 13.

2.4 ACCESSORIES
A. Fertilizer: Uniform in composition, dry and free flowing. Comply with FS O-F-241. Provide nutrients required by soil analysis.
B. Mulching Material: Wood or wood cellulose fiber free of growth or germination inhibiting ingredients.

PART 3 EXECUTION

3.1 PREPARATION
A. Protect existing underground improvements from damage.
B. Do not place turf and grasses until existing weeds have been removed and soil has been prepared.
C. Do not sow immediately following rain, when ground is too dry, too hard, or during windy periods without first loosening the surface.

3.2 GRADING
A. Establish finished grades after settling to provide adequate drainage so no water pockets or ridges will be created.
B. Till soil to a depth of 4 inches and remove rocks and debris over 2 inches diameter and any vegetation and weeds. Fine grade entire site to a smooth, loose, and uniform surface. Use native or approved imported topsoil and plant after proper preparation.
C. When Subgrade has been established, roll areas to remove ridges and depressions so surface is parallel with finished grade. Limit weight of rolling equipment to 110 pounds minimum or 250 pounds maximum per square foot.
D. Site tolerances.
   1. Total topsoil depth for lawns or grasses: 5 inches.
   2. Elevation of topsoil relative to walks, hard surfaces or edges.
      a. Seed Areas: 1/2 inch below.
      b. Sod Areas: 1-1/2 inch below.
   3. Slope away from building 5 percent for 10 feet minimum. Fill low spots and pockets. High point of finish grade shall be at least 6 inches below finish floor level.

3.3 FERTILIZING

A. Apply fertilizer in formulation and quantity required by soil analysis.

B. Apply after fine grading and mix thoroughly into upper 2 inches of topsoil.

C. Do not apply grass seed and fertilizer at same time in same machine unless one step hydro seeding is used.

D. Lightly water to aid breakdown of fertilizer and to provide moist soil for seed.

3.4 **SEEDING**

A. Unless indicated otherwise, apply seed at a rate of 5 pounds per 1,000 square feet evenly in 2 intersecting directions. Rake in lightly.

B. Apply fine spray water immediately after each area has been sown.

3.5 **ONE STEP HYDRO SEEDING**

A. Unless indicated otherwise, on lawn areas apply seed at the rate of 5 pounds per 1,000 square feet and fertilizer at the rate of 15 pounds per 1,000 square feet of area.

B. Mix the seed and fertilizer with a specially prepared dyed wood cellulose fiber and water to form a slurry.

C. Mix the slurry in tanks having continuous agitation so that a homogenous mixture is discharged hydraulically on the area to be seeded.

D. Apply the wood fiber mulch in suspension at a rate of 2,000 pounds per acre or as indicated otherwise.

3.6 **TWO STEP HYDRO SEEDING**

A. Make soil surface smooth, loose and of uniformly fine texture prior to seeding. Do not prepare more ground than can be seeded in a work day period.

B. Mix fertilizer at a rate of 15 pounds per 1,000 square feet, with wood fiber mulch and water to form a slurry.

C. Maintain a well mixed fertilizer slurry in the mix tank.

D. Spray the fertilizer mixture at the rate of 2,000 pounds per acre.

E. Sow seed on fertilized areas at the rate of 5 pounds per 1,000 square feet of area, in 2 directions with a cyclone seeder or other approved mechanical seeder.

3.7 **DRILL SEEDING METHOD**

A. Use the drill method of seeding on accessible slopes 3:1 and flatter.

B. Use the drill manufacturer’s directions in the presence of the Engineer. Calibrate the drill to apply seed at the rate indicated in the seeding schedule.

C. Maintain the drill at the calibrated setting throughout the seeding operation.

D. Drill along the contour.

E. Set depth bands to drill seeds to a 1/2 inch depth.

3.8 **SEED PROTECTION ON SLOPES**

A. Blankets: Section 31 25 00.

3.9 **LAYING SOD**

A. Maintain the sod moist, live, and in good condition to encourage immediate growth.

B. Comply with ASPA guidelines for sodding.

C. Lay the sod on smooth, moist topsoil, working off planks if required. Rake topsoil to loosen and level prior to placing each course of sod. Ensure that sod is not stretched or overlapped and that all joints are butted tight. Place sod to break joints on ends. Keep length seams in a straight line.

D. Roll sod immediately after placing. Thoroughly water with a fine spray to a depth sufficient that the underside of the new sod and soil immediately below the sod are thoroughly wet.

E. On slopes 2 horizontal to 1 vertical and steeper, lay sod perpendicular to slope and secure every row with wooden pegs at 2 feet maximum on center. Drive pegs flush with soil portion of sod.

3.10 **RESTORATION**

A. Restore Pavement, concrete, grassed areas, planted areas, and other improvements damaged during execution of work of this section to a condition equal to original conditions.

3.11 **MAINTENANCE**

A. Section 32 01 90.

B. Remove from site foreign materials collected during cultivation.

C. Dispose of cleanings.

END OF SECTION

SECTION 33 05 03

COPPER PIPE

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Copper pipe, couplings, fittings, and joint materials for buried water utility applications.

B. Related work includes but is not limited to,

1. Excavation, Section 31 23 16.
2. Trench backfill, Section 33 05 20 .
3. Landscape restoration, Section 32 92 00 or Section 32 93 13.
4. Pavement restoration, Section 33 05 25.

1.2 **REFERENCES**

A. ASTM B 88: Standard Specification for Seamless Copper Water Tube.

B. AWWA C800: AWWA Standard for Underground Service Line Valves and Fittings.

1.3 **QUALITY ASSURANCE**

A. Reject any pipe that does not conform to Contract Documents or is cracked, chipped, crushed, dented, kinked, or otherwise unacceptable.

PART 2 PRODUCTS

2.1 **PIPE**

A. Type K copper, ASTM B 88 Table 3, "Dimension, Weight and Tolerances," and capable of connecting to AWWA standard water service taps and fittings.

B. Outside diameter greater than 2 inches requires ENGINEER acceptance.

C. Smooth surface free from bumps, flexible enough to be coiled.

2.2 **CONNECTIONS**

A. Flared or compression.

B. Dielectric insulating unions for dissimilar connections.

C. Fittings, AWWA C800.

PART 3 EXECUTION

3.1 **INSTALLATION**

A. Install pipe per manufacturer's instructions.

B. Water distribution and transmission, Section 33 12 19.

C. Irrigation System, Section 32 84 23.

END OF SECTION

SECTION 33 05 05

DUCTILE IRON PIPE

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Ductile iron pipe, couplings, fittings, and joint materials.

B. Related work includes but is not limited to,

1. Excavation, Section 31 23 16.
2. Trench backfill, Section 33 05 20 .
3. Landscape restoration, Section 32 92 00 or Section 32 93 13.
4. Pavement restoration, Section 33 05 25.

1.2 **REFERENCES**

A. AWWA C104: American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.

B. AWWA C110: American National Standard for Ductile-Iron and Gray Iron Fittings, 3 In. Through 48 In., for Water and Other Liquids.

C. AWWA C111: American National Standard For Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.

D. AWWA C115: American National Standard for Flanged Ductile-Iron and Gray Iron Pipe with Threaded Flanges.

E. AWWA C151: American National Standard for Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.

F. AWWA C600: AWWA Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances.

PART 2 PRODUCTS

2.1 **PIPE AND FITTINGS**

A. Buried Applications:

1. Class 52 or pressure class 350 psi ductile iron pipe, AWWA C151 with push-on joints, AWWA C111.
2. Cement lining for all pipe and fittings, AWWA C104.
3. Class 250 fittings, AWWA C110.
4. Coupler with mechanical joint fittings, AWWA C104, C110, and C111.
5. Rubber gasket slip-on pipe joints, AWWA C111 with gasket lubricant.
6. Bronze wedges with current capacity of 400 amps each for each joint as follows:

Pipe Diameter	No. of Wedges
less than 10"	2
10"	3
12"	4
greater than 12"	6

B. Above Ground Applications: As buried applications, except use bolted flanged fittings, AWWA C104, C110, and C115.

2.2 **COVERINGS**

A. Buried Mechanical Joints: Grease and 8 mil vinyl wrap plastic cover.

PART 3 EXECUTION

3.1 **INSTALLATION** A Install pipe per manufacturer's instructions and AWWA C600.

B. Water distribution and transmission, Section 33 12 19.

C. Gravity water systems, Section 33 31 00 or Section 33 41 00.

D. Irrigation Systems, Section 32 84 23.

END OF SECTION

SECTION 33 05 06

POLYETHYLENE PIPE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Polyethylene pipe, couplings, fittings and joint materials.
B. Related work includes but is not limited to,
   1. Excavation, Section 31 23 16.
   2. Trench backfill, Section 33 05 20 .
   3. Landscape restoration, Section 32 92 00 or Section 32 93 13.
   4. Pavement restoration, Section 33 05 25.

1.2 REFERENCES

A. AASHTO M 252: Standard Specification for Corrugated Polyethylene Drainage Pipe.
B. AASHTO M-294: Standard Specification for Corrugated Polyethylene Drainage Pipe 300-1200 mm Diameter.
C. AASHTO MP7-97: Standard specification for Corrugated Polyethylene Pipe – 1350 and 1500 mm Diameter.
D. ASME B1.1: Unified Inch Screw Threads (UN and UNR Thread Form), Supplement.
E. ASTM A 307: Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
F. ASTM D 2239: Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Inside Diameter.
G. ASTM D 2321: Standard Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.
H. ASTM D 2657: Standard Recommended Practice for Heat Joining of Thermoplastic Pipe and Fittings.
I. ASTM D 2774: Standard Recommended Practice for Underground Installation of Thermoplastic Pressure Piping.
J. ASTM D 3261: Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
K. ASTM D 3350: Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
L. ASTM F 477: Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
M. ASTM F 1055: Standard Specification for Electofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing.

1.3 DEFINITIONS

A. Standard Dimension Ratio (SDR): Average diameter of pipe divided by the minimum wall thickness. The diameter may be either inside or outside measurement depending upon which standard is referenced.
B. Code Designation: A rating system by the Plastic Pipe Institute for smooth wall polyethylene pipe materials. The designation PE 3408 designates the type of plastic pipe (PE), the grade (34), and the hydrostatic design stress measured in units of 100 psi (08) at 23 deg C.

PART 2 PRODUCTS

2.1 SMOOTH WALL PIPE SYSTEMS

A. Material: PE 3408 per ASTM D 2239 with a minimum cell classification of 345434C per ASTM D 3350.
B. Pipe: Smooth wall inside and out with an SDR or working pressure rating indicated or accepted by ENGINEER. Exterior markings as follows.
   1. ASTM Standard Number.
   2. Pipe Size.
   3. Class and profile number.
   4. Production code.
   5. Standard dimension ratio.
C. Fittings:
   1. Resin same as pipe.
   2. Working pressure same or greater than pipe.
D. Joints:
   1. Thermally welded butt fusion, ASTM D 3261.
   2. Flanged, ASTM D 2657.
   3. Ultra high molecular weight electo-fusion tape with a polyethylene coupler meeting ASTM F 1055 requirements.

2.2 CORRUGATED WALL PIPE SYSTEMS

A. Material: Polyethylene, ASTM D 3350 with a cell class as required in AASHTO M 252, AASHTO M 294 or AASHTO MP7-97
B. Pipe: Type S or D unless specified otherwise. Corrugations may be either annular or helical.

Type	Description
C	Circular pipe with a corrugated surface inside and out.
CP	Type C pipe with perforations

S Circular pipe with an outer corrugated wall and a smooth inter wall

SP Type S pipe with perforations

D Circular pipe with a corrugated wall sandwiched between a smooth outer wall and a smooth inner wall.

C. Fittings:

1. Blow molded with cell class 335420C, ASTM D 3350.
2. Rotational molded with cell class 213320C, ASTM D 3350.
3. Shop or field remanufactured of the same material as the pipe

D. Joints:

1. Bell and spigot with gaskets, ASTM F 477. Foam type weather stripping not allowed.
2. Split corrugated couplings with plastic or stainless steel ties and leak resistant neoprene gasket.

2.3 **NUTS AND BOLTS**

A. Carbon steel machined heavy hex heads, Class 2 fit, ASTM A 307; Grade B, threads, ASME B1.1.

PART 3 EXECUTION

3.1 **INSTALLATION**

A. Install pipe as per manufacturer's instructions, ASTM D 2321 or ASTM D 2774.

B. Water distribution and transmission, Section 33 12 19.

C. Gravity water systems, Section 33 31 00 or Section 33 41 00.

D. Irrigation Systems, Section 32 84 23.

E. Tape wrap steel materials for protection against corrosion after piping installation.

END OF SECTION

SECTION 33 05 07

POLYVINYL CHLORIDE PIPE

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Polyvinyl chloride pipe, couplings, fittings and joint materials.

B. Related work includes but is not limited to,

1. Excavation, Section 31 23 16.
2. Trench backfill, Section 33 05 20 .
3. Landscape restoration, Section 32 92 00 or Section 32 93 13.
4. Pavement restoration, Section 33 05 25.

1.2 **REFERENCES**

A. ASTM D 1784: Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

B. ASTM D 2241: Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure Rated Pipe (SDR -Series).

C. ASTM D 2321: Standard Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.

D. ASTM D 2412: Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.

E. ASTM D 2564: Standard Specification for Solvent Cement for Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings.

F. ASTM D 2729: Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

G. ASTM D 2774: Standard Recommended Practice for Underground Installation of Thermoplastic Pressure Piping.

H. ASTM D 2855: Standard Practice for Making Solvent Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings.

I. ASTM D 3034: Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

J. ASTM D 3139: Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.

K. ASTM D 3212: Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

L. ASTM F 656: Standard Specification for Primers for Use in Solvent Cement Joints of Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings.

M. ASTM F 679: Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter

Plastic Gravity Sewer Pipe and Fittings.

N. ASTM F 949: Standard Specification for Poly(vinyl Chloride) (PVC) Corrugated sewer Pipe with a Smooth Interior and Fittings.

O. AWWA C900: AWWA Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In., for Water Distribution.

1.3 **DEFINITIONS**

A. Standard Dimension Ratio (SDR): Outside diameter of pipe divided by wall thickness.

PART 2 PRODUCTS

2.1 **GRAVITY PIPE SYSTEMS**

A. Pipe:

1. Solid smooth wall, 4 to 15 inch diameter, ASTM D 3034.
2. 18 to 27 inch diameter, ASTM F 679.
3. 4 to 10 inches diameter corrugated wall with a smooth interior, ASTM F 949.

B. Fittings: ASTM D 1784.

C. Stiffness: 50 psi minimum when measured at 5 percent deflection, ASTM D 2412.

D. Additives and Fillers: Not to exceed 10 parts by weight; 100 parts of resin in the compound.

E. Joints: Bell and spigot with flexible elastomeric seals, ASTM D 3212.

F. Flattening: No visual evidence of splitting, cracking, or breaking when flattened to 60 percent deflection, ASTM D 2412.

2.2 **PRESSURE PIPE SYSTEMS**

A. Pipe: Conform to AWWA C900 except use outside diameters defined by ductile iron pipe sizes. Dimensions, class, SDR, and tolerances per ASTM D 2241.

B. Compounds: Type 1, Grade 1, Class 12454A, ASTM D 1784.

C. Joints:

1. Bell and spigot with flexible elastomeric seals, ASTM D 3139. Use non-toxic lubricant.
2. Solvent weld, ASTM D 2564.

2.3 **PERFORATED PIPE SYSTEMS**

A. Pipe: Refer to gravity pipe products above.

B. Perforations: ASTM D 2729.

C. Joints: Push-on, solvent weld or other.

2.4 **SOLVENT WELDS**

A. Primer, ASTM F 656.

B. Glue, ASTM D 2564.

PART 3 EXECUTION

3.1 **INSTALLATION**

A. Install pipe per manufacturer's instructions, ASTM D 2321 for gravity systems, AWWA C900 or ASTM D 2774 for pressure systems, And ASTM D 2855 for underground Irrigation Systems.

B. Water distribution and transmission, Section 33 12 19.

C. Gravity water systems, Section 33 31 00 or Section 33 41 00.

D. Irrigation System, Section 32 84 23.

END OF SECTION

SECTION 33 05 14

UTILITY GRADE ADJUSTMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Raise, lower, or change slope of Street Fixtures.
B. Install Cover Collars.
C. This section is NOT APPLICABLE to raising and lowering Street Fixtures that withstand internal pressure.

1.2 DEFINITIONS

A. Box: A structure such as a valve box, meter box, monument box, fire hydrant box, electrical pull box, cleanout box or other like structure not intended for human entry.
B. Cover Collar: A concrete filled annular space between metal frames and the adjacent Pavement structural section.
C. Extension Ring: A concrete or metal ring used to adjust surface elevations and surface cross slopes of Street Fixture covers. Metal rings are used between metal frames and metal covers or grates. Concrete rings are used below metal frames or in the concrete structure below.
D. Manhole: A structure designed to permit human entry and working space inside and to confine and control the flow of pipe-conveyed fluids.
These structures are collectively referred to as manholes regardless of composition, design, type or depth.
E. Street Fixture: The top of existing structures such as but not limited to Manholes, catch basin, sumps, inlets, valve boxes, meter boxes, monument boxes, and similar structure in a thoroughfare surface.
F. Vault: A structure intended for human entry containing electrical/telephone facilities or other like utilities.

PART 2 PRODUCTS

2.1 PAVEMENT

A. Asphalt Concrete: AC-20-DM-1/2, Section 32 12 05.
B. Cast-in-place Concrete: Class 4000, Section 03 30 04.

2.2 GROUT

A. Hydraulic cement, Section 03 61 00.

2.3 EXTENSION RINGS

A. Metal: Cast iron or steel, Section 05 56 00.
B. Cast-in-place Concrete: Class 4000, Section 03 30 04.

PART 3 EXECUTION

3.1 PREPARATION

A. Determine condition of existing incidental structure. Any item not reported damaged prior to construction shall be considered unbroken and must be replaced by CONTRACTOR at no additional cost to OWNER.
B. Provide invert cover over pipe in cleanout box to prevent gravel, concrete, or debris from entering pipeline.
C. Unless indicated otherwise, arrange for utility companies to adjust their own structures.
D. Coordinate all adjustments with requirements of affected utility company.

3.2 ADJUST STRUCTURE TO GRADE

A. Restrict excavation around the structure to a minimum area.
B. At the completion of the structure adjustment, backfill the void around the structure and compact before paving or landscaping.
C. Apply mortar to inside and outside of concrete grade rings used to make adjustments.
D. If the cone is cracked during construction, restack the Manhole with shorter Manhole sections and install a new cone at no additional cost to the OWNER.

3.3 ADJUST COVER IN PAVEMENT SURFACE

A. Method A -Metal Extension Rings:
1. Use rings that lock together.
2. Set frame at desired elevation and cross-slope.
3. Seal joints between Pavement and ring, Section 32 01 17.

B. Method B – Concrete Extension Rings:
1. Place concrete grade rings under frame or in structure riser shaft.
2. Set frame at desired elevation and cross-slope.
3. Provide 100 percent concrete support under frame. Do not use wood, bricks, concrete fragments, blocks or particles as support.
4. Grout seams between concrete rings and between frame and concrete rings.

C. Method C – Place Concrete:
1. Set frame at desired elevation and cross-slope.
2. Place concrete and provide 100 percent concrete support under frame.

D. Method D – Concrete Deck:

1. Remove existing concrete deck.
2. Reset steel rebar.
3. Set frame to grade, set forms.
4. Pour concrete. Provide complete concrete support under Street Fixture.

3.4 **INSTALLING COVER COLLAR**

A. Open an annular space between pavement and Street Fixture cover. Unless indicated otherwise, provide 12 inches of annular space.

B. Set concrete collar to 1/4 inch minimum to 1/2 inch maximum below asphalt concrete pavement surface and 1/4 inch below portland cement concrete pavement surface.

C. Trowel finish, Section 03 35 00.

3.5 **PAVEMENT SURFACE RESTORATION**

A. In new streets or overlays, adjust Street Fixture cover after bituminous paving is complete.

B. Pavement restoration, Section 33 05 25.

END OF SECTION

SECTION 33 05 20

BACKFILLING TRENCHES

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Trench backfill materials.
B. Trench backfilling requirements.
C. Surface restoration requirements.

1.2 **DEFINITIONS**

A. Bedding: That surface of the Excavation or portion of the Pipe Zone below the pipe.

B. Pipe Zone: That zone in a backfilling operation which supports, and surrounds the pipe barrel, and extends to 1 foot above the top of the pipe barrel.

1.3 **SUBMITTALS**

A. Submit maximum laboratory dry density and optimum laboratory moisture content for:

1. Subgrade material, and
2. Each type of fill to be used.

B. Upon ENGINEER's request, submit a written quality control Inspections and testing report describing source and field quality control activities performed by CONTRACTOR and its Suppliers.

1.4 **QUALITY ASSURANCE**

A. Do not change material sources, or aggregate without ENGINEER's knowledge.

B. Reject backfill material that does not comply with requirements specified in this section.

1.5 **STORAGE AND PROTECTION**

A. Storage:

1. Safely stockpile backfill materials.
2. Separate differing materials, prevent mixing, and maintain optimum moisture content of backfill materials.

B. Protection:

1. During installation or repair, plug end of pipe or fitting except when installing next section of pipe or fitting.
2. Avoid displacement of and injury to Work while compacting or operating equipment.
3. Movement of construction machinery over Work at any stage of

construction is solely at CONTRACTOR's risk.

1.6 **SITE CONDITIONS**

A. Do not place, spread, or roll any backfill material over material that is damaged by water. Remove and replace damaged material at no additional cost to OWNER.

B. Control traffic and erosion. Keep area free of trash and debris. Repair settled, eroded, and rutted areas.

C. Reshape and compact damaged structural section to required density.

D. Restore any damaged structure to its original strength and condition.

E. Replace contaminated backfill at no additional cost to OWNER.

1.7 **SEQUENCING**

A. Coordinate backfilling operation with pipeline commissioning requirements in Section 33 08 00.

1.8 **ACCEPTANCE**

A. General:

1. Native material may be wasted if there is no additional cost to substitute material acceptable to ENGINEER.
2. For material acceptance refer to.
   a. Common fill, Section 31 05 13.
   b. Crushed aggregate base, Section 32 11 23.
   c. Cement treated fill, Section 31 05 15.

B. Trench Backfilling: One test per Lot.

Table 1: Lot Size for Trench Backfilling Operation

Material	Test Criteria	Lot size
Subgrade	Standard (a)	200 lineal feet
Common Fill	Standard (a)	200 lineal feet per lift 25 square feet of footing area per lift
Crushed Aggregate Base	Modified (a)	200 lineal feet per lift 25 square feet of footing area per lift
Flowable Fill	Strength (b)	50 cubic yards

NOTES
(a) Proctor density, Section 33 05 05
(b) Compressive strength, Section 31 05 15
(c) Lift thickness above the pipe zone before compaction, 8 inches.

1.9 **WARRANTY**

A. Any settlement noted in Trench backfill or in structures built over the Trench backfill will be considered to be caused by improper compaction methods and shall be corrected at no cost to the OWNER.

B. Restore structures damaged by settlement at no additional cost to OWNER.

PART 2 PRODUCTS

2.1 **BACKFILL MATERIALS**

A. Common fill, Section 31 05 13.
B. Crushed aggregate base, Section 32 11 23.
C. Cement treated fill, Section 31 05 15.
D. Slag or asphalt bearing material not allowed.

2.2 **ACCESSORIES**

A. Water: Make arrangements for sources of water during construction and make arrangements for delivery of water to site. Comply with local Laws and Regulations at no additional cost to OWNER when securing water from water utility company.

B. Geotextile Fabric: Section 31 05 19.

C. Identification Tape: Permanent, bright-colored, continuous-printed magnetic plastic tape, intended for direct-burial service; not less than 6 inches wide by 4 mils thick. The tape shall read "**CAUTION: BURIED INSTALLATION BELOW**". Color of tape as follows.

1. Red: Electric power lines, cables, conduit and lighting cables
2. Yellow: Gas, oil, steam, Petroleum or gaseous materials
3. Orange: Communications, alarm, signal, cables or conduits
4. Blue: Potable water
5. Purple: Reclaimed Water, irrigation and slurry lines
6. Green: Sewer and storm drain lines

PART 3 EXECUTION

3.1 **PREPARATION**

A. Verify backfill material meets gradation requirements, foundation walls are braced to support surcharge forces imposed by backfilling operations, areas to be backfilled are free of debris, snow, ice or water, and Trench bottom is not frozen.

B. If Subgrade is not readily compactable secure written authorization for extra excavation and backfill; Section 31 23 16.

C. Avoid injuring and displacement of pipe and structures while compacting soil or operating equipment next to pipeline.

D. Place geotextile fabrics; Section 31 05 19.

3.2 **GENERAL BACKFILLING REQUIREMENTS**

A. Protect Subgrade from desiccation, flooding and freezing.

B. Do not damage corrosion protection on pipe.

C. Repair or replace damaged pipe at no additional cost to OWNER.

D. Withdraw sheathing, Shoring, piles, and similar supports as backfilling progresses. Backfill and compact all holes left by removals.

E. Provide sufficient water quality facilities to protect downstream fish and wildlife, and to meet State water quality requirements.

F. Water settling of Trench backfill is not permitted. "Jetting" of Trench backfill is prohibited.

3.3 **PIPE ZONE**

A. Maintain uniform foundation along barrel of pipe with sufficient relief for joint connections.

B. Use backfill materials meeting pipe manufacturer's recommendations. Maximum backfill particle size is 3/4 inch for plastic pipe.

C. Do not permit free fall of backfill material which may damage pipe, pipe finish, or pipe alignment.

D. Except where piping must remain exposed for tests, fill Pipe Zone as soon as possible.

3.4 **TRENCH ABOVE PIPE ZONE.**

A. Maximum lift thickness before compaction is 8 inches.

B. Fill unauthorized Excavations with material acceptable to ENGINEER at no additional cost to OWNER.

C. Do not damage adjacent structures or service lines.

D. Install continuous plastic line marker directly over buried lines 18 inches below finished grade.

3.5 **MODIFIED BACKFILL LAYER METHOD**

A. At discretion of CONTRACTOR, backfill may be placed in thicker layers than indicated above subject to the following provisions.

1. CONTRACTOR proves the ability of proposed method to achieve specified average compaction density.
2. ENGINEER, on the basis of test results, approves the system in writing.

B. Should CONTRACTOR find it necessary to change the method or any part of it, including the source of material, or the rate of placing the material, obtain approval of ENGINEER, who may require a further trial area.

C. If testing shows a previously approved system is no longer producing the required degree of compaction, make changes to comply.

D. Where vibration effects are creating environmental problems, make changes to eliminate problems.

3.6 **COMPACTION**

A. Compact backfill, Section 33 05 05.

1. A-1 soils: 95 percent or greater of a Modified Proctor Density.
2. Other soils: 95 percent or greater of a Standard Proctor Density.

3.7 **COMPRESSIVE STRENGTH**

A. Where a flowable fill is used, provide compressive strength indicated in Section 31 05 15. Use fill which flows easily and vibration is not required.

3.8 **SURFACE RESTORATION**

A. Provide temporary paved surfaces where Trenches pass through roadways, Driveways or sidewalks.

B. Restore paved surfaces; Section 33 05 25.

C. Finish landscaped surfaces with grass, Section 32 92 00 or with other ground cover, Section 32 93 13.

3.9 **CLEANING**

A. Remove stockpiles from the site. Grade site surface to prevent free standing surface water.

B. Leave borrow areas clean and neat.

END OF SECTION

SECTION 33 05 25

PAVEMENT RESTORATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Aggregate base restoration.
B. Concrete base restoration.
C. Surface restoration.

1.2 REFERENCES

A. ACI 305: Hot Weather Concreting.
B. ACI 306: Cold Weather Concreting.
C. ASTM C 615: Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
D. ASTM C 78: Standard Test Method for Flexural Strength of Concrete (Using Simple Beam With Third-Point Loading).
E. ASTM C 928: Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repairs.
F. ASTM D 1664: Standard Test Method for Coating and Stripping of Bitumen-Aggregate Mixtures.

1.3 SUBMITTALS

A. Mix design for,
   1. Temporary patching material.
   2. Permanent cold weather patching material.
B. Manufacturer's chemical additive data sheets.

1.4 WEATHER

A. Asphalt Concrete Pavement Patch:
   1. Provide temporary or permanent cold weather asphalt patching material when air and roadbed temperature in the shade are less than 40 deg. F.
   2. Remove any temporary patching and provide permanent patching material when temperatures exceed 40 deg. F. CONTRACTOR may perform work after cold weather season if authorized in writing by ENGINEER.
B. Portland Cement Concrete Pavement Patch: Comply with hot and cold weather requirements, ACI 305 or ACI 306.

1.5 ACCEPTANCE

A. Aggregate base compaction.
B. Asphalt concrete compaction.
C. Grade and cross slope of pavement surface.

PART 2 PRODUCTS

2.1 MATERIALS

A. Untreated Base Course: Section 32 11 23.
B. Flowable Fill Base: Section 31 05 15.
C. Portland Cement Concrete Base: Class 4000, Section 03 30 04.
D. Tack Coat: Section 32 12 14, Grade SS-1.
E. Permanent Warm Weather Asphalt Concrete Patching Material: Section 32 12 05, AC-20-DM-1/2 unless indicated otherwise.
F. Permanent Cold Weather Asphalt Concrete Patching Material: MC-250-FM-1, Section 32 12 05 modified as follows.
   1. Asphalt Cement:
      a. Kinematic viscosity at 140 deg F: 250 to 800 cSt.
      b. Flash Point: 175 deg F.
      c. Water: 0.2 percent maximum.
      d. Distillate Test:
         To 437 deg F: None.
         To 500 deg F: 0 -15 percent.
         To 600 deg F: 15 -75 percent.
         To 680 deg F: 75 percent minimum.
      e. Residue Tests: Penetration at 77 deg F: None. Ductility at 77 deg F: 100 cm minimum. Solubility in Trichloroethylene: 99 percent minimum.
   2. Composition of Mixture:
      a. Minimum Mix: 115 pounds asphalt cement per finished ton (5.75 percent).
      b. Maximum Mix: 135 pounds asphalt cement per finished ton (6.75 percent).
      c. Stripping: Not more than 5 percent, ASTM D 1664, after mixing.
      d. Workability: Material stockpiled for 1 year shall be capable of being shoveled, raked, spread and compacted.
   3. Chemical Additives: Capable of coating wet aggregates without stripping and maintains adhesive qualities in damp or wet applications.
G. Temporary Cold Weather Asphalt Concrete Patching Material: Type MC-250-DM-1/2, Section 32 12 05 with hydrated lime or anti-stripping agent as indicated in the mix design.
H. Pavement Sealing:
   1. Slurry seal Type RS-1-SS-II, Section 32 01 13.
   2. Chip seal Type MC-250-CS-A, Section 32 01 14.

I. Portland Cement Concrete Patching Material: Class 4000, Section 03 30 05.

J. High Early Strength Portland Cement Concrete Patching Material:

1. Concrete compressive strength of 3,000 psi minimum in 4 hours.
2. Cementatious Material: Rapid hardening or very rapid hardening, ASTM C 928.
3. Cement content of mix, per cement manufacturer's recommendations or approved mix design.
4. Non-reactive aggregates in applications subjected to wetting, extended exposure to humid atmosphere, or contact with moist ground.

K. Pavement Marking: Tape or paint, Section 32 17 23.

PART 3 EXECUTION

3.1 PREPARATION

A. At site, post name, address and telephone number of CONTRACTOR to contact in emergencies.

B. Notify ENGINEER within 24 hours of commencing work of this section but not less than 4 hours.

C. Provide worker and public safety; Section 01 55 26.

D. Cutting Pavements: Cut full depth and straight, Section 02 41 14. Remove all bonding inhibitors.

3.2 AGGREGATE BASE OR FLOWABLE FILL BASE

A. Match depth of existing aggregate base or 8 inches thick minimum.

B. Place crushed aggregate base in lifts not exceeding 8 inches before compaction. Compact per Section 33 23 26 to a Modified Proctor Density of 95 percent or greater.

C. When providing controlled low strength material (CLSM as specified in 31 05 15) match depth of existing aggregate base. Use fill that flows easily and vibration is not required. Cure the fill before placing surface patch.

3.3 CONCRETE SUBSTRATE

A. Apply concrete bonding compound, Section 03 30 10, to edge of existing concrete. Place concrete, Section 03 30 10.

3.4 ASPHALT CONCRETE PATCH

A. Match existing Pavement thickness plus 1 inch, but not less than 4 inches.

B. Clean all vertical surfaces that butt against new patchwork. Provide full coverage spray tack coat. Do not spray tack coat on surfaces exposed to public view. Do not apply tack coat by brush.

C. Place asphalt concrete in lifts not exceeding 3 inches after compaction

D. Compaction: 94 percent of ASTM D 2041 (Rice) plus or minus 2 percent.

E. Match adjacent surface slopes.

1. Plane off surface distortions that exceed 1/4-inch vertical deviation in 10 feet.
2. Coat planed surfaces with a cationic or anionic tack emulsion that complies with Section 32 12 03. Cover tack with sand.

3.5 PORTLAND CEMENT CONCRETE PATCH

A. Full Depth restorations:

1. Clean vertical surfaces in patchwork. Install dowels in vertical load bearing joints. Apply concrete bonding compound, Section 03 30 10.
2. Match adjacent surface slopes. Apply membrane forming compound, Section 03 39 00 immediately to protect work from hot or cold weather.
3. After concrete cure, plane off surface distortions that exceed 1/4 inch deviation in 10 feet. Use a water repelling product, Section 07 19 00 to water proof planed surfaces.
4. Do not allow traffic on the repaired area until concrete strength is achieved.

B. Partial Depth Patching:

1. Chip, hydro-blast or saw cut concrete to a minimum depth of 1 inch.
2. Make surfaces free of frost, ice, mud, water, grease, dirt and other materials that hamper bonding.
3. Install bonding agent per manufacturer’s recommendations.
4. Apply membrane forming compound, Section 03 39 00 immediately to protect work from hot or cold weather.
5. After concrete cure, plane off surface distortions that exceed 1/4 inch deviation in 10 feet. Use a water repelling product, Section 07 19 00 to water proof planed surfaces.
6. Do not allow traffic on the repaired area until concrete strength is achieved.

3.6 CONCRETE PAVERS

A. Screed Bedding with a notched and cambered screed board to achieve a crown between existing pavers. Use graded aggregate, geotextile, and bedding sand, Section 32 14 13.

B. In asphalt concrete or portland cement concrete surfaces place pavers against Pavement cuts to form a border course, i.e. the short side of the paver against the cut except at corners.

C. After placement, use a plate-type vibrating compactor to compact pavers. Size compactor to provide at least 5,000 lbf. force. Sweep sand into the joints and vibrate until joints are full. Remove excess sand.

D. Match adjacent surface grades with no more than 1/4 inch vertical deviation in 10 feet.

3.7 **PAVEMENT MARKINGS**

A. Unless indicated otherwise, repair all damaged Pavement markings with matching type of materials and installation.

END OF SECTION

SECTION 33 08 00

COMMISSIONING OF WATER UTILITIES

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Testing requirements for potable and non-potable water piping systems.

B. Warning: DO NOT use hydrostatic pressures described in this section for air-pressure testing.

1.2 **DEFINITIONS**

A. Leakage: The quantity of water required to maintain the specified hydrostatic test pressure after the pipeline has been filled with water and the air expelled.

B. Non-rigid Pipe: Any pipe that requires Bedding and backfill material for structural support.

1.3 **SUBMITTALS**

A. Pipeline Test Report: Submit.

1. Type of test.
2. Identification of pipe system.
3. Size, type, location and length of pipe in test section.
4. Test pressure and time.
5. Video cassette and log of visual examination.
6. Amount of Leakage versus allowable.
7. Date of test approval.
8. Signature of test supervisor.
9. Signature of Resident Project Representative witnessing and accepting the test.

1.4 **PROJECT CONDITIONS**

A. Repair pipeline system at no additional cost to OWNER until it passes specified commissioning tests.

1.5 **WARRANTY**

A. At the end of the One Year Correction Period repeat any test requested by ENGINEER to verify warranty of pipeline performance.

PART 2 PRODUCTS

2.1 **TESTING MATERIALS**

A. Medium: Water, air.

B. Recording Equipment (pressure systems):

1. Supply all equipment and power to perform pressure testing.
2. Secure approval of pressure gages.
3. Locate all gages and recording equipment away from affect of sunshine or unsuitable weather conditions.
4. Place, vents, pressure taps and drains for the test. Repair pipeline at completion of test at no additional cost to OWNER.

PART 3 EXECUTION

3.1 **PREPARATION**

A. Notify ENGINEER 48 hours in advance of test.

B. Carry out tests as pipeline construction progresses to ensure construction methods are producing satisfactory results.

C. Remove debris, sediment and other material from installed pipe prior to testing. Do not discharge or flush sand, gravel, concrete, debris or other foreign material into any existing pipeline system. Flushing with clean water only will be allowed but with minimal flows to eliminate exceeding capacities of the existing gravity systems. Flushing into existing pressurized water systems will not be allowed.

3.2 **ALIGNMENT AND GRADE TEST**

A. Do not allow line and grade of pipe to vary more than 1/2 inch in 10 feet and not more than 1 inch variance from true line at any location.

B. Do not allow grade of pipe to vary more than 1/4 inch in 10 feet for all design grades less than or equal to 1 percent and not more than 1/2 inch total variance from true grade at any location. Also, do not allow grade of pipe to vary more than 1/2 inch in 10 feet for all design grades greater than 1 percent and not more than 1 inch total variance from true grade at any location. Theses tolerances shall be acceptable provided that such variation does not result in a level or reverse sloping invert.

C. The variation in the invert elevation between adjoining ends of pipe due to eccentricity of joining surface and pipe interior surfaces shall not exceed 1/64 inch per inch of pipe diameter, or 1/4 inch maximum.

3.3 **PRESSURE TEST**

A. Air Test: Per pipe manufacturer's recommendation.

B. Hydrostatic test:

1. Provide 225 psi test pressure for 2 hours unless specified otherwise.

2. Provide air release taps at pipeline's highest elevations and expel all air before the test. Insert permanent plugs after test has been completed.
3. No piping installation will be acceptable until the leakage is less than the amount allowed by industry standards for the type of pipe material being tested or if no standard prevails than the number of gallons per hour as determined by the formula:

$$Q = \frac{LD \times \text{square root of } P}{133{,}200}$$

Where

Q = allowable leakage, in gallons per hour.

L = length of pipe under test in feet.

D = nominal diameter of pipe in inches.

P = average test pressure, in pounds per square inch (gage).

C. Locate and repair defective joints and retest until the leakage rate is less than allowable.

D. Repair any noticeable leakage even if total leakage is less than allowable.

3.4 **OBSTRUCTION AND DEFLECTION TEST**

A. Obstructions: Maximum protuberance is 1 inch.

B. Deflections:

1. Do not use mechanical pulling equipment when pulling mandrels through pipe.
2. Maximum reduction of internal diameter in any plane measured full length of installation and not less than 30 days after installation as follows:
   a. Polyvinyl chloride pipe, 7.5 percent.
   b. High density polyethylene pipe, 5 percent.
   c. Ductile iron pipe, 3 percent.
   d. Corrugated metal pipe, 7.5 percent.
3. Recommend an alternate method of measurement if mandrel testing would cause damage to internal pipe coating.

3.5 **INFILTRATION TEST**

A. Maximum is 50 gallons per inch diameter per mile per 24 hours.

3.6 **PIPE TESTING SCHEDULE**

A. Irrigation -Gravity System:

1. Grade test: All circuits drain.

B. Irrigation – Pressure System:

1. Grade test: All circuits drain.
2. Pressure test.

3. Operational Testing:
   a. Perform operational testing after hydrostatic test is complete; backfill is in place and sprinkler heads adjusted to final coverage.
   b. Demonstrate system meets coverage requirements and automatic controls function properly.
   c. Coverage requirements are based on operation of 1 circuit at a time.

C. Sanitary Sewers:

1. Alignment and grade test.
2. Obstructions and deflection test.
3. Infiltration test for gravity pipeline systems.
4. Pressure test for pressure pipeline systems.
5. Video inspection.

D. Subdrains:

1. Grade test: All pipelines drain.
2. Obstructions and deflection test.

E. Storm Drains:

1. Alignment and grade test.
2. Obstructions and deflection test.
3. Infiltration test for gravity pipeline systems.
4. Pressure test for pressure pipeline systems.
5. Video inspection.

F. Potable Water System:

1. Obstruction and deflection test.
2. Pressure test.
3. Disinfection (Section 33 13 00).

END OF SECTION

SECTION 33 11 00

WATER DISTRIBUTION AND TRANSMISSION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Water distribution and transmission system identification, valves, boxes, service connections and accessories.

B. This section is applicable to potable and non-potable water pressure systems.

1.2 REFERENCES

A. ACPA: American Concrete Pipe Association.

B. Applicable water company requirements.

C. AWWA C600: AWWA Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances.

D. AWWA C605: AWWA Standard for Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water.

E. AWWA C800: AWWA Standard for Underground Service Line Valves and Fittings.

F. AWWA M11: AWWA Manual for Steel Pipe -Design and Installation.

G. CDA: Copper Development Association.

1.3 PERFORMANCE REQUIREMENTS

A. Depth of Cover:

1. 48 inches minimum to top of pipe, service line, or as indicated in local building code. 72 inches maximum unless ENGINEER authorizes otherwise.
2. If less cover, provide additional protection to withstand frost and external loads.

B. Remove any section of pipe already placed that is found to be defective or damaged. Relay or replace without additional cost to OWNER.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions.

B. Commissioning: Submit testing data indicated in Section 33 08 00.

C. Record Documents: Submit documents, Section 01 78 39. Include details of underground structures, connections, thrust blocks and anchors. Show interface and spatial relationship between piping and adjacent structures.

D. Operating and Maintenance: Submit data, Section 01 78 23. Include maintenance data, parts lists, product data, and shop drawings.

1.5 **SITE CONDITIONS**

A. Minimize neighborhood traffic interruptions. Barricade stockpiles.
B. Secure acceptance of pipeline lateral tie-in work.
C. Repair public and private facilities damaged by CONTRACTOR.
D. Do not turn on or turn off any valve outside of the Work prior to securing ENGINEER's or water company's permission.

PART 2 PRODUCTS

2.1 **PIPES AND FITTINGS**

A. Provide piping materials and factory fabricated piping products of sizes, types, pressure ratings, and capacities indicated. Use only NSF approved products in drinking water systems. All such products shall be appropriately stamped with the NSF logo.
B. Where not indicated, provide proper selection as determined by installer and acceptable to ENGINEER to comply with installation requirements.
C. Provide sizes and types of equipment connections for fittings of material that matches pipe material used in the piping system. Where more than one type of material or product Option is indicated, selection is installer's choice.
D. Provide pipe fittings and accessories of same material and weight or class as pipe, with joining method indicated or recommended by manufacturer.

2.2 **VALVES**

A. Section 33 12 16.

2.3 **VALVE BOX**

A. Buried Valves In Traffic Areas: 2 piece, cast iron, screw adjustable sleeve, 5 -1/4 inch shaft, with a drop lid.
B. Buried Valves in Non-traffic Areas: Slip type of height required for the installation.
C. Markings: On cover of valve box, cast the appropriate utility lettering.

2.4 **VALVE CHAMBER**

A. General: Refer to applicable design criteria requirements explained in Laws and Regulations.
B. Basin: Class 4000 concrete floor and walls.
C. Steps: Plastic, cast into sidewalls greater than 4 feet deep.

D. Top: Flat slab class 4000 concrete.
E. Frame and Cover: Scoriated asphalt coated, heavy duty ductile iron conforming to Section 05 56 00 with flat top design and appropriate utility lettering. Shape and size as indicated.

2.5 **MORTAR, GROUT, AND CONCRETE**

A. Mortar: Cement, Section 04 05 16.
B. Grout: Cement, Section 03 61 00.
C. Concrete:
   1. Cast-in-place: Class 4000, Section 03 30 04.
   2. Precast: Class 5000, Section 03 40 00.

2.6 **TAPPING SADDLES**

A. Provide bronze alloy, ductile iron, or stainless steel saddles with stainless steel double straps.
B. Provide tapping saddles that have a minimum rated working pressure of 300 psi, neoprene Buna N gaskets, and bronze tapered threads.

2.7 **SERVICE CONNECTION**

A. Type K copper pipe; Section 33 05 03 with flare type 200 psi compression fittings in accordance with AWWA C800. If materials used in main line are non-copper, provide a plastic nipple to separate the metals.

2.8 **ACCESSORIES**

A. Bolts, Nuts, Washers: Steel, Section 05 05 23.
B. 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.
C. Corporation Stops: All bronze with tapered threads.
D. Hydrant and Valve: Dry barrel, Section 33 12 19.
E. Water Meter and Valve: Section 33 12 19.
F. Grease: Non-oxide.
G. Polyethylene Sheet: 8 mil thick.

PART 3 EXECUTION

3.1 **EXAMINATION**

A. Verify Trench Excavation is ready to receive work, and dimensions, and elevations are as indicated.

B. Commencing installation means acceptance of existing conditions.

3.2 **PREPARATION**

A. Excavation, Section 31 23 16. Hand trim to required elevations. Correct over excavations.

B. Remove stones or other hard matter that could damage pipe embedment or impede backfilling or compaction.

C. Examine areas and conditions under which materials and products are to be installed. Do not proceed with system installation until unsatisfactory conditions have been corrected in manner acceptable to system installer.

D. Clearly identify and promptly set aside defective or damaged pipe.

E. Use pipe cutting tool acceptable to pipe manufacturer.

3.3 **LOCATING POTABLE WATER PIPE**

A. Comply with Utah Drinking Water Act. As a minimum locate potable water pipe at least 18 inches vertical and 10 feet horizontal edge to edge between water and sewer lines. Place water lines above sewer line.

B. Where potable water pipe crosses under gravity-flow sewer lines, fully encase the sewer pipe in concrete for a distance at least 10 feet each side of the crossing.

1. Do not locate any joint in the water line within 36 inches of the crossing.
2. Encase water line if it is within 24 inches of a sewer force main or inverted syphon.
3. Encase sewer main joints in concrete if joints are horizontally closer than 36 inches to the water line.

C. Do not put potable water lines in the same Trench with sewer lines, storm drains or electric wires.

3.4 **INSTALLATION -PIPE AND FITTING**

B. Steel Pipe: AWWA M11.

C. Ductile Iron Pipe: AWWA C600.

D. Copper Tube: CDA "Copper Tube Handbook".

E. Polyethylene Pipe: For 3 inches and smaller pipe follow AWWA C901. Install all other sizes per manufacturer's installation instructions.

F. Polyvinyl Chloride Pipe: AWWA C605.

G. Concrete Pipe: ACPA "Concrete Pipe Handbook".

H. Wedges: Install metal wedges on all metal pipe systems.

3.5 **INSTALLATION – CONCRETE THRUST BLOCKS**

A. Do not make hydrostatic tests of Section 33 08 00 until thrust block concrete has

cured for at least 5 days.

B. Provide thrust blocks on all plugs, caps, tees, hydrants and vertical or horizontal bends.

C. Provide stainless steel or epoxy coated steel tie rods and clamps or shackles to restrain thrust.

D. Unless otherwise indicated or directed by ENGINEER, place the base and bearing sides of thrust blocking directly against undisturbed earth.

E. Sides of thrust blocking not subject to thrust may be placed against forms. Place thrust blocking so the fitting joints will be accessible for repair.

3.6 **INSTALLATION -VALVES AND VALVE BOXES**

A. Valves:

1. Ensure all parts are in working order.
2. Set location of valves outside of sidewalk limits, Driveway Approaches and other pedestrian or vehicular interference.
3. Install plumb with stems pointing up.
4. Grease all exposed bolts and nuts then apply polyethylene sheet and tape wrap.

B. Valve Boxes:

1. Set over valve nut so operator's key is plumb with clearance in valve box when opening and closing the valve.
2. Adjust box to finish grade.
3. Clean all dirt or foreign material out of box.

3.7 **INSTALLATION – TAPS**

A. Apply for and pay for applicable permits from water company for the indicated size and location of tap to water main. Comply with all connection requirements of water company.

B. Make all service taps with a tapping machine acceptable to the water company. Use teflon tape on all taps unless indicated otherwise.

C. The minimum distance between taps is 24 inches, with a 5 degree stagger. Do not make service taps within 24 inches of the end of pipe. Install taps at 60 degress from vertical, or authorized by ENGINEER.

D. Service saddles are required on all taps except, 3/4 inch or 1" taps to new ductile iron pipe

E. Grease all exposed bolts and nuts then apply polyethylene sheet and tape wrap.

3.8 **INSTALLATION – SERVICE LINES**

A. Replacing Existing Water Service Line:

1. Follow AWWA C800, Utah public drinking water regulations and Utah plumbing

code requirements.
2. When replacing water service lines, replace non-copper pipe with type K copper pipe, Section 33 05 03.

B. Looping Existing Water Service:
1. Minimum pipe diameter 3/4 inch.
2. Pinching tools used to close and open service lines may be used only if allowed by ENGINEER. When service line pinches cannot be returned to previous shape or flow, remove and replace damaged portion of pipe.
3. Soldered joints or connections not allowed.
4. For copper to iron connections use a brass pack joint compression coupling with joint locking device.
5. For copper-to-copper connections use a brass flare coupling.
6. Follow details shown in the Drawings.

C. Meter Box: Install meter boxes back of the curb, outside of sidewalks and Driveway Approaches and outside of other pedestrian and vehicular interference.

3.9 **INSTALLATION – WATER MAIN LOOP (SYPHON)**

A. Existing water mains may not match standard size. Excavate to obtain actual pipe diameter and match size.

B. Do not shutdown pipeline until couplings and fittings are on site. Coordinate shutdown with water company.

C. Connections to steel or transite pipe requires transition couplings or sleeves with transition gaskets.

D. Grease all exposed bolts and nuts then apply polyethylene sheet and tape wrap

E. Provide thrust blocks except where joints are welded. Follow details shown on the Drawings.

3.10 **DISINFECTION**

A. Secion 33 13 00.

B. After disinfection, legally dispose of disinfection water.

3.10 **BACKFILLING**

A. Prior to Backfilling:
1. Secure ENGINEER's acceptance of brass wedge installations and concrete thrust block installations.
2. For pressure pipe testing follow Section 33 08 00 requirements and for disinfection follow Section 33 13 00 requirements.

B. Trenches: Section 33 05 20.

C. Landscapes: Section 31 23 23.

3.11 **SURFACING RESTORATION**

A. Roadway Trenches and Patches: Section 33 05 25.
B. Landscapes: Section 32 92 00 or Section 32 93 13 as applicable.

END OF SECTION

SECTION 33 11 11

RELOCATE WATER METERS AND FIRE HYDRANTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Relocate existing water meters or fire hydrants which may be necessary because of changes in grade or installation of new improvements which conflict with existing meter and hydrant locations.

1.2 REFERENCES

A. AWWA C203: AWWA Standard for Coal-Tar Protective Coatings and Linings for Steel Water Pipelines -Enamel and Tape -Hot-Applied.

B. AWWA C502: AWWA Standard for Dry-Barrel Fire Hydrants.

1.3 JOB CONDITIONS

A. Secure utility company permit to do relocation work and pay applicable fees.

B. Secure utility company approval of joints, connections, and pipe installations prior to commencing backfill operations.

PART 2 PRODUCTS

2.1 HYDRANTS

A. Use existing hydrant unless Contract Documents specify OWNER or CONTRACTOR will provide a new unit.

B. Use the same type of pipe material as used for existing hydrant piping unless indicated otherwise.

C. Use mechanical and flange joint fittings unless indicated otherwise. Use only new tees, fittings, and bends.

D. Coat all weld connections and damaged areas of metal piping with coal tar enamel. Follow AWWA C203 requirements. Tape wrap coatings.

2.2 WATER SERVICE METERS

A. Use existing water meter and yoke unless Contract Documents specify OWNER or CONTRACTOR will provide a new unit.

B. When relocating meters, use Type K copper pipe (Section 33 05 03) or polyethylene pipe (Section 33 05 06) from main to meter yoke.

2.3 CONCRETE

A. Cast-in-place: Class 3000 or 4000, Section 03 30 04.

PART 3 EXECUTION

3.1 PREPARATION

A. Before commencing work, coordinate location and shutdown of utility lines with utility company and residents; Section 01 31 13.

B. Protect existing hydrants and meters from damage.

C. Control ground water, surface water, and storm water.

D. Control pedesrian and vehicular traffic, Section 01 55 26.

E. Provide all excavation backfill, compaction, connections, testing, and surface restorations to made the installation complete.

3.2 MOVING EXISTING HYDRANTS

A. Relocate to locations indicated.

B. Do not disturb location of hydrant lateral tee at water main.

C. The method of harnessing the hydrant (reshackling or reblocking) shall match existing conditions or approval of ENGINEER.

D. Install hydrant so base flange is even with or less than 4 inches above grade of surrounding surface.

3.3 RECONNECTING EXISTING HYDRANTS

A. Hydrant reconnections shall meet new work requirements indicated in Section 33 12 19.

B. When existing tee on water main is to be moved to new location, seal and shackle old tee.

3.4 HYDRANT BARREL EXTENSIONS

A. Follow AWWA C502 to extend barrels, operating stems and flanged adapters in design material and workmanship so hydrant base flange is even with or less than 4 inches above grade of surrounding surface.

3.5 RESETTING WATER METERS

A. Follow Section 33 12 33 to relocate water meters and service connections to locations indicated.

B. Follow Section 33 05 14 to adjust meter boxes to grade in paved surfaces.

3.6 **FIELD QUALITY CONTROL**

A. Hydrostatic tests, Section 33 08 00.

B. Disinfection, Section 33 13 00.

END OF SECTION

SECTION 33 12 13

WATER METER

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Water meters, service connections, materials.

B. Related work includes but is not limited to,

1. Excavation, Section 31 23 16.
2. Trench backfill, Section 33 05 20 .
3. Landscape restoration, Section 32 92 00 or Section 32 93 13.
4. Pavement restoration, Section 33 05 25.

1.2 **REFERENCES**

A. AWWA C704: AWWA Standard for Cold-Water Meters -Propeller Type for Main Line Applications.

B. AWWA C800: AWWA Standard for Underground Service Line Valves and Fittings.

1.3 **SUBMITTALS**

A. Manufacturer's test records on the range and accuracy of the meter being furnished.

B. Equipment material diagram and parts schematic.

PART 2 PRODUCTS

2.1 **METERS FOR SYSTEM PIPING**

A. Materials and Construction: AWWA C704

1. Cast iron bodies with 175 psi working pressure flanged connections.
2. Built-in straightening vanes.
3. Working pressure 150 psi.
4. Polyethylene plastic propeller.
5. Stainless steel shaft with stainless steel ball bearings, lubricated by means of a single pressure fitting.

B. Accuracy: Plus or minus 2 percent of scale for velocities over 1 foot per second.

C. Totalizer: Six digits reading in units indicated.

2.2 **METERS FOR SERVICE PIPING**

A. Provided by OWNER unless indicated otherwise.

2.3 **SERVICE LINE, VALVES, AND FITTINGS**

A. Service Pipe: Provide copper pipe, Section 33 05 03 or polyethylene pipe, (Section 33 05 06). The service pipe between the main and the meter and to a point not less than 1 foot from the public way side of the property line cannot exceed the meter size.

B. Service Valves and Fittings: AWWA C800.

C. Meter Setters: Brass, with angle fittings, saddle nuts and gaskets.

D. Corporation Stops and Angle Valves: Invert key design.

E. Bypasses: Not allowed on any service installation without approval of ENGINEER.

2.4 **METER BOXES**

A. Meters to 1" Service: Plastic or asphalt-dipped corrugated metal. Fiber meter boxes are not acceptable. Provide a meter box with frame and cover of sufficient strength to withstand loadings in vehicular traffic areas without breaking.

B. Meters 1-1/2" and Larger: Reinforced concrete with a minimum clearance of 12" from each side of meter plumbing.

PART 3 EXECUTION

3.1 **INSTALLATION**

A. Install meter box, meter setters, valves, etc. at indicated locations. If not indicated, install in street right-of-way parking strip or at a location approved by ENGINEER.

B. Install meter setters level and horizontal. Provide suitable pipe lengths to prevent stress.

C. Do not operate any of the utility agency's main line valves. Contact agency if valves are to be operated. If required by water utility agency notify affected water users, Section 01 31 13.

D. OWNER Supplied Meters: Installed by CONTRACTOR unless indicated otherwise.

END OF SECTION

SECTION 33 12 16

WATER VALVES

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Gate, butterfly, plug, check, pressure reducing, pressure relief, control valves and their installation.

B. Related work includes but is not limited to,

1. Excavation, Section 31 23 16.
2. Trench backfill, Section 33 05 20 .
3. Landscape restoration, Section 32 92 00 or Section 32 93 13.
4. Pavement restoration, Section 33 05 25.

1.2 **REFERENCES**

A. AWWA C111: American National Standard for Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.

B. AWWA C504: AWWA Standard for Rubber-Seated Butterfly Valves.

C. AWWA C508: AWWA Standard for Swing-Check Valves for Waterworks Service, 2 In. Through 24 In. NPS.

D. AWWA C509: AWWA Standard for Resilient-Seated Gate Valves for Water and Sewerage Systems.

E. AWWA C550: AWWA Standard for Protective Interior Coatings for Valves and Hydrants.

F. AWWA C600: AWWA Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances.

1.3 **SUBMITTALS**

A. Provide technical information as required for evaluating the quality of the valve. As a minimum include dimensions, weights, materials lists and operation charts.

PART 2 PRODUCTS

2.1 **VALVES -GENERAL**

A. Underground:

1. Less than 3 inches: Screwed ends.

2. 3 inches and larger: Flanged or mechanical joint ends as specified. Non-rising stem. Two inches square operating nut. Low alloy steel bolts, AWWA C111.

B. Submerged or Above Sewage or Water:
   1. Valve body bolts per manufacturer's recommendations.
   2. For joining valve to piping system use stainless steel nuts and bolts, Section 05 05 23.

C. Below an Operating Deck: Provide shaft extension from the valve to deck level.

D. Above Ground: Non-rising stems equipped with a hand wheel.

E. Manually Operated Valves Over 6 feet Above Operating Level: Provide chain operated handles.

F. Clearance: Install so that handles clear all obstruction when moved from open to closed.

G. Rated Working Pressure: 150 psi unless indicated.

H. Coating: Interior, AWWA C550. Exterior per manufacturer's recommendation.

2.2 **GATE VALVES**

A. Material: Cast iron body, bronze mounted. Furnish valves 3 inches through 48 inches that conform to the requirements of AWWA C509, non-rising stem design with "O" ring seals.

B. Operating Direction: Open counterclockwise.

C. Buried Valves: Flanged, mechanical joint, or as indicated.

2.3 **BUTTERFLY VALVES**

A. Material: Cast iron body, bronze mounted. Furnish valves 3 inches through 48 inches that conform to the requirements of AWWA C504.

B. Body Type: Short body or long body at CONTRACTOR's option or short body valves only where the disc will not interfere with adjacent fittings.

C. Wafer Valves: Subject to approval.

2.4 **ECCENTRIC PLUG VALVES**

A. Material: Cast iron body, bronze mounted, non-lubricated, eccentric, quarter-turn type with resilient face plugs, ductile iron discs with upper and lower shafts integral.

B. Markings: Indicate open and close position.

C. Port Areas: At least 82 percent of full pipe area.

D. Resilient Seat Seals: Buna N, field replaceable.

2.5 **CHECK VALVES**

A. Material: AWWA C508.

B. Valves 2-1/2 inches in Size and Smaller: 200 psi working pressure Y-pattern, bronze, regrinding, swing check valve with screwed ends.

C. Valves 3 inches in Size and Larger: Iron body, bronze mounted, flanged end, swing valves with stainless steel hinge pins.

D. Outside Weight and Lever: Required.

2.6 **PRESSURE REDUCING VALVES -SERVICE LINE**

A. Operation: Capable of reducing a varying higher upstream pressure to an adjustable constant lower downstream pressure.

B. Spring and nylon reinforced diaphragm type construction.

C. Equip with Y-strainer upstream of valve.

2.7 **PRESSURE REDUCING VALVES -MAIN LINE**

A. Operation: Capable of maintaining an adjustable constant downstream pressure regardless of upstream pressure.

B. Type: Hydraulically operated using a direct-acting, spring-loaded, normally open, pilot valve controlled diaphragm.

C. Provide a single removable seat and a resilient disc. No "O" ring type discs permitted. No external packing glands permitted. No pistons operating the main valve or pilot controls permitted.

D. Equip with Y-strainers on the pilot controls, variable closing and opening speed controls and a valve position indicator.

E. Rating: 250 psi working pressure with flanged connections.

F. Include an upstream and downstream pressure gage capable of accurately measuring system pressures.

2.8 **PRESSURE RELIEF VALVES**

A. Operation: Maintain a constant upstream pressure by passing or relieving excess pressure.

B. Closed Valves: Drip-tight.

C. Type: Hydraulically operated, pilot control using a diaphragm with a single removable seat and resilient disc.

D. Pilot Controls: Direct acting, adjustable between 20 and 200 psi, spring-loaded diaphragm valve.

E. Rating: 250 psi working pressure with flanged connections.

2.9 **CONTROL VALVE**

A. Types: Diaphragm actuated, single seated, composition disc,

hydraulically operated globe valve.

B. Pilot Controls: Externally mounted, four-way, solenoid pilot valve with self cleaning strainers and diaphragm type check valves.

C. Equip with a limit switch for pump control.

D. Equip with a built-in lift check valve to prevent flow reversal.

E. Rating: 250 psi working pressure with flanged connections.

F. Solenoids and the Limit Switch: Supplied with operating voltage as indicated.

PART 3 EXECUTION

3.1 **INSTALLATION**

A. Flush all lines before valve installation.

B. In ductile iron water mains install valves, AWWA C600.

C. Install butterfly valve shafts vertical in Vault boxes and horizontal otherwise.

END OF SECTION

SECTION 33 12 19

HYDRANTS

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Dry-barrel fire hydrants, valves, piping and accessories.

1.2 **REFERENCES**

A. AWWA C110: American National Standard for Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In., for Water and Other Liquids.

B. AWWA C111: American National Standard for Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.

C. AWWA C209: AWWA Standard for Cold-Applied Tape Coatings for the Exterior of Special Section, Connections, and Fittings for Steel Water Pipelines.

D. AWWA C210: AWWA Standard for Liquid Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines.

E. AWWA C213: AWWA Standard for Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel water Pipelines.

F. AWWA C214: AWWA Standard for Tape Coating Systems for the Exterior of Steel Water Pipelines.

G. AWWA C502: AWWA Standard for Dry-Barrel Fire Hydrants.

H. AWWA M17: AWWA Manual for Installation, Operation, and Maintenance of Fire Hydrants.

1.3 **PRODUCT HANDLING**

A. Package fire hydrants, gate valves, and valve boxes for protection against dirt and damage during shipment and storage.

B. Do not plug drain hole.

1.4 **SUBMITTALS**

A. Product Data: Manufacturer's technical product data and installation instructions.

B. Shop Drawings: Show interface and spatial relationship between piping and adjacent structures.

C. Field Quality Control Reports: For system commissioning.

1.5 **JOB CONDITIONS**

A. Notify appropriate fire department as soon as hydrant is removed or placed in service.

PART 2 PRODUCTS

2.1 DRY-BARREL FIRE HYDRANT

A. Cast iron compression type, AWWA C502, opening against pressure and closing with pressure, base valve design, 150 psi working pressure, with 1/4 inch diameter minimum tapping and bronze plug in standpipe.
1. Size: 5-1/4 inch valve opening.
2. Direction to Open Hydrant: Counterclockwise.
3. Size and Shape of Operating and Cap Nuts: Pentagon. 1-1/2 inch point to flat.
4. Hose Nozzles: Two 2-1/2 inch National Standard Thread, cap, gasket and chain.
5. Pumper Nozzle: One 4-1/2 inch National Standard Thread, cap, gasket and chain.
6. Depth of Burial: 48 inches or consistent with main depth.
7. Connection to Main: 6 inches flanges or mechanical joint.
8. Pressure: 150 psi working pressure and 300 psi hydrostatic pressure.
9. Inlet Bottom Connection: 6 inches mechanical joint or flanged in accordance with AWWA C110 and AWWA C111, designed to allow separation at the sidewalk level when hydrant is sheared off.
10. Automatic Drain: Opens as the hydrant is closed.

2.2 PIPE AND FITTINGS

A. Ductile iron, Section 33 05 05. Standard drilling, AWWA C110.

B. PVC, Section 33 05 07.

C. Steel, Section 33 05 09. Standard drilling, 150 lb.

D. Spool, Schedule 40 steel, epoxy lined, exterior wrapped with minimum 60 mil thick tape wrap, AWWA C210 or C213 and C209 or C214 with two welded in place 150 lb. steel ANSI B 16.5 slip on flanges.

2.3 VALVES

A. Gate valve. Section 33 12 16.

B. If indicated, furnish an auxiliary 6 inch diameter valve with end connections as required.

2.4 ACCESSORIES

A. Bolts, Nuts, Washers: Stainless steel, Section 05 05 23.

B. 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.

C. Thrust Blocks: Cast-in-plac concrete, Class 2000 minimum, Section 03 30 04.

D. Valve Box, Valve Chamber: Section 33 12 19.

PART 3 EXECUTION

3.1 PREPARATION

A. Excavation, Section 31 23 16.

3.2 INSTALLATION

A. Install hydrants, valves, and valve boxes as indicated and located in accordance with AWWA M17. Hydrants shall not be connected to or lacted within 10 feet of a sanitary sewer or storm drain.

B. Install so bottom of hydrant base flange is even with or less than 4 inches above grade.

C. Point 4-1/2" pumper nozzle to face the street.

D. Drain holes at base of hydrant to remain clear with a minimum of 1 cubic yard of clean Sewer Rock (Section 32 11 23) placed around hydrant base and drain. Place sheet plastic over gravel to prevent silting.

E. Coal tar and tape wrap steel pipe.

F. Grease all buried nuts and bolts and wrap with 8 mil polyethylene sheet and tape.

G. Install thrust blocks, Section 33 12 19.

3.3 BACKFILLING

A. Secure water company permission to commence backfilling operation.

B. Trenches, Section 33 05 20.

C. Structures and landscaping, Section 31 23 23.

D. Pavements, Section 32 05 10.

3.4 PAINT

A. Paint buried portion of hydrant with two coats of coal tar enamel or asphalt.

B. Paint hydrant barrel and caps with one coat primer and final coat per water company paint standards.

3.5 FIELD QUALITY CONTROL

A. Commissioning, Section 33 08 00.

B. Disinfection, Section 33 13 00.

END OF SECTION

SECTION 33 13 00

DISINFECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Disinfection of potable water system.
B. Test and report results.

1.2 REFERENCES

A. AWWA A100: AWWA Standard for Water Wells.
B. AWWA B300: AWWA Standard for Hypochlorites.
C. AWWA B301: AWWA Standard for Liquid Chlorine.
D. AWWA C651: AWWA Standard for Disinfecting Water Mains.
E. AWWA C652: AWWA Standard for Disinfection of Water-Storage Facilities.
F. State of Utah: Public Drinking Water Regulations, Part 2, Section 12.

1.3 DEFINITIONS

A. Disinfectant Residual: The quantity of disinfectant in treated water.
B. ppm: Parts per million.

1.4 SUBMITTALS

A. CONTRACTOR's evidence of experience in disinfection.
B. Bacteriological laboratory's evidence of certification if laboratory is not OWNER's laboratory.
C. Disinfection Report: 3 copies containing:
   1. Date issued.
   2. Project name and location.
   3. Treatment contractor's name, address and phone number.
   4. Type and form of disinfectant used.
   5. Time and date of disinfectant injection started.
   6. Time and date of disinfectant injection completed.
   7. Test locations.
   8. Initial and follow-up disinfectant residuals in ppm for each outlet tested.
   9. Time and date of flushing start.
   10. Time and date of flushing completion.
   11. Disinfectant residual after flushing in ppm for each outlet tested.
   12. Flush water disposal location and acceptance by local agency.

D. Bacteriological Report: 3 copies including:
1. Date issued.
2. Project name and location.
3. Laboratory's name, certification number, address, and phone number.
4. Time and date of water Sample collection.
5. Name of person collecting Samples.
6. Test locations.
7. Time and date of laboratory test start.
8. Coliform bacteria test results for each outlet tested.
9. Certification that water conforms or fails to conform to bacterial standards of State of Utah public drinking water regulations.
10. Bacteriologist's signature.

1.5 **QUALITY ASSURANCE**

A. Bacteriological Laboratory: Certified by State of Utah if laboratory is other than OWNER's laboratory.

1.6 **PRODUCT HANDLING**

A. Store and protect disinfectant in accordance with manufacturer's recommendations to protect against damage or contamination. Do not use unsuitable disinfectant.

B. Follow all instruction labeling for safe handling and storage of disinfectant materials.

1.7 **REGULATORY REQUIREMENTS**

A. Conform to State of Utah public drinking water regulations.

PART 2 PRODUCTS

2.1 **DISINFECTANT**

A. Liquid Chlorine: AWWA B301 with chlorine 99.5 percent pure by volume.

B. Sodium Hypochlorite: AWWA B300 with not less than 100 grams per liter available chlorine.

C. Calcium Hypochlorite: AWWA B300 with 65 to 70 percent available chlorine by weight in granular form.

D. Powder, tablet, or gas according to manufacturer's specification.

2.2 **ALKALI**

A. Caustic Soda or Soda Ash.

2.3 **ACID**

A. Hydrochloric (Muriatic) type.

PART 3 EXECUTION

3.1 **PREPARATION**

A. Provide necessary signs, barricades, and notices to prevent accidental exposure to disinfecting materials, consuming disinfecting water, or disturbing the system being disinfected.

B. Make sure the potable water system is complete, clean, and that the system to be disinfected is not connected to the existing system.

3.2 **DISINFECTION OF WATER LINES**

A. Use one method defined under AWWA C651 that is acceptable to ENGINEER.

B. After pressure testing per Section 33 08 00, flush system through hydrants or if a hydrant does not exist, install a tap of sufficient size to provide 2.5 feet per second flushing velocity in the line.

C. Starting at outlet closest to water source, bleed water from each outlet until chlorine residual reaches outlet. Repeat process at each outlet throughout system.

D. Collect a bacteriological water sample at end of line to be tested. If sample fails bacteriological test, flush system and retest. Continue flushing and retesting until a good sample is obtained.

E. If flushing does not produce a passing bacteriological test disperse disinfectant throughout system to obtain 10 to 25 ppm of free chlorine residual.

F. Flush the chlorinated water from the main until chlorine measurements show the concentration in the water leaving the main is no higher than that generally prevailing in the system or is acceptable for domestic use.

G. After a negative bacteriological sample is obtained, let the system relax for 24 hours. Flush and collect a subsequent bacteriological sample for testing. If the subsequent test is negative then water line is acceptable.

3.3 **DISINFECTION OF CULINARY WELLS**

A. Use one method defined under AWWA A100 that is acceptable to ENGINEER.

B. Do not start disinfection until well is thoroughly cleaned.

C. Use a disinfecting solution containing a minimum of 50 ppm residual chlorine.

D. Flush system after disinfection.

3.4 **DISINFECTION OF WATER STORAGE RESERVOIRS**

A. Use one method defined under AWWA C652 that is acceptable to the ENGINEER.

B. Do not start disinfection until water storage tank is thoroughly cleaned.

C. Provide and use necessary safety equipment for workers in contact with disinfectant or gasses.

D. Flush system after disinfection.

3.5 **FIELD QUALITY CONTROL**

A. Bacteriological Test:

1. Collect Samples for testing no sooner than 16 hours after system flushing.
2. Analyze water samples per State of Utah requirements.
3. If bacteriological test proves water quality to be unacceptable, repeat system treatment.
4. Do not place water systems into service until a negative bacteriological test is made. Provide a copy of the negative bacteriological test to ENGINEER.

B. Disposal of Disinfectant:

1. Legally dispose of disinfecting water and ensure no chlorine buildup or damage to the environment.

END OF SECTION

SECTION 33 14 00

FLUOROSILICIC ACID SYSTEM

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Minimum requirements for the installation of fluorosilicic acid injection equipment used in culinary water systems.

B. Injection system major equipment list.

C. General chemical feed requirements.

D. Injection system testing and start up requirements.

1.2 **REFERENCES**

A. AWWA A100: AWWA (American Water Works Association) Standard for Water Wells.

B. AWWA Water Fluoridation Principles and Practices, Manual M4

C. ANSI/AWWA Standard for Hydrofluosilicic Acid, B703-00

D. MMWR 44(RR-13); 1-40, Engineering and Administrative Recommendations for Water Fluoridation 1995, U.S. CDC.

E. ANSI/ASME B31 Piping Code.

F. ANSI Z358.1-1998 American National Standard for Emergency Eyewash and Shower Equipment.

G. International Plumbing Code 2000.

H. United States Department of Labor - Occupational Safety and Health Administration (OSHA) CFR Part 1910.

I. National Fire Protection Association (NFPA), NFPA 70 National Electrical Code latest edition.

J. International Building Code (IBC) latest edition.

K. Utah Administrative Code; R309-535-5 Fluoridation and R309-525-11 Chemical Addition

L. Davis County Board of Health Regulation Regarding Drinking Water Fluoridation
(7 ½ page document)

M. ANSI/NSF Standard 60

N. Fluoridation, in the Recommended Standards for Water Works, 1997 edition (commonly known as "Ten State Standards").

1.3 **GLOSSARY OF SELECTED TERMS**

A. Distribution sample: A water sample taken from the distribution lines of the public water system that is representative of the water quality in the water system.

B. Calculated dosage: The calculated amount of fluoride (mg/L) that has been added to an adjusted fluoridated water system. The calculation is based on the total amount of fluoride (weight) that was added to the water system and the total amount of water (volume) that was produced.

C. Monitoring fluoride: The regular analysis and recording by water system operators of the fluoride ion content in the drinking water.

D. Natural fluoride level: The concentration of fluoride (mg/L) that is present in the water source from naturally occurring fluoride sources.

E. Optimal fluoride level: The recommended fluoride concentration (mg/L) based on the annual average of the maximum daily air temperature in the geographical area of the fluoride water system.

1.4 **SUBMITTAL**

A. Not used.

PART 2 PRODUCT

2.1 **SYSTEM GENERAL REQUIREMENTS**

A. Fluorosilicic acid shall conform to the applicable ANSI/NSF Standard 60 and shall be supplied by the owner. Fluoride shall be isolated from all other chemicals to prevent contamination and shall be stored in covered shipping containers inside a building. Unsealed storage units for fluorosilicic acid shall be vented to the atmosphere at a point outside the building.

B. The fluorosicilicic acid injection system shall include the follow major equipment

1. Bulk storage tank
2. Fluorosilicic acid transfer pump in the bulk tank
3. Fluorosilicic acid day tank
4. Scale weight measuring device for the day tank.
5. Fluorosilicic acid chemical metering injection pump.
6. Metering pump calibration device
7. Fluoride analyzer and testing line
8. Eye wash and shower
9. Overflow receiving basin or drain
10. Liquid level indicators
11. Relief valves, check valves, flush drains, vents (3/4 inch PVC Flexible) and overflow lines.
12. Safety equipment
13. Three eights (3/8) inch diameter polyethylene tubing feed lines.

C. General chemical feed and storage equipment requirements:
1. Scales and other loss of weight recorders or liquid level indicators shall be provided for chemical feeds and shall be accurate to within five (5) percent of the average daily change in reading.
2. Feeders shall be accurate to within five (5) percent of any desired feed rate.
3. The point of application of fluorosilicic acid into a horizontal pipe shall be in the lower half (½) of the pipe.
4. Fluoride solution shall be applied by a positive displacement pump having a stroke rate not less than twenty (20) strokes per minute.
5. Fluoride solutions shall be injected at a point of continuous positive pressure.
6. The electrical outlet used for the fluoride feed pump should have a nonstandard receptacle and shall be interconnected with the well or main booster pump.

7. Secondary control systems shall be provided as a means of reducing overfeed. These may include flow or pressure switches or other devices.
8. Safety equipment shall be provided for all system operators and shall include deluge showers and eye wash devices.
9. Chemical feeders and pumps shall operate at no lower that twenty (20) percent of the feed range.
10. Acid storage tanks shall be vented to the outside atmosphere, but not in common with other tanks.
11. Storage tanks shall be protected with curbing capable of containing chemicals from equipment failure, spillage or accidental drainage.
12. Liquid chemical feeders shall be provided with devices approved by the Utah Plumbing Code which will prevent siphoning, back flow and excessive pressure. Pumps shall be sized to match or exceed maximum head conditions at the point of injection.
13. When motor driven transfer pumps are provided a liquid level limit switch and an overflow from the day tank shall be provided.
14. Lead weights shall not be used in fluoride chemicals solutions to keep pump suction lines at the bottom a day or bulk storage tanks.

PART 3 EXECUTION

3.1 **PREPARATION**

A. Prior to installing the fluoride equipment, ensure the potable water system is completed, cleaned, disinfected and tested in accordance with Section 02675 and 01815.

B. Isolate the pump station piping from the main water system by turning off the main valve to the system. Leave valve off until fluoride system is ready for injection into the water system.

C. Provide necessary signs, barricades, and notices to prevent accidental exposure to fluoride chemicals.

3.2 **INSTALLING FEED LINES**

A. The injection feed lines should be as short and straight as possible. Avoid sharp curves or loops. Use flexible connections in the bulk storage line and in the pump suction line.

B. At the fluoride injection point, the feed line shall be forty five (45) degrees from the bottom of the pipe and protrude one third (1/3) of the pipe diameter into the

pipe.

C. A corporation stop shall be part of the installation with an anti-siphon device.

3.3 **EQUIPMENT INSTALLATION**

A. The fluoride system injection pump shall be tied electrically to the well pump to insure system pumping while injection is taking place.

B. Seismic straps anchored to reinforced masonry walls (or other structural systems) shall be installed on all tanks sufficiently strong to prevent overtopping during earthquakes.

C. Follow all applicable codes and manufacture suggestions.

3.4 **CALIBRATING INJECTION PUMPS WITH CALIBRATION CYLINDERS**

A. Follow manufacture operation procedures to calibrate pumps.

B. Use to verify the flow rate of the feed pumps.

3.5 **PRESSURE TESTING**

A. Test for leakage and obstructions in accordance with Section 01815.

B. Follow section 01819 for testing, adjusting and balancing systems

3.6 **OPENING THE SYSTEM FOR PUBLIC USE**

A. Inform the water department and Engineer for visual inspection and permission to start injection system.

B. Insure that the proper testing has been completed by the Owner.

END OF SECTION