STATE OF NEW HAMPSHIRE DEPARTMENT OF NATURAL AND CULTURAL RESOURCES DIVISION OF PARKS & RECREATION

172 Pembroke Road Concord, NH 03302-1856 Tel. (603) 271-3556 Fax (603) 271-3553

PROJECT MANUAL

Project No.: ARP 2418

JERICHO MOUNTAIN STATE PARK

NEW RV CAMPGROUND

298 Jericho Lake Road, Berlin NH 03570

June, 2024

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PROJECT DIRECTORY NEW RV CAMPGROUND JERICHO MOUNTAIN STATE PARK, ERROL NH

<u>OWNER</u> :	Department of Natural and Cultural Resources DIVISION OF PARKS & RECREATION 172 Pembroke Road Concord, New Hampshire 03301 Telephone: 603-271-3556 Contact: Thomas Mansfield E-mail: thomas.c.mansfield@dncr.nh.gov
CONSULTANTS:	
CIVIL ENGINEER:	HORIZONS ENGINEERING 176 Newport Road, Suite 8, New London, NH 03257 Telephone: 603-444-4111 Contact: Will Davis E-mail: WDAVIS@HORIZONSENGINEERING.COM
LANDSCAPE ARCHITECT:	SE GROUP 1 Mill Street, Suite 190, Burlington, VT 05401 Telephone: 802-682-0098 Contact: Patrick Olstad & Adam Portz E-mail: POLSTAD@SEGROUP.COM and APORTZ@SEGROUP.COM
ARCHITECT:	SAMYN-D'ELIA ARCHITECTS, PA 6 Central House Road, Holderness, NH 03245 Telephone: 603-968-7133: Contact: Ward D'Elia E-mail: WARD@SDARCHITECTS.COM
ELECTRICAL ENGINEER:	CPB & ASSOCIATES 500 Depot Street, Rumney, NH 03266 Telephone: 603-786-9992 Contact: Charles Buckley E-mail: CBUCK616@YAHOO.COM

END OF PROJECT DIRECTORY

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SECTION 00 11 16

INVITATION TO BID

NEW RV CAMPROUND ARP 2418 Jericho Mountain State Park, Berlin NH

- 1. <u>Sealed Bids</u>: Proposals for a General Contract for the Construction of the above project will be received by the <u>Owner until 2:00 P.M.</u> prevailing time on July 10, 2024, at 2:00 pm at which time they will be publicly opened and read aloud. All Bids shall be made out only on the form included in the specifications package and delivered in a sealed, labeled envelope marked: <u>Bid Proposal for Jericho RV Campground</u> and deposited in the bid box located at the reception desk of the Department of Natural and Cultural Resources (DNCR) offices at 172 Pembroke Road in Concord, NH. Bidders are invited to attend the Bid opening. Bids received after the above stated time and date will not be accepted.
- <u>Technical Questions</u>: Questions regarding the Bidding Documents shall be referred to: Department of Natural and Cultural Resources, 172 Pembroke Road, Concord New Hampshire, 03301, attention Thomas Mansfield, Dept. Architect, Telephone (603) 271-3972, email: thomas.c.mansfield@dncr.nh.gov.
- 3. <u>Documents</u>: Bidding Documents may be examined at the Design, Development and Maintenance Section of DNCR, 172 Pembroke Road, Concord NH and at the following locations:

Construction Summary of New Hampshire Inc.: 734 Chestnut Street, Manchester, New Hampshire 03104, (603) 627-8856, www.constructionsummary.com

Alpha Graphics: 933 Islington Street, Portsmouth, NH 03801, (800) 581-2712 or (603) 436-3030, www.planroom.agportsmouth.com

McGraw-Hill Construction: 34 Crosby Drive, Suite 201, Bedford, Ma. 03170 (781) 430 2000 www.construction.com

Signature Digital Imaging: 45 Londonderry Turnpike, Hooksett, NH 03106, (603) 624-4025, www.signaturenh.com

ConstructConnect 20 Farrell Street, Suite 103, South Burlington, VT 05403. (800) 286 3633 or (802) 658-3797 www.constructconnect.com

New Hampshire Department of Administrative Services Bureau of Purchase and Property Website: http://admin.state.nh.us/purchasing/vendorresources.asp

New Hampshire State Parks Website: www.nhstateparks.org/news-events/improving-state-parks/rfps-projects.

- 4. <u>Qualifications</u>: All companies, corporations, and trade names bidding must be registered and have a Certificate of Existence from the New Hampshire Secretary of State's Office, Corporate Division (telephone 603-271-3244) in order to do business with the State of New Hampshire
- 5. <u>Bid Security</u>: A Bid Bond in the amount of five (5%) percent of the total amount of the lump sum bid price shall accompany each Bid Proposal in accordance with the Instructions to Bidders.
- 6. <u>Bonds</u>: The successful bidder, at the time of the execution of the contract, shall be required to provide the Owner with financial responsibility as security for the completion of the contract in accordance with the plans, specifications, and contract documents, in the form of a Performance and Payment Bond in the amount of One Hundred (100%) Percent of the contract award, if the contract award is seventy-five thousand dollars (\$75,000) or more, the cost of which shall be a part of the Base Bid. The form of bond and the surety shall be acceptable to the Commissioner. No contract bond shall be required on contract awards of less than seventy-five thousand dollars (\$75,000).
- 7. <u>Inspection of Site</u>: Bidders are <u>expected</u> to thoroughly inspect <u>existing building</u> and <u>site</u> <u>conditions</u> prior to submission of Proposals. A pre-bid tour of the existing building/site will be conducted by the Owner and Architect on Tuesday, June 25, 2024 at 11:00 a.m. The tour will depart from the Jericho Mountain State Park Welcome Center. Attendance by Bidders shall be considered mandatory.
- 8. <u>Awards</u>: In most cases the proposal submitted by the qualified bidder with the lowest base bid price shall be selected. However, the Department of Natural and Cultural Resources (DNCR) reserves the right to reject any or all proposals or advertise for new proposals as it judges to be in the best interest of the state.
- Domestic Preference for Procurement: The Contractor, consistent with 2 CFR 200.322, should, to the greatest extent practicable, provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products).

END OF INVITATION TO BID

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INSTRUCTIONS TO BIDDERS

DEFINITIONS

- 1. Definitions set forth in the Specification Section 00 72 00 "General Conditions" or in other Contract Documents are applicable to the Bidding Documents.
- 2. Bidding Documents include the Bidding Requirements and the proposed Contract Documents. The Bidding Requirements include the Invitation to Bid, Instructions to Bidders, the Proposal Form and other sample Bidding and Contract forms.
- Addenda are written or graphic instruments issued prior to the execution of the Contract. They
 modify or interpret the Bidding Documents by additions, deletions, clarifications, or corrections.
 Addenda will become part of the Contract Documents when the Construction Contract is
 executed.
- 4. A Bid is a complete and properly signed Proposal to do the Work or designated portion thereof for the sums stipulated therein, submitted in accordance with the Bidding Documents.
- 5. The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents as the base, to which Work may be added or deducted for sums stated in Alternate Bids.
- 6. An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from the amount of the Base Bid if the corresponding change in Work, as described in the Bidding Documents, is accepted.
- 7. A Unit Price is an amount stated in the Bid as a possible price per unit of measurement for materials, equipment, services, or a portion of the Work as described in Bidding Documents. The choice of using Unit Prices, or an alternative method of payment, for additional Work shall be left solely to the Owner's discretion.
- 8. A Bidder is a person or entity who submits a Bid.
- 9. A Sub-Bidder is a person or entity who submits a bid to a Bidder for materials, equipment, or labor for a portion of the Work.

BIDDER'S REPRESENTATION

1. Each Bidder by making his Bid represents that he has examined and understands the Bidding Documents, that the Bidding Documents are adequate to produce the required results, and that his Bid is in accordance therewith.

- 2. Each Bidder by making his Bid represents that he has visited and thoroughly inspected the existing site and familiarized himself with the local conditions under which the Work will be performed. Bidders are encouraged to make any and all inspections and tests as they feel necessary to achieve such familiarization prior to submitting Bids. Such inspections and tests shall be conducted at times mutually acceptable to the Owner and Bidder. Unless waived by the Owner, Bidders shall make repairs following their testing, as necessary to restore tested areas to pre-testing condition. Should a Bidder conclude that time or other factor(s) prohibits him from performing sufficient tests, he shall so notify the Owner, in writing, prior to the receipt of Bids.
- 3. The submission of a Bid will be construed as conclusive evidence that the Bidder has made all such examinations and inspections necessary for a complete and proper assessment of the Work required, and that the Bidder has included in his Bid a sum sufficient to cover the cost of all items necessary to perform the Work as set forth in the proposed Contract Documents. No allowance will be made to a Bidder because of lack of such examination, inspection, or knowledge.
- 4. Each Bidder by making his Bid represents that he has assessed the conditions of the current construction marketplace, and verified that an adequate, experienced workforce is available to suitably man the Work of this Project and complete it in a timely fashion.
- 5. Each Bidder is assumed to have made himself familiar with all Federal, State and Local laws, ordinances, and regulations which in any manner affect those engaged in or upon the Work, or in any way affect those engaged or employed in the Work, and no plea of misunderstanding will be considered on account of ignorance thereof. The Contractor shall comply with all taxes, fees and assessments as levied by Federal, State and Local authorities.

BIDDING PROCEDURES

- 1. All Bids must be prepared on the Bid Proposal Form provided in the Specification and submitted in duplicate copies in accordance with the Notice to Bidders and Instructions to Bidders. Any bids submitted that are not on the official bid proposal forms will not be accepted.
- 2. A Bid shall be invalid if it has not been deposited at the designated location prior to the time and date in the Invitation to Bid, or prior to any extension thereof issued to the Bidders.
- 3. Each copy of a Bid shall be signed by the person or persons legally authorized to bind the Bidder to a Contract. A Bid by a corporation shall further give the state of incorporation and have a corporate seal affixed.
- 4. Unless otherwise provided in any supplement to these Instructions to Bidders, no Bidder shall modify, withdraw, or cancel his Bid or any part thereof for Ninety (90) days after the time designated for the receipt of Bids in the Notice to Bidders.
- 5. Prior to the receipt of Bids, Addenda will be e-mailed, mailed, or delivered to each person or firm recorded by the Owner as having received the Bidding Documents and will be available for inspection wherever the Bidding Documents are kept available for that purpose.

BID SECURITY

1. Bid Security shall be made payable to the Owner, in the amount of not less than five percent (5%) of the Bid Sum and shall be attached to the Bid. Security shall be either a certified check made payable to the "Treasurer, State of New Hampshire," or Bid Bond issued by surety licensed to conduct business in the State of New Hampshire. The successful Bidder's security will be retained until he has signed the Agreement or Contract and furnished the required Performance and Payment Bonds and Certificates of Insurance. The Owner reserves the right to retain the Security of the next two lowest Bidders until the low Bidder enters into a Contract, or until Sixty (60) days after Bid opening, whichever occurs first. Bid Security of all other Bidders will be returned as soon as practicable. If any Bidder refuses to enter into an Agreement or Contract, the Owner will retain his Bid Security as liquidated damages, but not as a penalty.

EXAMINATION OF BIDDING DOCUMENTS

1. Each Bidder shall examine the Bidding Documents carefully and, not later than seven (7) days prior to the date of receipt of Bids, shall make written request to the Owner for interpretation or correction of any ambiguity, inconsistency, or error therein, which he may discover. Any interpretation or correction will be issued as an Addendum by the Owner. Only a written interpretation or correction by Addendum will be binding. No Bidder shall rely upon any interpretation or correction given by any other method. <u>Bidders are encouraged to direct any questions which may arise to the Owner</u>, in order to provide necessary clarifications <u>prior</u> to the receipt of Bids. Bidders shall promptly notify the Owner of any ambiguity, inconsistency, or error which they may discover upon examination of the Bidding Documents, or the existing building, site, or local conditions. Should a Bidder fail to notify the Owner of errors, discrepancies, or contradictions, he shall be <u>assumed to have bid the more expensive alternative</u>.

SUBSTITUTIONS

- Each Bidder represents that his Bid is based upon the materials and equipment described in the Bidding Documents. Where the language "or approved equal" is used in the Bidding Documents, it is intended to require that all such materials and equipment shall be submitted as required by these Instructions to Bidders and approved by the Owner <u>prior to the receipt of Bids</u>.
- 2. <u>No substitution will be considered unless written request has been submitted to the Owner for</u> <u>approval at least seven (7) days prior to the date for receipt of Bids.</u> Each such request shall conform to the requirements of Section 01 25 00 "Substitution Procedure.".
- 3. If a Bidder proposes to use a material which, while suitable for the intended use, deviates in any way from the detailed requirements of the Contract Documents, he shall inform the Owner in writing of the nature of such deviations at the time the material is submitted for approval. <u>It shall</u> be the responsibility of the Bidder to notify the Owner, in writing, of the presence of Asbestos or any other hazardous materials in any proposed substitution. Such written notice shall be in the form of a cover letter attached to the related documents.

- 4. In requesting approval of deviations or substitutions, a Bidder shall provide, upon request, evidence leading to a reasonable certainty that the proposed substitution or deviation will provide a quality of result at least equal to that otherwise attainable. If, in the opinion of the Owner, the evidence presented by the Bidder does not provide a sufficient basis for such reasonable certainty, the Owner may reject such substitution or deviation without further investigation.
- 5. In requesting approval of substitutions, a Bidder represents that he will provide the same warranty and/or guarantee for the substitution that he would for that specified.
- 6. The Contract Documents are intended to produce a building and site improvements of consistent character and quality of design. The Owner shall judge the design and appearance of proposed substitutes on the basis of their suitability in relationship to the overall design of the Project, as well as for their intrinsic merits. <u>The Owner will not approve proposed substitutions which, in his opinion, would be out of character, obtrusive, or otherwise inconsistent with the character or quality of design of the project.</u>
- 7. The Contractor shall be solely responsible for coordinating the installation of accepted substitutions, making such changes as may be required for the Work to be complete in all respects. Any additional cost, or any loss or damage arising from the substitution of any material or any method for those originally specified shall be borne by the Contractor, notwithstanding approval or acceptance of such substitution by the Owner, unless such substitution was made at the written request or direction of the Owner.
- 8. The burden of proof of the merit of a proposed substitution is upon the proposer. Approval of a proposed substitution is valid only upon issuance by the Owner in written form, and the Owner's decision of approval or disapproval of a proposed substitution shall be considered final.

DETERMINATION OF RIGHT TO DO BUSINESS WITH STATE OF NEW HAMPSHIRE

1. If selected as the low bidder, the bidder must be registered and have a Certificate of Good Standing from the Secretary of State, Corporate Division (telephone 603-271-3244) in order to do business with the State of New Hampshire.

PROPOSAL SELECTION

1. In most cases the proposal submitted by the qualified bidder with the lowest base bid price shall be selected. However, the Department of Natural and Cultural Resources (DNCR) reserves the right to reject any or all proposals or advertise for new proposals as it judges to be in the best interest of the State of New Hampshire.

CONTRACTORS QUALIFICATIONS

 Upon the Owner's request, the successful bidder shall provide evidence that they have been successfully performing this type, scale, and quality of Work for a minimum of five (5) years. Upon request by the Owner, a comprehensive list of all similar projects worked on in the past two (2) years by the Contractor shall be submitted along with contact information for three (3) references or owners representatives involved with three (3) different projects completed by the Contractor.

EXECUTION OF AGREEMENT

- Execution and Approval of Agreement: The Agreement shall be signed by the successful Bidder and returned, together with Bonds if applicable, within fifteen (15) Days after the Agreement has been mailed or otherwise delivered to the Bidder. No Agreement shall be considered as in effect until it has been fully executed by all Parties thereto and, when the Price Limitation is more than \$10,000, the Agreement has been concurred in by Governor and Council.
- 2. Failure to Execute Agreement: Failure to execute the Agreement within fifteen (15) Days after the Agreement has been mailed or otherwise delivered to the successful Bidder shall be just cause for the cancellation of the bid and the forfeiture of the Bid Security which shall become the property of the Department, not as a penalty, but in liquidation of damages sustained. Award of the Contract may then be made to the next lowest Bidder, or the Work may be re-advertised as the Commissioner of the Department of Natural and Cultural Resources may decide.

PRECONSTRUCTION CONFERENCE

1. Either before or soon after the actual award of the Contract (but in any event prior to the start of construction), the Contractor or his representative and his principal subcontractors shall attend a preconstruction conference with representatives of the Owner. The conference will serve to acquaint the participants with the general plan of contract administration and requirements under which the construction operation is to proceed.

END OF INSTRUCTIONS TO BIDDERS

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SECTION 00 25 10

REQUIREMENTS FOR FEDERAL AID PROJECTS

I. NEW HAMPSHIRE STATE AND LOCAL FISCAL RECOVERY FUNDS FEDERAL REQUIREMENTS

This Agreement is funded under a grant to the State of New Hampshire (State) and subsequently through the Governor's Office for Emergency Relief and Recovery (GOFERR) and New Hampshire Department of Natural and Cultural Resources (NHDNCR) as approved by the Governor and Executive Council from the federal government through the Department of Treasury (Treasury) through the American Rescue Plan Act of 2021 (ARPA), with the source of funds being the State and Local Fiscal Recovery Funds (SLFRF) identified under the Catalog of Federal Domestic Assistance (CFDA) number #21.027. The Federal Award Identification Number (FAIN) for this award is SLFRP0145. This grant award is a subaward of SLFRF funds and any and all compliance requirements, as updated by Treasury, for use of SLFRF funds are applicable to the Subrecipient, without further notice. Treasury requirements are published and updated at <u>https://home.treasury.gov/policy-issues/coronavirus/assistance-for-state-local-and-tribal-governments/state-and-local-fiscal-recovery-funds</u>.

FEDERAL FUNDING ACCOUNTABILITY and TRANSPARENCY ACT (FFATA). The Subrecipient shall comply with the terms of the FFATA by providing NHDNCR with their Unique Entity Identifier (Unique Entity ID), and all applicable Executive Compensation Data information as required under the FFATA. A Unique Entity ID may be obtained by visiting <u>https://www.sam.gov</u>.

SAM REGISTRATION: The Subrecipient must have an active registration with the System for Award Management (SAM) (<u>https://www.sam.gov</u>).

GENERALLY ACCEPTED ACCOUNTING PROCEDURES: The Subrecipient, if a governmental entity, shall maintain project accounts in accordance with the Generally Accepted Accounting Principles (GAAP), including standards relating to the reporting of infrastructure assets as issued by the Governmental Accounting Standards Board (GASB). The full text of Governmental Accounting Reporting Standards is available through the GASB website at: <u>http://www.gasb.org</u>

RECORDKEEPING REQUIREMENTS: The Subrecipient must maintain records and financial documents for five years after all funds have been expended or returned to the State and/or Treasury. Treasury may request transfer of records of long-term value at the end of such period. Wherever practicable, such records should be collected, transmitted, and stored in open and machine-readable formats.

Subrecipient must agree to provide or make available such records to the State and Treasury upon request, and to the Government Accountability Office ("GAO"), Treasury's Office of Inspector General ("OIG"), and their authorized representative in order to conduct audits or other investigations.

SINGLE AUDIT REQUIREMENTS: Recipients and subrecipients that expend more than \$750,000 in Federal awards during their fiscal year will be subject to an audit under the Single Audit Act and its

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implementing regulation at 2 CFR Part 200, Subpart F regarding audit requirements. Recipients and subrecipients may also refer to the Office of Management and Budget (OMB) Compliance Supplements for audits of federal funds and related guidance and the Federal Audit Clearinghouse to see examples and single audit submissions.

CIVIL RIGHTS COMPLIANCE: The sub-grantee, contractor, subcontractor, successor, transferee, and assignee shall comply, and shall include in every contract or agreement funded with these funds this same requirement to comply, with Title VI of the Civil Rights Act of 1964, which prohibits recipients of federal financial assistance from excluding from a program or activity, denying benefits of, or otherwise discriminating against a person on the basis of race, color, or national origin (42 U.S.C. § 2000d et seq.), as implemented by the Department of the Treasury's Title VI regulations, 31 CFR Part 22, which are herein incorporated by reference and made a part of this contract (or agreement). Title VI also includes protection to persons with "Limited English Proficiency" in any program or activity receiving federal financial assistance, 42 U.S.C. § 2000d et seq., as implemented by the Department of the Treasury's Title VI regulations, 31 CFR Part 22, and herein incorporated by reference and made a part of this contract (or agreement). Title VI also includes protection, s31 CFR Part 22, and herein incorporated by the Department of the Treasury's Title VI regulations, 31 CFR Part 22, and herein incorporated by reference and made a part of this contract or agreement.

In order to carry out its enforcement responsibilities under Title VI of the Civil Rights Act, NHDNCR may collect and review information from subrecipients to ascertain their compliance with the applicable requirements before and after providing financial assistance. Treasury's implementing regulations, 31 CFR part 22, and the Department of Justice (DOJ) regulations, Coordination of Non-discrimination in Federally Assisted Programs, 28 CFR part 42, provide for the collection of data and information from recipients and subrecipients (see 28 CFR 42.406).

PERIOD OF PERFORMANCE: All funds are subject to statutory requirements that they must be used for costs incurred by the recipient during the period that begins on March 3, 2021, and ends on December 31, 2024, and that award funds for the financial obligations incurred by December 31, 2024 must be expended by December 31, 2026.

PROCUREMENT, SUSPENSION AND DEBARMENT: Recipients are responsible for ensuring that any procurement using SLFRF funds, or payments under procurement contracts using such funds are consistent with the procurement standards set forth in the Uniform Guidance at 2 CFR 200.317 through 2 CFR 200.327, as applicable. The Uniform Guidance establishes in 2 CFR 200.319 that all procurement transactions for property or services must be conducted in a manner providing full and open competition, consistent with standards outlined in 2 CFR 200.320, which allows for non-competitive procurements only in circumstances where at least one of the conditions below is true: the item is below the micro-purchase threshold; the item is only available from a single source; the public exigency or emergency will not permit a delay from publicizing a competitive solicitation; or after solicitation of a number of sources, competition is determined inadequate. Subrecipients must have and use documented procurement procedures that are consistent with the standards outlined in 2 CFR 200.317 through 2 CFR 200.320.

Subrecipient shall fully comply with Subpart C of 2 C.F.R. Part 180 entitled, "Responsibilities of Participants Regarding Transactions Doing Business with Other Persons," as implemented and supplemented by 2 C.F.R. Part 1532. subrecipient is responsible for ensuring that any lower tier covered transaction, as described in Subpart B of 2 C.F.R. Part 180, entitled "Covered Transactions," and 2 C.F.R. § 1532.220, includes a term or condition requiring compliance with 2 C.F.R. Part 180, Subpart C. subrecipient is responsible for further requiring the inclusion of a similar term and condition in any subsequent lower tier covered transactions. subrecipient acknowledges that failing to disclose the information required under 2 C.F.R. § 180.335 to NHDNCR may result in the delay or negation of this assistance agreement, or pursuance of administrative remedies, including suspension and debarment. Subrecipients may access the System for Award Management (SAM) exclusion list at https://sam.gov/SAM/ to determine whether an entity or individual is presently excluded or disqualified.

By entering into this agreement, the subrecipient certifies that the subrecipient is not debarred or suspended. Furthermore, the subrecipient certifies that no part of this contract will be subcontracted to a debarred or suspended person or firm.

DOMESTIC PREFERENCES FOR PROCUREMENTS (2 C.F.R. § 200.322) As appropriate and to the extent consistent with law, to the greatest extent practicable, there is a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products). The requirements of this section must be included in all <u>subawards</u> including all <u>contracts</u> and purchase orders for work or products under this award.

For purposes of this section:

- (1) "Produced in the United States" means, for iron and steel products, that all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States.
- (2) "Manufactured products" means items and construction materials composed in whole or in part of non-ferrous metals such as aluminum; plastics and polymer-based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber.

PROHIBITION ON CERTAIN TELECOMMUNICATIONS AND VIDEO SURVEILLANCE SERVICES OR EQUIPMENT:

As required by 2 CFR 200.216, subrecipients, are prohibited from obligating or expending loan or grant funds to procure or obtain; extend or renew a contract to procure or obtain; or enter into a contract (or extend or renew a contract) to procure or obtain equipment, services, or systems that use covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. As described in Public Law 115-232, section 889, covered telecommunications equipment is telecommunications equipment produced by Huawei Technologies

Company or ZTE Corporation (or any subsidiary or affiliate of such entities). Recipients, Subrecipients, and borrowers also may not use federal funds to purchase:

a. For the purpose of public safety, security of government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).

b. Telecommunications or video surveillance services provided by such entities or using such equipment.

c. Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of the National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.

Consistent with 2 CFR 200.471, costs incurred for telecommunications and video surveillance services or equipment such as phones, internet, video surveillance, and cloud servers are allowable except for the following circumstances:

a. Obligating or expending funds for covered telecommunications and video surveillance services or equipment or services as described in 2 CFR 200.216 to:

(1) Procure or obtain, extend or renew a contract to procure or obtain;

(2) Enter into a contract (or extend or renew a contract) to procure; or

(3) Obtain the equipment, services, or systems. Certain prohibited equipment, systems, or services, including equipment, systems, or services produced or provided by entities identified in section 889, are recorded in the System for Award Management exclusion list which can be found at <u>https://www.sam.gov/SAM/pages/public/index.jsf</u>

II. FEDERAL REQUIREMENTS APPLICABLE TO ARPA INFRASTRUCTURE PROJECTS OVER \$10M

For projects over \$10 million (based on expected total cost) a recipient shall provide a certification that, for the relevant project, all laborers and mechanics employed by contractors and subcontractors in the performance of such project are paid wages at rates not less than those prevailing, as determined by the U.S. Secretary of Labor in accordance with subchapter IV of chapter 31 of title 40, United States Code (commonly known as the "Davis-Bacon Act"), for the corresponding classes of laborers and mechanics employed on projects of a character similar to the contract work in the civil subdivision of the State (or the District of Columbia) in which the work is to be performed. All contracts and subcontracts for the construction of treatment works shall insert in full in any contract the standard Davis-Bacon contract clause as specified by 29 CFR §5.5(a).

00 25 10 Requirements for Federal Aid Projects-4

OTHER SPECIAL PROVISIONS

- A. In addition to the above special provisions, the following provisions as required by federal regulations apply to this Agreement:
- 1. *Financial management*. The Contractor shall comply with 2 CFR part 200 Subpart D and the specific standards regarding financial reporting, accounting records, internal control, budget control, allowable cost, source documentation, and cash management outlined therein.
- 2. Allowable costs. All costs charged to this Agreement shall be eligible, necessary, and reasonable for performing the tasks outlined in the approved project scope of services. The costs, including match, shall be incurred during the period of performance of the project, and shall be allowable, meaning that the costs must conform to specific federal requirements detailed in 2 CFR part 200 Subpart E.
- 3. **Property Management.** The Contractor shall comply with the property management and procedures detailed in 2 CFR Part 200 Subpart D.
- 4. **Restrictions on Lobbying.** The Contractor shall comply with the terms of 15 CFR part 28 and 2 CFR Part 200 Subpart E which prohibit the use of federal Contract funds to influence (or attempt to influence) a federal employee and requires the submission of Standard Form LLL ("Disclosure of Lobbying Activities") if *non*federal funds have been used to influence (or attempt to influence) a federal employee.
- 5. **Drug-Free Workplace.** The Contractor shall comply with the terms of 2 CFR part 1329 which require that as a condition of the Agreement, certification that they maintain a drug-free workplace. By signing and submitting the Agreement, the Contractor certifies that he or she will not engage in the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance in conducting any activity associated with the Agreement.
- 6. **Protection for Whistleblowers.** The Contractor shall comply with the terms of 41 U.S.C. §471 regarding Whistleblower protections. As described in 41 USC §471 "an employee of a contractor, subcontractor, grantee, or subgrantee or personal services contractor may not be discharged, demoted, or otherwise discriminated against as a reprisal for disclosing to a person or body described in paragraph (2) information that the employee reasonably believes is evidence of gross mismanagement of a Federal contract or grant, a gross waste of Federal funds, an abuse of authority relating to a Federal contract or grant, a substantial and specific danger to public health or safety, or a violation of law, rule, or regulation related to a Federal contract (including the competition for or negotiation of a contract) or grant."

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SECTION 00 41 00

BID PROPOSAL FORM

Project No. ARP 2418

- PROJECT: New RV Campground Jericho Mountain State Park 298 Jericho Lake Road, Berlin NH 03570
- BID OPENING DATE: July 10, 2024, at 2:00 pm at DNCR's office at 172 Pembroke Road, Concord, NH
- START DATE: September 30, 2024
- COMPLETION DATE: October 22, 2025

Sealed bid proposals for the above project will be accepted until the time and date indicated above. Bids may be deposited in the bid box at DNCR's offices in Concord or mailed to the attention of Thomas Mansfield, Dept. Architect, Department of Natural and Cultural Resources (DNCR), 172 Pembroke Road, Concord NH 03301. Please note on the outside of the sealed envelope: <u>Bid Proposal for Jericho RV Campground</u>.

DATE:_____

PROPOSAL OF:_____

GRAND TOTAL / LUMP SUM BASE BID (A+B):_____

PROPOSAL

Proposal of...

(name)

(address)

To furnish and deliver all materials, except as noted, and to perform all work in accordance with the Contract of the State of New Hampshire, Department of Natural and Cultural Resources for the construction of...

Project: ARP 2418 New RV Campground Jericho Mountain State Park 298 Jericho Lake Road, Berlin NH 03570

Commissioner Department of Natural and Cultural Resources 172 Pembroke Road Concord, N.H. 03302-1856

Commissioner:

In accordance with the advertisement of the Department of Natural and Cultural Resources inviting proposals for the project herein before named and in conformity with the Plans and Specifications on file in the office of the Department of Natural and Cultural Resources,

(firm name) hereby certifies that _________ is/are the only person, or persons, interested in this proposal as principals; that this proposal is made without collusion with any person, firm, or corporation; that an examination has been made of the Plans, of the Standard Specifications, and Special Attentions, Supplemental Specifications, and Special Provisions, all of which are attached hereto, and also of the site of the work; and I, or we, propose to furnish all necessary machinery, equipment, tools, labor, and other means of construction, and to furnish all materials specified in the manner and at the time prescribed; and understand that the quantities of work as shown herein are approximate only and are subject to increase or decrease, and further understand that all quantities of work are to be performed at the quoted prices.

To execute the form of contract and begin work within 15 (fifteen) days after the notice to proceed has been received or otherwise delivered to the contractor and to prosecute said work until its completion.

It is further proposed:

To furnish a contract bond in the amount of one hundred percent (100%) of the contract award, if the contract award is seventy-five thousand dollars (\$75,000) or more, as security for the completion of the contract in accordance with the plans and specifications and contract documents. The form of bond and the surety shall be acceptable to the Commissioner. No contract bond shall be required on contract awards of less than seventy-five thousand dollars (\$75,000).

To guarantee all of the work performed under this contract to be done in accordance with the plans and specifications and contract documents.

Enclosed, herewith, find certified check or bid bond in the amount of 5% of the total amount of the Lump Sum Price made payable to the "Treasurer, State of New Hampshire" as a proposal guarantee which is understood, will be forfeited in the event the form of contract is not executed, if awarded to the undersigned. Note: Personal checks will not be accepted as a proposal guarantee.

The undersigned acknowledges receipt of the following addenda, issued during the bidding time, and states that these have been incorporated in the proposal:

Addendum #1 dated_____Addendum #2 dated_____

Addendum #3 dated

Dated_____

ALLOWANCE #1: Unanticipated Modification and/or Additions to Contract Items:

Include in the Contract, a stipulated sum/price of \$90,000 for use upon the Project Managers instruction. This Allowance will make money available for modifications and/or additions to contract items due to owner-initiated changes, or for unknown, latent, or differing existing conditions, or for the removal of hazardous materials that are encountered by construction.

- a. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, equipment rental, overhead and profit will be included in Change Orders authorizing expenditure of funds from this Allowance. The cost of the bond for the amount of Allowance shall be included as part of the lump sum base bid.
- b. Funds will be drawn from an Allowance only by Change Order. Contractor can proceed with Change Order Work against Allowance with direction from the Project Manager. The Contractor shall not proceed with any work that will exceed the amount of Allowance remaining.
- c. Credits can only be added to an Allowance by Change Order. The Contractor may not use a credit until a Change Order is fully executed.
- d. Notwithstanding the Contractors objection, the Project Manager may at any time reduce the funds remaining in the Allowance by Change Order.
- e. At Final Payment of the Contract, funds remaining in the Allowance will be credited to the State.

SCHEDULE OF VALUES: NEW RV CAMPGROUND JERICHO MOUNTAIN STATE PARK

INDICATE DOLLAR AMOUNT OF CONTRACT SUM ALLOCATED TO EACH CATEGORY OF WORK AS DESIGNATED BELOW:

Specification	Description	Amount
00 72 00	General Conditions	
00 72 00	Bond Cost	
03 30 53	Cast-In-Place Concrete	
03 41 00	Precast Architectural Concrete	
	Shelters, Pump House and Kiosk	
	Signage	
	RV Pedestals	
	Campsite Accessories	
	RV Dump Station	
33 31 13	Facility Sanitary Sewers and Manholes	
	Septic System	
26 01 00	Electrical System	
	Otome Water Tractice and Original	
	Storm water Treatment System	
	Filter Pond and Sediment Forebay	
21 11 00	Site Clearing	
31 22 00	Site Cleaning	
31 25 00	Erosion and Sedimentation Controls	
51 25 00	Trenching	
	Gravel Parking Spurs and Amenity Pads	
32 12 16.31	Asphalt Paving	
32 93 00	Plantings	
32 92 00	Seeding and Sodding	
	Water Utilities and Distribution Piping	

Sub Total (A):

Allowance #1 (B):			\$90,000
Grand Total: lump sum ba	se bid (A + B)		
Add Alternative No. 1:	Electric power to the event area	\$	
Add Alternative No. 2:	Shelter Camp Sites L1.03		\$
Add Alternative No. 3:	Infill Sites L1.02	\$	
Add Alternative No. 4:	Electric power to five existing cabi	ns E1.03J \$	

Unit Price: Rock Removal _____per cubic yard

NOTE: This Schedule of Values must be completely filled out in order for bid proposal to be considered responsive.

SIGNATURE PAGE

company Name:	
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Names and Addresses of Members of the Firm/Corporation	
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Name	address
Name	address

SECTION 00 72 00

GENERAL CONDITIONS

TABLE OF ARTICLES

- 1. GENERAL PROVISIONS
- 2. CONTRACTOR'S RESPONSIBILITIES
- 3. OWNER'S RESPONSIBILITIES
- 4. SUBCONTRACTS
- 5. TIME
- 6. CHANGES
- 7. PAYMENT
- 8. INDEMNITY, INSURANCE, AND BONDS
- 9. SUSPENSION, NOTICE TO CURE, AND TERMINATION
- 10. DISPUTE MITIGATION AND RESOLUTION
- 11. MISCELLANEOUS
- 12. CONTRACT DOCUMENTS

ARTICLE 1 – GENERAL PROVISIONS

1.01 Definitions

- A. Addenda: Written or graphic instruments issued prior to opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
- B. Agreement: The written agreement between the Parties, executed on New Hampshire Form Number P-37, and these General Conditions, as modified, and exhibits and attachments made part of the agreement upon execution.
- C. Allowance: The sum stipulated in the Contract Documents, for use by the Owner to pay for unanticipated Modifications or Changes to the Contract Price.
- D. Architect: The term "Architect", where used throughout the Contract Documents, shall indicate the Design Professional retained or employed by the Owner and having the authority to make decisions about the design intent of the Project.
- E. Bidding Requirements: The Invitation to Bid, Instructions to Bidders, bid bond or other bid security, if any, the Bid Proposal Form, and the bid with any attachments.
- F. Business Day: All Days, except Saturdays, Sundays, and legal holidays indicated in the Contract Documents.
- G. Change Order: A written order signed by the Parties after execution of the Agreement, indicating changes in the scope of Work, the Contract Price, or Contract Time.
- H. Construction Change Directive: A change to the Work directed by the Owner pursuant to Section 6.03.

- I. Construction Schedule: A schedule, prepared and maintained by the Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Time.
- J. Contract: The entire and integrated written Agreement between the Owner and Contractor concerning the Work.
- K. Contract Documents: Consist of the Agreement, Invitation to Bid, Instructions to Bidders, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract.
- L. Contract Price: The stated amount in the Contractors bid, excluding Allowances, to perform the Work under the Contract Documents, as modified by any Alternates.
- M. Contract Time: The period of time between the Date of Commencement and the total time authorized to achieve Final Completion.
- N. Contractor: The person or entity identified in the Agreement and includes the Contractor's Representative.
- O. Date of Commencement: The date of commencement of the Work as identified in the Notice to Proceed.
- P. Day: A calendar day.
- Q. Defective Work: Any portion of the Work that does not conform to the requirements of the Contract Documents.
- R. Design Professional: The licensed architect or engineer, and its consultants, retained or employed by the Owner to perform design services for the Project.
- S. Final Completion: The date when the Contractor's obligations under this Agreement are complete and accepted by the Owner and final payment becomes due and payable, as enumerated in Box 1.7 "Completion Date" of the Agreement.
- T. Hazardous Material: Any substance or material identified now or in the future as hazardous under the Law, or any other substance or material that may be considered hazardous or otherwise subject to statutory or regulatory requirement governing handling, transportation, disposal, or cleanup.
- U. Law: Federal, state, or local law, ordinance, code, rule, and regulations applicable to the Work with which the Contractor must comply that are enacted as of the Agreement date.
- V. Modification: A written amendment to the Contract signed by both Parties, a Change Order, a Construction Change Directive, or a written order for a minor change in the Work issued by the Design Professional.
- W. Notice to Proceed: A written notice by the Owner to the Contractor fixing the date on which the Contract Time will commence to run and on which Contractor shall start to perform the Work.

- X. Others: Other contractors, suppliers, and persons or entities at the Site who are not employed by the Contractor or Subcontractors.
- Y. Owner: The State Agency indicated in Box 1.1 "State Agency Name" of the Agreement and includes the Owner's Representative.
- Z. Owner's Representative: The Owners appointed representative having authority to act on the Owners behalf and shall be responsible for general supervision and administration of the Contract.
- AA. Parties: Collectively the Owner and the Contractor.
- BB. Price Limitation: The amount indicated in Box 1.8 "Price Limitation" of the Agreement. The Price Limitation is the grand total lump sum, comprised of the Contract Price and the Allowance, available to pay for the Work under the Construction Documents.
- CC. Project: The building, facility, or other improvements for which the Contractor is to perform Work under the Agreement. It may also include construction by the Owner or Others.
- DD. Site: The area of the Project location where the Work is to be performed.
- EE. Subcontractor: A person or entity retained by the Contractor as an independent contractor to provide labor, materials, equipment, or services necessary to complete a specific portion of the work.
- FF. Substantial Completion: The date when the Work (or a specified part thereof) is sufficiently complete in accordance with the Contract Documents so that the Owner may occupy or utilize the Project, or a designated portion, for the use for which it is intended, without unapproved disruption.
- GG. Sub-Subcontractor: A person or entity who has an agreement with a Subcontractor, another Subsubcontractor, or Supplier to perform a portion of the Subcontractor's Work or to supply material or equipment.
- HH. Supplier: A person or entity retained by the Contractor to provide material or equipment for the Work.
- II. Work: The construction and services necessary or incidental to fulfill the Contractor's obligations for the Project in conformance with and reasonably inferable from the Agreement and the Contract Documents. The Work may refer to the whole Project or only a part of the Project if work is also being performed by the Owner or Others.

1.02 Parties Relationship

- A. The Parties agree to proceed with the Project on the basis of mutual trust, good faith, and fair dealing. The parties shall each endeavor to promote harmony and cooperation among all Project participants.
- B. The Contractor represents that it is an independent contractor and that in its performance of the Work it shall act as an independent contractor.

C. Neither the Contractor nor any of its agents or employees shall act on behalf of or in the name of the Owner.

1.03 Ethics

- A. The Parties shall perform their obligations with integrity, ensuring at a minimum that each:
 - 1. Avoids conflicts of interest and promptly discloses any to the other Party.
 - 2. Warrants that it has not and shall not pay or receive any contingent fees or gratuities to or from the other Party, including its agents, officers, and employees, Subcontractors, or others for whom they may be liable, to secure preferential treatment.

1.04 Design Professional

- A. The Owner, through its Design Professional, shall provide all architectural and engineering design services necessary for completion of the Work, excluding however:
 - 1. Design services delegated to the Contractor in accordance with Section 2.15.
 - 2. Services within the construction means, methods, techniques, sequences, and procedures employed by the Contractor, its Subcontractors, and Sub-subcontractors in connection with their construction operations.

1.05 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

- A. The Owners design professionals, including the Architect, the Architects consultants, Engineers, and other professionals providing services shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and Suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the design professionals reserved rights.
- B. The Contractor, Subcontractors, Sub-subcontractors, and Suppliers are authorized to use and reproduce the Instruments of Service provided to them solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and Suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of Work without the specific written consent of the Owner, and Owner's design professionals.

1.06 Digital Data Use and Transmission

A. Except as otherwise stated elsewhere in the Agreement, the Parties may transmit and shall accept, Project-related correspondence, text, data, documents, drawings, information, and graphics, including but not limited to shop drawings and other submittals, in electronic media or digital format, either directly, or though access to a secure Project website.

- B. If the Agreement does not establish protocols for electronic or digital transmittals, the Parties shall jointly develop such protocols.
- C. When transmitting items in electronic media or digital format, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the items, or from those established in applicable transmittal protocols.

ARTICLE 2 – CONTRACTOR'S RESPONSIBILITIES

2.01 General Responsibilities

- A. The Contractor shall use its diligent efforts to perform the Work in an expeditious manner consistent with the Contract Documents. Such Work includes furnishing construction administration and management services.
- B. The Contractor shall provide all labor, materials, equipment, and services necessary to complete the Work, all of which shall be provided in full accord with and reasonably inferable from the Contract Documents.
- C. Unless the Contract Documents instruct otherwise, the Contractor shall solely be responsible for and have control over the construction means, methods, techniques, sequences, procedures, site security, and safety precautions, and for coordinating all portions of the Work under the Agreement.
- D. The Contractor shall perform Work only within locations allowed by the Contract Documents, Law, and applicable permits unless otherwise directed by the Owner.

2.02 <u>Construction Personnel and Supervision</u>

- A. The Contractor shall provide competent supervision for the performance of the Work. Before commencing the Work, or making a change in the supervisory personnel, the Contractor shall notify the Owner in writing of the name and qualifications of its proposed superintendent(s) and project manager so the Owner may review the individual's qualifications. If, for reasonable cause, the Owner refuses to approve the individual, or withdraws its approval after once giving it, the Contractor shall name a different superintendent or project manager for the Owner's review. Any disapproved superintendent shall not perform in that capacity thereafter at the Site. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.
- B. The Contractor shall be responsible to the Owner for acts or omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for or on behalf of the Contractor or any of its Subcontractors and Suppliers.
- C. The Contractor shall permit only qualified persons to perform the Work. The Contractor shall enforce safety procedures, strict discipline, and good order among persons performing the Work. If the Owner determines that a particular person does not follow safety procedures, or is unfit or

unskilled for the assigned Work, the Contractor shall immediately reassign the person upon receipt of the Owner's written notice to do so.

- D. The Contractor's representative shall possess full authority to receive instructions from the Owner and to act on those instructions.
- E. The Contractor shall coordinate and supervise the work performed by Subcontractors to ensure that the Work is carried out without conflict between trades and so that no trade, at any time, causes delay to the general progress of the Work. The Contractors and all Subcontractors at all times shall afford each trade, any separate contractor, or the Owner and Others, every reasonable opportunity for the installation of their work and the storage of materials, subject to the specific limitations or restrictions of a particular site.

2.03 <u>Cooperation with Work of Owner and Others</u>

- A. The Owner may perform work at the Site directly or by Others. Any agreements with Others to perform construction or operations related to the Project shall include provisions pertaining to insurance, indemnification, waiver of subrogation, consequential damages, coordination, interference, cleanup, and safety that are substantively the same as the corresponding provisions of the Agreement.
- B. If the Owner elects to perform work at the Site directly or by Others, the Parties shall coordinate the activities of all forces at the Site and agree upon fair and reasonable schedules and operational procedures for Site activities. The Owner shall require each separate contractor to cooperate with the Contractor and assist with the coordination of activities and the review of construction schedules and operations. The Contract Price and Contract Time may be equitably adjusted for changes resulting from the coordination of construction activities, and the Construction Schedule shall be revised accordingly.
- C. With regard to work of the Owner and Others, the Contractor shall:
 - 1. Proceed with the Work in a manner that does not hinder, delay, or interfere with the work of the Owner or Others or cause the work of the Owner or Others to become defective;
 - 2. Afford the Owner or Others reasonable access for introduction and storage of their materials and equipment and performance of their activities; and
 - 3. Coordinate the Contractor's Work with theirs.
- D. Before proceeding with any portion of the Work affected by the construction or operations of the Owner or Others, the Contractor shall give the Owner prompt written notification of any defects the Contractor discovers in their work which will prevent the proper execution of the Work. The Contractor's obligations in this subsection do not create a responsibility for the work of the Owner or Others but are for the purpose of facilitating the Work. If the Contractor does not notify the Owner of defects interfering with the performance of the Work, the Contractor acknowledges that the work of the Owner or Others is not defective and is acceptable for the proper execution of the Work. Following receipt of written notice from the Contractor of defects, the Owner shall promptly inform the Contractor what action, if any, the Contractor shall take with regard to the defects.

2.04 Contract Document Review

- A. Prior to commencing the Work, the Contractor shall examine and compare all Contract Documents as well as information furnished by the Owner, shall take field measurements of any existing conditions related to the Work, and shall observe any conditions at the Site affecting the Work. These obligations are for the purpose of facilitating coordination and construction of the Work by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Owner and, if directed, the Design Professional in the form of a request for information (RFI) any errors, inconsistencies, or omissions discovered by or made known to the Contractor by such examination. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.
- B. The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, ordinances, codes, rules and regulations, or lawful orders of authorities having jurisdiction, but the Contractor shall promptly report to the Owner any nonconformity discovered by or made known to the Contractor as a request for information.
- C. Nothing in this section shall relieve the Contractor of responsibility for its own errors, inconsistencies, and omissions.

2.05 Workmanship

- A. The Work shall be executed in accordance with the Contract Documents in a workmanlike manner. All materials used in the Work shall be furnished in sufficient quantities to facilitate the proper and expeditious execution of the Work and shall be new except as otherwise provided in the Contract Documents.
- B. Work for which no explicit quality of standards of materials and/or workmanship is defined in the Contract Documents shall be of best quality for the intended use and consistent with the quality of surrounding work and of the construction of the Project generally.
- C. All manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned in accordance with manufacturer's written instructions, unless specifically indicated otherwise in the Contract Documents.
- D. Where the Work is to fit with existing conditions or work to be performed by Others, the Contractor shall join the Work fully and completely with such conditions or work, unless otherwise specified.
- E. The Contractor shall be responsible for inspection of portions of the Work already performed to determine that such portions are in proper condition to receive subsequent Work.
- F. The Contractor shall study and compare all Drawings and verify all figures shown thereon before laying out or constructing the Work. The Contractor shall be responsible for errors in its work and the work of its Subcontractors that might reasonably have been avoided thereby. The Contractor shall establish and be responsible for the accuracy of all lines, grades, measurements, levels, column lines, wall and partition lines required by the various Subcontractors in laying out their Work and shall protect and preserve all permanent bench and other markers. Checking of the figures or layout by the Design Professional shall not relieve the Contractor of these responsibilities.

2.06 Material Furnished by the Owner or Others

A. If the Work includes installation of materials or equipment furnished by the Owner or Others, it shall be the responsibility of the Contractor to examine the items so provided and thereupon handle, store, and install the items, unless otherwise provided in the Contract Documents, with such skill and care as to provide a satisfactory and proper installation. Loss or damage due to acts or omissions of the Contractor shall be the responsibility of the Contractor and may be deducted from any amounts due or to become due the Contractor. Any defects discovered in such materials or equipment shall be reported at once to the Owner. Following receipt of written notice from the Contractor of defects, the Owner shall promptly inform the Contractor what action, if any, the Contractor shall take with regard to the defects.

2.07 <u>Tests and Inspections</u>

- A. The Contractor shall schedule all tests, inspections, and approvals of the Work required by the Contract Documents, Law, or orders of authorities having jurisdiction at an appropriate time so as to not delay the progress of the Work. The Contractor shall give proper notice to all required parties of such tests, inspections, and approvals. If feasible, the Owner and Others may timely observe the tests at the normal place of testing. The Contractor shall bear all expenses associated with tests, inspections, and approvals required by the Contract Documents, which, unless otherwise agreed to, shall be conducted by an independent testing laboratory or entity retained by the Contractor, and approved by the Owner. Unless otherwise required by the Contract Documents, required certificates of testing, inspection, or approval shall be secured by the Contractor and promptly delivered to the Owner.
- B. If the Owner or appropriate authorities determine that tests, inspections, or approvals in addition to those required by the Contract Documents will be necessary, the Contractor shall arrange for the procedures and give timely notice to the Owner and others who may observe the procedures. Costs of the additional tests, inspections, or approvals are at the Owner's expense except as provided in the subsection below.
- C. If the procedures described in the two subsections immediately above indicate that portions of the Work fail to comply with the Contract Documents, the Contractor shall be responsible for costs of correction and retesting.

2.08 Warranty

A. The Contractor warrants that all materials and equipment shall be new unless otherwise specified, of good quality, in conformance with the Contract Documents, and free from defective workmanship and materials. At the Owner's request, the Contractor shall furnish satisfactory evidence of the quality and type of materials and equipment furnished. The Contractor further warrants that the Work shall be free from material defects not intrinsic in the design or materials required in the Contract Documents. The Contractor's warranty does not include remedies for defects or damages caused by normal wear and tear during normal usage, use for a purpose for which the Project was not intended, improper or insufficient maintenance, modifications performed by the Owner or Others, or abuse. The Contractor's warranty shall commence on the Date of Substantial Completion of the Work. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective.
- B. With respect to any portion of the Work performed after Substantial Completion, the Contractor's warranty obligation shall be extended by the period of time between Substantial Completion and the actual performance of the later Work.
- C. The Contractor shall obtain from its Subcontractors and Suppliers any special or extended warranties required by the Contract Documents. The Contractor's liability for such warranties shall be limited to the one-year correction period as provided in Section 2.09. After that period, the Contractor shall provide reasonable assistance to the Owner in enforcing the obligations of Subcontractors or Suppliers for such extended warranties.

2.09 Correction of Work Within One Year

- A. If, prior to Substantial Completion and within one year after the date of Substantial Completion of the Work, any Defective Work is found, the Owner shall promptly notify the Contractor in writing. Unless the Owner provides written acceptance of the condition, the Contractor shall promptly correct the Defective Work at its own cost and time and bear the expense of additional services required for correction of any Defective Work for which it is responsible. If within the one-year correction period the Owner discovers and does not promptly notify the Contractor or give the Contractor an opportunity to test or correct Defective Work as reasonably requested by the Contractor, the Owner waives the Contractor's obligation to correct the Defective Work as well as the Owner's right to claim a breach of the warranty with respect to that Defective Work.
- B. With respect to any portion of Work performed after Substantial Completion, the one-year correction period shall be extended by the period of time between Substantial Completion and the actual performance of the later Work. Correction periods shall not be extended by corrective work performed by the Contractor.
- C. If the Contractor fails to correct Defective Work within a reasonable time after receipt of written notice from the Owner prior to final payment, the Owner may correct it in accordance with the Owners right to carry out the Work. In such case, an appropriate Change Order shall be issued deducting the cost of correcting the Defective Work from payments then or thereafter due the Contractor. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.
- D. The Contractor's obligations and liability, if any, with respect to any Defective Work discovered after the one-year correction period shall be determined by the Law. If, after the one-year correction period but before applicable limitation period has expired, the Owner discovers any Work which the Owner considers Defective Work, the Owner shall, unless the Defective Work requires emergency correction, promptly notify the Contractor, and allow the Contractor an opportunity to correct the Work if the Contractor elects to do so. If the Contractor elects to correct the Work, it shall provide written notice of such intent within fourteen (14) Days of its receipt of notice from the Owner and shall complete the correction of Work within a mutually agreed timeframe. If the Contractor does not elect to correct the Work, the Owner may have the Work corrected by itself or Others, and, if the Owner intends to seek recovery of those costs from the Contractor, the Owner shall promptly provide the Contractor with an accounting of the correction costs it incurs.
- E. If the Contractor's correction or removal of Defective Work causes damage to or destroys other completed or partially completed Work or existing buildings, the Contractor shall be responsible for the cost of correcting the destroyed or damaged property.

- F. The one-year period for correction of Defective Work does not constitute a limitation period with respect to enforcement of the Contractor's other obligations under the Contract Documents.
- G. At the Owners option and with the Contractor's agreement, the Owner may elect to accept Defective Work rather than require its removal and correction. In such case, the Contract Price shall be equitably adjusted for any diminution in the value of the Project caused by such Defective Work. Such adjustment shall be effected whether or not final payment has been made.

2.10 Correction of Covered Work

- A. On request of the Owner, Work that has been covered without a requirement that it be inspected prior to being covered shall be uncovered for the Owner's inspection. The Owner shall pay for the costs of uncovering and replacement if the Work proves to be in conformance with the Contract Documents, or if the defective condition was caused by the Owner or Others. If the uncovered Work proves to be defective, the Contractor shall pay the costs of uncovering and replacement.
- B. If any Work is covered contrary to requirements in the Contract Documents, the Owner may issue an order to uncover the Work for the Owner's observation and re-cover the Work all at the Contractor's expense and with no adjustment to the Contract Time.

2.11 Safety

- A. Safety Programs: The Contractor holds overall responsibility for safety programs. However, such obligation does not relieve the Subcontractors of their safety responsibilities or requirements to comply with the Law. The Contractor shall seek to avoid injury, loss, or damage to persons or property by taking reasonable steps to protect:
 - 1. Its employees and other persons at the Site;
 - 2. Materials and equipment stored at onsite or offsite locations for use in the Work; and
 - 3. Property located at the Site and adjacent to work areas, whether or not the property is part of the Site.
- B. The Contractor shall designate an individual at the Site in its employ as its safety representative. Unless otherwise identified by the Contractor in writing to the Owner, the Contractor's superintendent shall serve as its safety representative. When the Contractor is required to file an accident report with a public authority, the Contractor shall furnish a copy of the report to the Owner.
- C. The Contractor shall give notices and comply with applicable laws, ordinances, rules, regulations, and lawful orders of authorities having jurisdiction bearing on safety or persons or property or their protection from damage, injury, or loss.
- D. Damage or loss not insured under property insurance which may arise from the Work to the extent caused by negligent acts or omissions of the Contractor, or anyone for whose acts the Contractor may be liable, shall be promptly remedied by the Contractor.
- E. The Contractor shall erect and maintain, as required by existing conditions and performance of the Work, reasonable safeguards for safety and protection, including posting danger signs and other

warnings against hazards, promulgating safety regulations, and notifying owners and users of adjacent sites and utilities.

- F. When use or storage of explosives or other Hazardous Materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.
- G. If the Owner deems any part of the Work or Site unsafe, the Owner, without assuming responsibility for the Contractor's safety program, may require the Contractor to stop performance of the Work, take corrective measures satisfactory to the Owner, or both. If the Contractor does not adopt corrective measures, the Owner may perform them and deduct their cost from the Contract Price. The Contractor agrees to make no claim for damages, for an increase in the Contract Price or Contract Time based on the Contractor's compliance with the Owners reasonable request.

2.12 <u>Emergencies</u>

A. In an emergency affecting the safety of persons or property, the Contractor shall act in a reasonable manner to prevent threatened damage, injury, or loss. Any change in the Contract Price or Contract Time resulting from the actions of the Contractor in an emergency situation shall be determined as provided for in Article 6.

2.13 <u>Hazardous Materials</u>

- A. The Contractor shall not be obligated to commence or continue Work until any Hazardous Material discovered at Site has been removed, rendered, or determined to be harmless by the Owner as certified by an independent testing laboratory and approved by the appropriate governmental agency.
- B. If after commencing the Work, Hazardous Material is discovered at the Site, the Contractor shall be entitled to immediately stop Work in affected area. The Contractor shall promptly report the condition to the Owner, the Design Professional, and, if required, the authority having jurisdiction.
- C. The Contractor shall not resume nor be required to continue any Work affected by any Hazardous Material without written mutual agreement between the Parties after the Hazardous Material has been removed or rendered harmless and only after approval, if necessary, of the authorities having jurisdiction.
- D. The Owner shall be responsible for retaining an independent testing laboratory to determine the nature of the material encountered and whether the material requires corrective measures or remedial action. Such measures shall be the sole responsibility of the Owner and shall be performed in a manner minimizing any adverse effect upon the Work.
- E. If the Contractor incurs additional costs or is delayed due to the presence or remediation of Hazardous Material, the Contractor shall be entitled to an equitable adjustment in the Contract Price, the Contract Time, or both.

2.14 <u>Submittals</u>

- A. The Contractor shall submit to the Owner and the Design Professional all shop drawings, samples, product data, and similar submittals required by the Contract Documents for review and approval. The Contractor shall prepare and deliver its submittals in a manner consistent with the Construction Schedule and in such time and sequence so as not to delay the performance of the Work or the work of the Owner and Others. If the Contract Documents do not contain specific submittal requirements pertaining to portions of the Work, the Contractor agrees upon request to submit in a timely fashion to the Owner and Design Professional for review any shop drawings, samples, product data, or similar submittals as may reasonably be required by the Owner.
- B. The Contractor shall be responsible for the accuracy and conformity of its submittals. By submitting shop drawings, samples, product data, and similar submittals, the Contractor represents to the Owner that the Contractor has:
 - 1. Reviewed and approved them;
 - 2. Determined and verified materials, field measurements and field construction criteria related thereto, or will do so; and
 - 3. Checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.
- C. The Contractor shall perform all Work strictly in accordance with approved submittals. Approval of submittals is not an authorization to perform changed work, unless the procedures of Article 6 are followed. Approval does not relieve the Contractor from responsibility for Defective Work resulting from errors or omissions on the approved shop drawings.
- D. No substitutions shall be made in the Work unless permitted in the Contract Documents and then only after the Contractor obtains approvals required under the Contract Documents for substitutions. All such substitutions shall be promptly memorialized in a Change Order following approval by the Owner and, if applicable, the Design Professional to provide for an adjustment in the Contract Price or Contract Time.

2.15 Design Delegation

- A. If the Contract Documents specify that the Contractor is responsible for the design of a particular system or component to be incorporated into the Project, the Owner shall provide all required performance and design criteria. The Contractor shall not be responsible for the adequacy of such performance and design criteria.
- B. As required by Law, the Contractor shall procure design services and certifications necessary to satisfactorily complete the Work from a licensed design professional. The signature and seal of the Contractor's design professional shall appear on all drawings, calculations, specifications, certifications, shop drawings, and other submittals related to the Work designed or certified by the Contractor's design professional.

2.16 Site Conditions

A. Site Visit: The Contractor acknowledges that it has visited, or has had the opportunity to visit, the Site to visually inspect the general and local conditions which could affect the Work.

- B. Concealed or Unknown Site Conditions: If the conditions encountered at the Site are (a) subsurface or other physical conditions materially different from those indicated in the Contract Documents, or (b) unusual and unknown physical conditions materially different from conditions ordinarily encountered and generally recognized as inherent in Work provided for in the Contract Documents, the Contractor shall stop affected Work after the condition is first observed and give prompt written notice of the condition to the Owner and the Design Professional. The Contractor shall not be required to perform any Work relating to the unknown condition without the written mutual agreement of the parties. Any change in the Contract Price or the Contract Time as a result of the unknown condition shall be determined as provided in Article 6.
- C. The Owner maintains possession of the premises and any improvements made by the Contractor. Under the Contract Documents, the Owner grants the Contractor the right to enter and use the premises. The Contractor shall confine its apparatus, the storage of materials, and the operations of the Contractor's workers to limits indicated by Law, ordinance, the Contract Documents, permits, and/or directions of the Owner and shall not unreasonably encumber the premises with the Contractor's materials or equipment.
- D. The Contractor shall remove snow or ice within the limits of the Site indicated in the Contract Documents that might result in damage or delay.

2.17 Permits, Fees, Notices and Compliance with Laws

- A. Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by authorities having jurisdiction necessary for proper execution and completion of the Work that are customarily secured after execution of the Agreement and legally required at the time bids are received or negotiations concluded.
- B. The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of authorities having jurisdiction applicable to performance of the Work.
- C. If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules, and regulations, or lawful orders of authorities having jurisdiction, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

2.18 Cutting, Fitting, and Patching

- A. The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.
- B. The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Others by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or Others except with written consent of the Owner and Others. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or Others, its consent to cutting or otherwise altering the Work.

2.19 Cleaning Up

- A. The Contractor shall regularly remove debris and waste materials at the Site resulting from the Work. Prior to discontinuing Work in an area, the Contractor shall clean the area and remove all rubbish and its construction equipment, tools, machinery, waste, and surplus material. The Contractor shall minimize and confine dust and debris resulting from construction activities. At the completion of the Work, the Contractor shall remove from the Site all construction equipment, tools, surplus materials, waste materials, and debris. All debris from the Project shall be cleaned up daily and removed from the Site at least on a weekly basis.
- B. If the Contractor fails to commence compliance with cleanup duties within two (2) Business Days after written notification from the Owner of non-compliance, the Owner may implement appropriate cleanup measures without further notice and shall deduct the reasonable costs from any amounts due or to become due the Contractor in the next payment period.

2.20 Access to Work

A. The Contractor shall facilitate the access of the Owner, Design Professional, and Others to Work in progress.

2.21 Compliance with Laws

- A. The Contractor shall comply with the Law at its own costs. The Contractor shall be liable to the Owner for all loss, cost, or expense attributable to any acts or omissions by the Contractor, its employees, subcontractors, and agents for failure to comply with the Law, including fines, penalties, or corrective measures. However, liability under this subsection shall not apply if prior approval by appropriate authorities and the Owner is received.
- B. The Contract Price or Contract Time shall be equitably adjusted by Change Order for additional costs or time needed resulting from any changes in Law, including increased taxes, enacted after the date of the Agreement.

2.22 Royalties, Patents, and Copyrights

A. The Contractor shall pay all royalties and license fees which may be due on the inclusion of any patented or copyrighted materials, methods, or systems selected by the Contractor and incorporated in the Work. The Contractor shall defend, indemnify, and hold the Owner harmless from all suits or claims for infringement of any patent rights or copyrights arising out of such selection.

ARTICLE 3 – OWNER'S RESPONSIBILITIES

3.01 Information and Services

A. The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

3.02 <u>Site Information</u>

- A. To the extent the Owner has obtained or is required elsewhere in the Contract Documents to obtain, Site information, the Owner shall furnish surveys describing physical characteristics, legal limitations, and utility locations for the Site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information provided by the Owner but shall exercise proper precautions relating to the safe performance of the Work.
- B. The Owner shall provide tests, inspections, and other reports dealing with environmental matters, Hazardous Material, and other existing conditions, including structural, mechanical, and chemical tests, required by the Contract Documents or by Law.

3.03 Permits, Fees, and Approvals

A. Except for those permits and fees related to the Work which are the responsibility of the Contractor, the Owner shall secure and pay for necessary approvals, easements, assessments, and fees required for the development, construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

3.04 Mechanics and Construction Lien Information

A. The Owner shall furnish to the Contractor within fifteen (15) Days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

3.05 <u>Owner's Representative</u>

A. The Owner's Representative shall be fully acquainted with the Project and shall have authority to bind the Owner in all matters requiring the Owner's approval, authorization, or written notice. If the Owner changes its Representative or its Representative's authority, the Owner shall immediately notify the Contractor in writing.

3.06 Owner's Right to Stop the Work

A. If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents or repeatedly fails to carry out the Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity.

3.07 Owner's Right to Carry Out the Work

A. If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. The Owner may, pursuant to Section 7.3, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Design Professional's additional services made necessary by such default, neglect, or failure. If current or future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

3.08 Submittals

A. The Owner or its Design Professional will review and approve, or take other appropriate action upon, the Contractor's submittals such as shop drawings, product data, and samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Owner's action will be taken with reasonable promptness while allowing sufficient time in the Owner's judgement to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Owner's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Owner's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

ARTICLE 4 – SUBCONTRACTS

4.01 Award of Subcontracts and Other Contracts for Portions of the Work

- Promptly after the award of the Agreement, the Contractor shall provide the Owner and, if directed, the Design Professional with a written list of the proposed Subcontractors and significant Suppliers. If the Owner has a reasonable objection to any proposed Subcontractor or Supplier, the Owner shall notify the Contractor in writing. Failure to promptly object shall constitute acceptance.
- B. If the Owner has reasonably and promptly objected, the Contractor shall not contract with the proposed Subcontractor or Supplier, and the Contractor shall propose another acceptable Subcontractor or Supplier to the Owner. No adjustment in the Contract Price or Contract Time shall be made because of such substitution.
- C. The Contractor shall not change a Subcontractor or Supplier previously selected without the prior written approval of the Owner.

4.02 Binding of Subcontractors and Suppliers

A. The Contractor agrees to bind every Subcontractor and Supplier (and require every Subcontractor to so bind its subcontractors and suppliers) to the Contract Document's applicable provisions to that portion of the Work. Each subcontract agreement shall preserve and protect the rights of the Owner and its Design Professional under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the

Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors.

4.03 Contingent Assignment of Subcontracts

- A. If the Agreement is terminated, each subcontract and supply agreement shall be assigned by the Contractor to the Owner, subject to the prior rights of any surety, provided that:
 - 1. The Agreement is terminated by the Owner pursuant to Sections 9.03 or 9.04; and
 - 2. The Owner accepts such assignment after termination by notifying the Contractor and Subcontractor or Contractor and Supplier in writing and assumes all rights and obligations of the Contractor pursuant to each subcontract or supply agreement.
- B. If the Owner accepts such an assignment, and the Work has been suspended for more than thirty (30) consecutive Days, following termination, if appropriate, the Subcontractor's or Supplier's compensation shall be equitably adjusted as a result of the suspension.

ARTICLE 5 – TIME

5.01 <u>General</u>

- A. Time is of the essence with regard to the obligations of the Contract Documents. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.
- B. Unless instructed by the Owner in writing, the Contractor shall not knowingly commence the Work before the effective date of insurance and Bonds to be provided by the Contractor as required by the Contract Documents.
- C. Date of Commencement: The Contractor shall commence the Work after the Notice to Proceed has been received by the Contractor. The Notice to Proceed shall be issued immediately after the Agreement has been approved by the Governor and Council and shall establish the actual construction start date. Failure to commence the Work within fifteen (15) Calendar Days after the Date of Commencement shall be considered a Default of the Agreement. If the Date of Commencement is later than the advertised start date, the date of Final Completion shall be extended by an equivalent number of Days.

5.02 Construction Schedule

A. Before submitting the first application for payment, the Contractor shall submit to the Owner, and if directed, the Design Professional, a Construction Schedule showing the dates on which the Contractor plans to commence and complete various parts of the Work, including dates on which information and approvals are required from the Owner. Except as directed by the Owner, the Contractor shall comply with the approved Construction Schedule. Unless otherwise agreed, the Construction Schedule shall be formatted in a detailed precedence-style critical path method that (a) provides a graphic representation of all activities and events, including float values that will affect the critical path of the Work, and (b) identifies dates that are critical to ensure timely and orderly completion of the Work.

B. The Contractor shall revise the Construction Schedule at appropriate intervals as required by the conditions of the Work and Project. At a minimum, an updated schedule shall be submitted with each application for payment, and within seven (7) Days following receipt of information by the Contractor, which the Contractor believes may result in a change of completion date.

5.03 Delays and Extensions of Time

- A. If the Contractor is delayed at any time in the commencement or progress of the Work by any cause beyond the control of the Contractor, the Contractor shall be entitled to an equitable extension of the Contract Time. Examples of causes beyond the control of the Contractor include, but are not limited to, the following:
 - 1. Acts or omissions of the Owner, Design Professional, or Others.
 - 2. Changes in the Work or the sequencing of the Work ordered by the Owner or arising from decisions of the Owner that impact the time of performance of the Work.
 - 3. Encountering Hazardous Materials or concealed or unknown conditions.
 - 4. Delay authorized by the Owner pending dispute resolution or suspension by the Owner under Section 9.01.
 - 5. Transportation delays not reasonably foreseeable.
 - 6. Labor disputes not involving the Contractor.
 - 7. General labor disputes impacting the Project but not specifically related to the Site.
 - 8. Fire.
 - 9. Terrorism.
 - 10. Epidemics.
 - 11. Adverse governmental actions.
 - 12. Unavoidable accidents or circumstances.
 - 13. Adverse weather conditions not reasonably anticipated. Such conditions do not include typical weather conditions of remote mountain top sites.
- B. The Contractor shall submit any requests for equitable extensions of the Contract Time in accordance with Article 6. The Contractor shall have the burden of demonstrating such impact and shall furnish to the Owner such documentation relating thereto as the Owner may reasonably require.
- C. If the Contractor incurs additional costs as a result of a delay that is caused by items 1 through 13 above, the Contractor shall be entitled to an equitable adjustment in the Contract Price.
- D. If delays to the Work are encountered for any reason, the Contractor shall provide prompt written notice to the Owner within five (5) Days of the cause of such delays after the Contractor first recognized the delay. The Parties agree to take reasonable steps to mitigate the effect of such delays.
- E. Any changes in time that extend past Completion Date of the Contract, shall be formalized in a Change Order in accordance with Article 6, and subsequent Contract Amendment for approval by Governor and Council.

5.04 Liquidated Damages

- A. The Contractor understands that if the date of Final Completion established in the Agreement, as may be amended by subsequent Change Order and approval by Governor and Council, is not attained, the Owner will suffer damages which are difficult to determine and accurately specify. The Contractor agrees that if the date of Final Completion is not attained, the Contractor shall pay the Owner the amount specified in the below Section as liquidated damages, and not as a penalty, for each Day that completion extends beyond the date of Final Completion. Should the amount of money otherwise due the Contractor be less than the amount of such liquidated damages, the Contractor and its Surety shall be liable to the Owner for such deficiency. When final acceptance of the Work has been duly made by the Owner, any liquidated damage charges shall end.
- B. Allowing the Contractor to continue executing the Work after the date of Final Completion, shall in no way obligate the Owner to waive any of its rights under the Agreement.
- C. Schedule of Liquidated Damages: The fixed, agreed, liquidated damages shall be assessed in accordance with the following:

Price Limitation		Amount of Liquidated
From more than:	To and Including:	
\$0.00	\$25,000.00	\$300.00
\$25,000.00	\$50,000.00	\$400.00
\$50,000.00	\$100,000.00	\$500.00
\$100,000.00	\$500,000.00	\$600.00

ARTICLE 6 – CHANGES

6.01 <u>General</u>

A. Changes in the Work that are within the general scope of the Agreement shall be accomplished, without invalidating the Agreement, by Change Order, and Construction Change Directive.

6.02 Change Orders

- A. The Contractor may request, or the Owner may order, changes in the Work or the timing or sequencing of the Work that impacts the Contract Price or the Contract Time. All such changes in the Work that affect Contract Price or Contract Time shall be formalized in a Change Order and processed in accordance with this Article.
- B. For changes in the Work, the Parties shall negotiate an appropriate adjustment to the Contract Price or the Contract Time, in good faith and conclude negotiations as expeditiously as possible. Acceptance of the Change Order and any adjustment in the Contract Price or Contract Time shall not be unreasonably withheld.
- C. The Contractor shall not be obligated to perform changes in the Work that impact Contract Price or Contract Time until a Change Order has been executed or a written Construction Change Directive has been issued.

6.03 <u>Construction Change Directives</u>

- A. The Owner may issue a written Construction Change Directive directing a change in the Work before agreeing on an adjustment to Contract Price or Contract Time or directing the Contractor to perform Work that the Owner believes is not a change. If the Parties disagree that the Construction Change Directive work is within the scope of the Work, the Contractor shall perform the disputed Work and furnish the Owner with an estimate of the costs to perform the disputed work in accordance with Owner's interpretations.
- B. The Parties shall negotiate expeditiously and in good faith for appropriate adjustments, as applicable, to the Contract Price or the Contract Time arising out of a Construction Change Directive. As the directed Work is performed, the Contractor shall submit its costs for such Work with its application for payment beginning with the next application for payment within thirty (30) Days of the issuance of the Construction Change Directive. If there is a dispute as to the cost to the Owner, the Parties shall resolve the disputed amount, subject to the requirements of Article 10. Undisputed amounts may be included in applications for payment and shall be paid by the Owner in accordance with the Agreement.
- C. When the Parties agree upon the adjustment in the Contract Price or the Contract Time, for a change in the Work directed by a Construction Change Directive, such agreement shall be the subject of a Change Order. The Change Order shall include all outstanding Construction Change Directives on which the Parties have reached agreement on Contract Price or Contract Time issued since the last Change Order.

6.04 Determination of Cost

- A. An increase or decrease in the Contract Price or the Contract Time resulting from a change in the Work shall be determined as follows:
 - 1. A mutually accepted lump sum properly itemized and supported by sufficient substantiating data, as determined by the Owner, to permit evaluation.
 - 2. If the price change is an increase in the Contract Price, and the Work is performed by the Contractor and not a Subcontractor, it shall include the following indirect costs for Work performed by the Contractor: Workmen's Compensation and Employee Liability, and Unemployment and Social Security Taxes.
 - a. In addition to the above indirect costs, the Contractor shall be allowed a markup not to exceed ten percent (10%). This markup shall be all inclusive for overhead, supervision, and profit.
 - 3. If the price change is an increase in the Contract Price, and the Work is performed by both the Contractor and a Subcontractor, the Contractor shall be allowed a markup of ten percent (10%) on that portion of the Work performed by the Contractor, and a markup of five percent (5%) on the portion of the Work performed by the Subcontractor. The same percentages shall apply to Sub-subcontractors.
 - 4. On any change that involves a decrease in the Contract Price, no overhead and profit shall be figured.

6.05 Changes Notice

A. Except as provided in Subsection 5.03 C for any claim for an increase in the Contract Price or Contract Time, the Contractor shall give the Owner written notice of the claim within fourteen (14)

Days after the occurrence giving rise to the claim or within fourteen (14) Days after the Contractor first recognizes the condition giving rise to the claim, whichever is later. Except in an emergency, notice shall be given before proceeding with the Work. Thereafter, the Contractor shall submit written documentation of its claim, including appropriate supporting documentation, within twenty-one (21) Days after giving notice, unless the Parties mutually agree upon a longer period of time. The Owner shall respond in writing denying or approving the Contractor's claim no later than fourteen (14) Days after receipt of the Contractors claim. Owner's failure to so respond shall be deemed a denial of the claim. Any change in the Contract Price or the Contract Time resulting from such claim shall be authorized by Change Order.

6.06 Incidental Changes

A. The Owner may direct the Contractor to perform incidental changes in the Work, upon concurrence with the Contractor that such changes do not involve adjustments in the Contract Price or Contract Time. Incidental changes shall be consistent with the scope and intent of the Contract Documents. The Owner shall initiate an incidental change in the Work by issuing a written order to the Contractor. Such written notice shall be carried out promptly and is binding on the Parties.

ARTICLE 7 – PAYMENT

7.01 <u>Schedule of Values</u>

A. Within fifteen (15) Days of receiving the Notice to Proceed and before the first application for payment, the Contractor shall submit to the Owner, for approval, a schedule of values allocating the Contract Price to various portions of the Work. This schedule of values shall be prepared in such form and supported by such data to substantiate its accuracy as the Owner may require. Upon approval by the Owner, this schedule shall be used as the basis for reviewing the Contractor's applications for payment and shall be revised if later found by the Owner to be inaccurate.

7.02 Progress Payments

- A. Applications for Payment: The Contractor shall submit to the Owner and, if directed, the Design Professional a monthly application for payment no later than the first Day of the calendar month for the preceding calendar month. Contractor's applications for payment shall be itemized and supported by the Contractor's schedule of values based on a percentage of completion and shall include any other substantiating data as required by the Agreement. Applications for payment shall be notarized and include payment requests on account of properly authorized Change Orders or Construction Change Directives. The Owner shall pay the amount otherwise due on any payment application no later than thirty (30) Days after the Contractor has submitted a complete and accurate payment application, or such shorter time period as required by applicable state statute. The Owner may deduct from any progress payment amounts that may be retained pursuant to Subsection 7.02 D.
- B. Stored Materials and Equipment: Unless otherwise provided in the Contract Documents, applications for payment may include materials and equipment not yet incorporated into the Work but delivered to and suitably stored onsite including applicable insurance, storage, and costs incurred transporting the materials to an offsite storage facility. Approval of payment applications for stored materials and equipment stored offsite shall be conditioned on a submission by the Contractor of bills of sale and proof of required insurance, or such other documentation satisfactory

to the Owner to establish proper valuation of the stored materials and equipment, the Owner's title to such materials and equipment, and to otherwise protect the Owner's interest therein, including transportation to the Site.

- C. Lien Waivers and Liens
 - 1. Partial Lien Waivers and Affidavits: If required by the Owner, as a prerequisite for payment, the Contractor shall provide partial lien and claim waivers in the amount of the application for payment and affidavits from its Subcontractors and Suppliers for the completed Work. Such waivers shall be conditional upon payment. In no event shall the Contractor be required to sign an unconditional waiver of lien or claim, either partial or final, prior to receiving payment or in an amount in excess of what it has been paid.
 - 2. Removing Liens: If the Owner has made payments in the time required by this article, the Contractor shall, within thirty (30) Days after filing, cause the removal of any liens filed against the premises or public improvement fund by any party or parties performing labor or services or supplying materials in connection with the Work. If the Contractor fails to take such action on a lien, the Owner may cause the lien to be removed at the Contractor's expense, including bond costs and reasonable attorney's fees. This subsection shall not apply if there is a dispute pursuant to Article 10 relating to the subject matter of the lien.
- D. Retainage: From each progress payment made prior to Substantial Completion, the Owner shall retain ten percent (10%) of the amount otherwise due after deduction of any amounts as provided in Section 7.02, and in no event shall such percentage exceed any applicable statutory requirements.

7.03 Adjustment of Contractor's Payment Application

- A. The Owner may adjust or reject a payment application or nullify a previously approved payment application, in whole or in part, as may reasonably be necessary to protect the Owner from loss or damage based upon the following, to the extent that the Contractor is responsible under the Agreement:
 - 1. The Contractor's repeated failure to perform the Work as required by the Contract Documents;
 - 2. Except as accepted by the insurer providing builders risk or other property insurance covering the project, loss or damage arising out of or relating to the Agreement and caused by the Contractor to the Owner or to Others to whom the Owner may be liable;
 - 3. The Contractor's failure to properly pay Subcontractors and Suppliers following receipt of such payment from the Owner;
 - 4. Rejected, nonconforming or Defective Work not corrected in a timely fashion;
 - 5. Reasonable evidence of delay in performance of the Work such that the Work will not be completed within the Contract Time;
 - 6. Reasonable evidence demonstrating that the unpaid balance of the Contract Price is insufficient to fund the cost to complete the Work; and
 - 7. Uninsured third-party claims involving the Contractor, or reasonable evidence demonstrating that third-party claims are likely to be filed unless and until the Contractor furnishes the Owner with adequate security in the form of a surety bond, letter of credit, or other collateral or commitment sufficient to discharge such claims if established.

B. No later than seven (7) Days after receipt of an application for payment, the Owner shall give written notice to the Contractor, at the time of disapproving or nullifying all or part of an application for payment, stating its specific reasons for such disapproval or nullification, and the remedial actions to be taken by the Contractor in order to receive payment. When the above reasons for disapproving or nullifying an application for payment are removed, payment will be promptly made for the amount previously withheld.

7.04 Acceptance of Work

A. Neither the Owner's payment of progress payments nor its partial or full use or occupancy of the Project constitutes acceptance of Work not complying with the Contract Documents.

7.05 Payment Delay

A. If for any reason not the fault of the Contractor, the Contractor does not receive a progress payment from the Owner within seven (7) Days after the time such payment is due, then the Contractor, upon giving seven (7) Days written notice to the Owner, and without prejudice to and in addition to any other legal remedies, may stop Work until payment of the full amount owing to the Contractor has been received.

7.06 Substantial Completion

- A. The Contractor shall notify the Owner and, if directed, the Design Professional, when it considers Substantial Completion of the Work or a designated portion to have been achieved. The Owner, with the assistance of its Design Professional, shall promptly conduct an inspection to determine whether the Work or its designated portion can be occupied or used for its intended use by the Owner without excessive interference in completing any remaining unfinished Work. If the Owner determines that the Work or designated portion has not reached Substantial Completion, the Owner shall promptly compile a list of items to be completed or corrected so the Owner may occupy or use the Work or designated portion for its intended use. The Contractor shall promptly complete all items on the list.
 - 1. The Contractor's notification of Substantial Completion shall include (a) a list of items to be completed or corrected, and (b) all permits, certificates, and special warranties required by the Contract Documents, endorsed by the Contractor and in a form reasonably acceptable to the Owner.
- B. When Substantial Completion of the Work or a designated portion is achieved, the Owner or Design Professional shall prepare a Certificate of Substantial Completion establishing the date of Substantial Completion and the respective responsibilities of each Party for interim items such as security, maintenance, utilities, insurance, and damage to the Work and fixing the time for completion of all items on the list accompanying the Certificate of Substantial Completion. In the absence of a clear delineation of responsibilities, the Owner shall assume all responsibilities for items such as security, maintenance, utilities, insurance, and damage to the Work. The Certificate of Substantial Completion shall also list any items to be completed or corrected and establish the time for their completion or correction.

- C. Unless otherwise provided in the Certificate for Substantial Completion, warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or a designated portion.
- D. Upon the Owner's acceptance of Substantial Completion, the Owner shall pay to the Contractor the remaining retainage held by the Owner for the Work described in the Certificate of Substantial Completion, less a sum equal to two hundred percent (200%) of the estimated cost of completing or correcting remaining items on that part of the Work, as agreed to by the Parties as necessary to achieve Final Completion. The Owner shall pay the Contractor monthly the amount retained for unfinished items as each item is completed.

7.07 Partial Occupancy or Use

- A. The Owner may occupy, or use completed or partially completed portions of the Work when:
 - 1. The portion of the Work is designated in a Certificate of Substantial Completion;
 - 2. Appropriate insurer(s) consent to the occupancy or use, and
 - 3. Appropriate authorities having jurisdiction authorize the occupancy or use.

7.08 Final Completion and Final Payment

- A. Upon notification from the Contractor that the Work is complete and ready for final inspection and acceptance, the Owner with the assistance of its Design Professional shall promptly conduct an inspection to determine if the Work has been completed and is acceptable under the Contract Documents.
- B. When Final Completion has been achieved, the Contractor shall prepare for the Owner's written acceptance a final application for payment stating that to the best of the Contractor's knowledge, and based on the Owner's inspections, the Work has reached Final Completion in accordance with the Contract Documents.
- C. Final payment of the balance of the Contract Price shall be made to the Contractor within thirty (30) Days after the Contractor has submitted a complete and accurate application for final payment, including submissions required under the subsection below.
- D. Final payment shall be due on the Contractor's submission of the following to the Owner:
 - 1. An affidavit declaring any indebtedness connected with the Work to have been paid, satisfied, or to be paid with the proceeds of final payment, so as not to encumber the Owner's property;
 - 2. As-built record drawings, manuals, copies of warranties, and all other close-out documents required by the Contract Documents;
 - 3. Release of any liens, conditioned on final payment being received;
 - 4. Consent of any surety; and
 - 5. Any outstanding known and unreported accidents or injuries experienced by the Contractor or its Subcontractors at the Site.
- E. If, after Substantial Completion of the Work, the Final Completion of a portion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the balance due for

portions of the Work fully completed and accepted. If the remaining contract balance for Work not fully completed and accepted is less than the retained amount prior to payment, the Contractor shall submit to the Owner and, if directed, the Design Professional, the written consent of any surety to payment of the balance due for portions of the Work that are fully completed and accepted. Such payment shall not constitute a waiver of claims, but otherwise shall be governed by these final payment provisions.

F. Contractor Acceptance of Final Payment: Unless the Contractor provides written identification of unsettled claims with an application for final payment, its acceptance of final payment constitutes a waiver of all claims by the Contractor arising out of or related to the Agreement or the Work.

ARTICLE 8 – INDEMNITY, INSURANCE, AND BONDS

8.01 Indemnity

- A. To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, the Owner's officers, directors, members, consultants, agents, and employees, the Design Professional, and Others (the Indemnitees) from all claims for bodily injury and property damage, other than to the Work itself and other property insured, including reasonable attorney's fees, costs, and expenses, that may arise from the performance of the Work, but only to the extent caused by the negligent acts or omissions of the Contractor, Subcontractors, or anyone employed directly or indirectly by any of them or by anyone for whose acts any of them may be liable.
- B. No Limitation on Liability: The limits and types of insurance set forth in this Article are the minimum required amounts and in no way limit the liability of the Contractor or Subcontractors. In any and all claims against the Indemnitees by any employee of the Contractor, anyone directly or indirectly employed by the Contractor or anyone for whose acts the Contractor may be liable, the indemnification obligation shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for the Contractor under workers' compensation acts, disability benefit acts, or other employment benefit acts.

8.02 Insurance

- A. The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement and Section 8.03 "Insurance Requirements."
- B. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where Project is located.
- C. The Owner, its trustees, their officers, employees, representatives, and agents including the Design Professional, shall be included as additional insureds (except under worker's compensation and employer's liability insurance) for and relating to the Work to be performed by the Contractor.
- D. Proof of Coverage: Certificates of Insurance, as evidence of the insurance required by these Contract Documents, shall be submitted by the Contractor to the Owner prior to the date of the Agreement and in all cases prior to the commencement of Work.

- Ε. Subcontractor Insurance: The Contractor shall either require subcontractors to carry the insurance or the Contractor shall insure the activities of the Subcontractors in the types and form of insurance required under the Contract Documents, and in such amounts as the Contractor shall deem appropriate.
- F. Notice of Cancelation or Expiration: Within ten (10) Days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide required coverage.
- G. Workers Compensation Insurance: Workers compensation insurance is required for all workers on the Site of this Project. Per RSA 21-I:80-VI, at the outset of Work on any State construction project, the Contractor shall provide to the Owner a current list of all Subcontractors and Subsubcontractors the Contractor has agreed to use on the Project, with a record of the entity to whom such Subcontractor is insured for workers compensation purposes. This list shall be posted on the Project Site and updated as needed to reflect any new Subcontractors or Sub-subcontractors.
 - 1. If it is determined that a Subcontractor or Sub-subcontractor is present on the Site without their name and direct contracting relationship being posted in a visible location at the Site, the Contractor shall require the Subcontractor or Sub-subcontractor to provide the information within thirty-six (36) hours and to post the information in a visible location at the Site. If the information is not provided within thirty-six (36) hours of its request, the Contractor shall suspend the Subcontractor or Sub-subcontractor until the information is provided and posted.

8.03 **Insurance Requirements**

- Α. Workers Compensation Insurance: In accordance with RSA 281-A.
 - Employers' Liability: 1.
 - \$100,000 Each accident a.
 - \$500,000 Disease-policy limit b.
 - \$100,000 Disease-each employee c.
- Β. Commercial General Liability Insurance: Occurrence Form Policy; Include full Contractual Liability, Broad Form Property Damage, Explosion, Collapse, and Underground Hazard coverage Limits of Liability: 1.
 - - a. \$1,000,000 Each Occurrence; Bodily Injury & Property Damage
 - \$2,000,000 General Aggregate; Include Per Project Aggregate Endorsement b.
 - c. \$2,000,000 Products/Completed Operations Aggregate
- C. **Owners Protective Liability:**
 - Limits of Liability: 1.
 - a. \$2,000,000 Each Occurrence
 - \$3,000,000 Aggregate b.

- D. <u>Commercial Automobile Liability:</u> Covering all motor vehicles including owned, hired, borrowed, and non-owned vehicles
 - 1. Limits of Liability:
 - a. \$1,000,000 Combined Single Limit for Bodily Injury & Property Damage
- E. <u>Commercial Umbrella Liability:</u>
 - 1. Limits of Liability:
 - a. \$1,000,000 Each Occurrence
 - b. \$1,000,000 Aggregate
 - c. \$1,000,000 Completed Operations Aggregate
- F. <u>Builder's Risk Insurance (Fire and Extended Coverage)</u>: The Contractor shall insure the work included in the Contract, including extra and change orders, on an "All Risk" basis, on one hundred percent (100%) completed value basis of the Contract, as modified. Builder's Risk coverage shall include materials located at the Contractor's premises, on-site, in-transit, and at any temporary site. The policy by its own terms or by endorsement shall specifically permit partial or beneficiary occupancy prior to completion or acceptance of the entire work. The policies shall be in the names of the NH Department of Natural and Cultural Resources, and the Contractor. The policies shall provide for the inclusion of the names of all other Contractors, Subcontractors, and others employed on the premises as insureds. The policies shall stipulate that the insurance companies shall have no right of subrogation against any Contractors, Subcontractors or other parties employed on the premises.
- G. <u>Other Insurance:</u> If blasting and/or demolition are required by the Contract Documents, the Contractor or Subcontractor shall obtain the respective coverage for those activities and shall furnish to the Owner a Certificate of Insurance evidencing the required coverage's prior to commencement of any operations involving blasting and/or demolition.

8.04 <u>Owner's Insurance</u>

A. Owner Liability Insurance: The Owner shall either self-insure or obtain and maintain its own liability insurance for protection against claims arising out of the performance of the Agreement, including, without limitation, loss of use and claims, losses, and expenses arising out of the Owner's acts or omissions.

8.05 <u>Bonds</u>

- A. Performance and Payment Bond: In the event a bid is \$75,000 or more, the Contractor shall furnish security by bond or otherwise in an amount equal to 100% of the Contract Price guaranteeing performance and payment. The payment security shall meet the requirements of New Hampshire RSA 447:16.
- B. The fully executed performance and payment bond must be returned to the Owner a minimum of fifteen (15) Days prior to the Date of Commencement for the Work.

8.06 Professional Liability Insurance

A. To the extent the Contractor is required to procure design services in accordance with Section 2.15, the Contractor shall require its design professional to obtain professional liability insurance for

claims arising from the negligent performance of design services under the Agreement, with a company reasonably satisfactory to the Owner, including coverage for all professional liability caused by any consultants to the Contractor's design professional, written for not less than the limits required for general liability. The Contractor's design professional shall be responsible for payment of any applicable retention or deductible. The Professional Liability Insurance shall contain a retroactive date providing prior acts coverage sufficient to cover all services performed by the Contractor's design professional for the Project. Coverage shall be continued in effect for eight years following the date of Substantial Completion.

ARTICLE 9 – SUSPENSION, NOTICE TO CURE, AND TERMINATION

9.01 Suspension by Owner for Convenience

- A. The Owner may, without cause, order the Contractor in writing to suspend, delay, or interrupt the performance of the Work, for the convenience of the Owner and not due to any act or omission of the Contractor or any person or entity for whose acts or omissions the Contractor may be liable, then the Contractor shall immediately suspend, delay, or interrupt that portion of the Work for the time period ordered by the Owner. The Contract Price and the Contract Time shall be equitably adjusted by Change Order for the cost and delay resulting from any such suspension.
- B. Any action taken by the Owner that is permitted by any other provision of the Contract Documents and that results in a suspension of part of the Work does not constitute a suspension of Work under this section.

9.02 Termination by Owner for Convenience

- A. The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.
- B. Upon receipt of Notice from the Owner of such termination for the Owner's convenience, the Contractor shall:
 - 1. Cease operations as directed by the Owner in the notice;
 - 2. Take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
 - 3. Except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.
- C. In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

9.03 <u>Default</u>

A. The Owner may terminate this Contract for default if the Contractor materially breaches this Contract by:

- 1. Refusing, failing, or being unable to commence the Work within the time specified in the Contract Documents
- 2. Refusing, failing, or being unable to properly manage the Work;
- 3. Refusing, failing, or being unable to supply the Work with sufficient numbers of properly skilled workers, proper materials, or construction equipment, or to maintain the Construction Schedule;
- 4. Refusing, failing, or being unable to make prompt payment to Subcontractors or Suppliers;
- 5. Disregarding Laws, ordinances, rules, regulations, or orders of any authority having jurisdiction or quasi-public authority having jurisdiction over the Project; or,
- 6. Refusing, failing, or being unable to substantially perform in accordance with the terms of the Agreement and Contract Documents, as determined by the Owner, or as otherwise defined elsewhere herein.
- B. Upon the occurrence of any of the events described in Section 9.03 A, the Owner shall give written Notice to the Contractor setting forth the nature of the default and requesting cure within seven (7) Days from the date of notice. Within seven (7) Days of receipt of the Owner's notice of default, the Contractor shall furnish the Owner with either:
 - 1. Written evidence that the default has been cured; or,
 - 2. A written plan demonstrating steps to be taken by the Contractor to cure the default and accomplish completion of the Work in accordance with the requirements of the Contract Documents and within established cost and schedule requirements.

9.04 <u>Owner's Remedies</u>

- A. If the Contractor fails to cure the default or provide a written plan to cure the default satisfactory to the Owner, or if the Contractor fails to expeditiously continue such cure until complete, the Owner may give written Notice to the Contractor of immediate termination, and the Owner, without prejudice to any other rights or remedies, may take any or all of the following actions:
 - 1. Exclude the Contractor from the Site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
 - 2. Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.
 - 3. Require the Contractor to assign the Contractor's right, title, and interest in any or all of the Contractor's subcontracts or orders to the Owner.
- B. When the Owner terminates the Agreement for default, the Owner shall be entitled to collect from the Contractor all direct, indirect, and consequential damages suffered by the Owner on account of the Contractor's default, including without limitation additional services and expenses of the Design Professional and attorney's fees and expenses made necessary thereby. The Owner shall be entitled to hold all amounts due the Contractor at the date of termination until all of the Owner's damages have been established, and to apply such amounts to such damages. In no case shall the Contractor be entitled to receive further payment until the Work is finished.

9.05 <u>Contractor's Right to Terminate</u>

- A. Upon seven (7) Days written notice to the Owner, the Contractor may terminate the Agreement if the Work has been stopped for a thirty (30) Day period through no fault of the Contractor for any of the following reasons:
 - 1. Under court order or order of other governmental authorities having jurisdiction;
 - 2. As a result of the declaration of a national emergency or other governmental act during which, through no act or fault of the Contractor, materials are not available; or
 - 3. Suspension by the Owner for convenience pursuant to Section 9.01
- B. In addition, if the Work is stopped for a period of 60 consecutive Days through no act or fault of the Contractor, and upon seven (7) Days written notice to the Owner, the Contractor may terminate the Agreement if the Owner:
 - 1. Has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work;
 - 2. Fails to pay the Contractor in accordance with the Agreement; or
 - 3. Otherwise materially breaches the Agreement
- C. Upon termination by the Contractor in accordance with this Section, the Contractor is entitled to recover from the Owner payment for all Work executed and for any proven loss, cost, or expense in connection with the Work, including all demobilization.

9.06 Obligations Arising Before Termination

A. Even after termination, the provisions of this Agreement still apply to any Work performed, payments made, events occurring, costs charged or incurred, or obligations arising before the termination date.

ARTICLE 10 – DISPUTE MITIGATION AND RESOLUTION

10.01 Work Continuance and Payment

A. Unless otherwise agreed in writing, the Contractor shall continue the Work and maintain the Construction Schedule during any dispute mitigation or resolution proceedings. If the Contractor continues to perform, the Owner shall continue to make payments in accordance with the Agreement.

10.02 Direct Discussions

A. If the Parties cannot reach resolution on a matter relating to or arising out of the Agreement, the Parties shall endeavor to reach resolution through good faith direct discussions between the Parties' representatives, who shall possess the necessary authority to resolve such matters and who shall record the date of first discussions. If the Parties' representatives are not able to resolve such matter within five (5) Business Days from the date of first discussion, the Parties' representatives shall immediately inform senior executives of each of the parties in writing that a resolution could not be reached. Upon receipt of such notice, the senior executives of the Parties shall meet within five (5) Business Days to endeavor to reach resolution. If the dispute remains unresolved after fifteen (15) Days from the date of first discussion, the Parties shall submit such matter to the dispute mitigation and dispute resolution procedures selected below.

10.03 Mediation

A. If direct discussions pursuant to Section 10.02 do not result in resolution of the matter, the Parties shall endeavor to resolve the matter by mediation through the current Construction Industry Mediation Rules of the American Arbitration Association, or the Parties may mutually agree to select another set of mediation rules. The parties shall mutually agree upon the mediator and the mediation process. The mediation shall be convened within thirty (30) Business Days of the matter first being discussed and shall conclude within forty-five (45) Business Days of the matter first being discussed. Either party may terminate the mediator. The costs of the mediation shall be shared equally by the Parties.

10.04 Binding Dispute Resolution

A. If the matter is unresolved after submission of the matter to mediation, the Parties shall submit the matter to litigation in either the state or federal court having jurisdiction of the matter in the location of the Project.

10.05 <u>Costs</u>

A. The Parties shall pay their own costs and attorneys' fees of any binding dispute resolution procedures unless otherwise determined by the adjudicator.

10.06 <u>Multiparty Proceeding</u>

A. All parties necessary to resolve a matter agree to be parties to the same dispute resolution proceeding, if possible. Appropriate provisions shall be included in all other contracts relating to the Work to provide for the joinder or consolidation of such dispute resolution procedures.

10.07 Lien Rights

A. Nothing in this article shall limit any rights or remedies not expressly waived by the Contractor that Contractor may have under lien laws.

ARTICLE 11 – MISCELLANEOUS

11.01 Conflicting Terms

A. These General Conditions are supplementary to the General Provisions of the New Hampshire Form P-37 Agreement, and in no case shall be construed or interpreted to reduce or supersede the requirements thereof. In all cases these General Conditions shall be considered as additions to those described in the Agreement.

ARTICLE 12 – CONTRACT DOCUMENTS

12.01 Interpretation of Contract Documents

- A. The Contract Documents are complimentary. If Work is shown only on one of the Contract Documents but not on the other, the Contractor shall perform the Work as though fully described on both.
- B. In case of conflict between the drawings and specifications, the specifications shall govern. In any case of omissions or errors in figures, drawings, or specifications, the Contractor shall submit the matter to the Owner for clarification. The Owners clarifications are final and binding.
- C. The Drawings are generally made to scale, but all working dimensions shall be taken from the figured dimensions, or by actual measurements taken at the Site, and in no case by scaling. Whether or not an error is believed to exist, deviation from the drawings and dimensions given thereon shall be made only after approval in writing from the Owner and its Design Professional.
- D. Unless otherwise specifically defined in the Agreement, any terms that have well-known technical or trade meanings shall be interpreted in accordance with their well-known meanings.

12.02 Order of Precedence

- A. In case of any inconsistency, conflict, or ambiguity among the Contract Documents, the documents shall govern in the following order:
 - 1. Change Orders and written amendments to the Agreement;
 - 2. The Agreement;
 - 3. The drawings (large scale governing over small scale), specifications, and addenda issued and acknowledged before the execution of the Agreement;
 - 4. Approved submittals;
 - 5. Information furnished by the Owner;
 - 6. Other Contract Documents listed in the Agreement.
- B. Among categories of documents having the same order of precedence, the term or provision that is strictest shall control.

END OF GENERAL CONDITIONS

SAMPLE FORMS

- Standard State Contract P-37
- Application and Certificate for Payment AIA G702 1983
- Continuation Sheet for Application for Payment AIA G703 1983
- Sample State Building Permit Application

FORM NUMBER P-37 (version 2/23/2023)

<u>Notice</u>: This agreement and all of its attachments shall become public upon submission to Governor and Executive Council for approval. Any information that is private, confidential or proprietary must be clearly identified to the agency and agreed to in writing prior to signing the contract.

AGREEMENT

The State of New Hampshire and the Contractor hereby mutually agree as follows:

GENERAL PROVISIONS

1. IDENTIFICATION.

1.1 State Agency Name - DNCR Forests and Lands		1.2 State Agency Address- 172 Pembroke Road, Concord NH 03301	
1.3 Contractor Name- Cloutier	Sand and Gravel	1.4 Contractor Address- 516 US RTE. 3, North Stratford, NH 03590	
1.5 Contractor Phone Number- 603-922-5527	1.6 Account Unit and Class	1.7 Completion Date	1.8 Price Limitation
1.9 Contracting Officer for State Agency		1.10 State Agency Telephone Number	
1.11 Contractor Signature		1.12 Name and Title of Contractor Signatory	
Date:			
1.13 State Agency Signature		1.14 Name and Title of State	Agency Signatory
Date:			
1.15 Approval by the N.H. Dep	artment of Administration, Divisi	on of Personnel (if applicable)	
By:		Director, On:	
1.16 Approval by the Attorney	General (Form, Substance and Ex	ecution) (if applicable)	
By:		On:	
1.17 Approval by the Governor	and Executive Council (if application	able)	
G&C Item number:		G&C Meeting Date:	

2. SERVICES TO BE PERFORMED. The State of New hereof, and shall be the only and the complete compensation to the Hampshire, acting through the agency identified in block 1.1 Contractor for the Services. ("State"), engages contractor identified in block 1.3 ("Contractor") 5.3 The State reserves the right to offset from any amounts otherwise attached EXHIBIT B which is incorporated herein by reference 80:7-c or any other provision of law. ("Services").

3. EFFECTIVE DATE/COMPLETION OF SERVICES.

contrary, and subject to the approval of the Governor and Executive performance or other equitable remedies against the State. Council of the State of New Hampshire, if applicable, this Agreement, and all obligations of the parties hereunder, shall 6. COMPLIANCE BY CONTRACTOR WITH LAWS AND become effective on the date the Governor and Executive Council **REGULATIONS/EQUAL EMPLOYMENT** approve this Agreement, unless no such approval is required, in **OPPORTUNITY**. ("Effective Date").

performed.

specified in block 1.7.

4. CONDITIONAL NATURE OF AGREEMENT.

termination of appropriated funds by any state or federal legislative nondiscrimination requirements. or executive action that reduces, eliminates or otherwise modifies the 6.3 No payments or transfers of value by Contractor or its become available, if ever, and shall have the right to reduce or other unlawful or improper means of obtaining business. terminate the Services under this Agreement immediately upon 6.4. The Contractor agrees to permit the State or United States that Account are reduced or unavailable.

5. CONTRACT PRICE/PRICE LIMITATION/ PAYMENT.

5.1 The contract price, method of payment, and terms of payment are identified and more particularly described in EXHIBIT C which is incorporated herein by reference.

contrary, and notwithstanding unexpected circumstances, in no do so under all applicable laws. payment by the State of the contract price shall be the only and the Agreement. complete reimbursement to the Contractor for all expenses, of whatever nature incurred by the Contractor in the performance

to perform, and the Contractor shall perform, the work or sale of payable to the Contractor under this Agreement those liquidated goods, or both, identified and more particularly described in the amounts required or permitted by N.H. RSA 80:7 through RSA

5.4 The State's liability under this Agreement shall be limited to monetary damages not to exceed the total fees paid. The Contractor agrees that it has an adequate remedy at law for any breach of this 3.1 Notwithstanding any provision of this Agreement to the Agreement by the State and hereby waives any right to specific

which case the Agreement shall become effective on the date the 6.1 In connection with the performance of the Services, the Agreement is signed by the State Agency as shown in block 1.13 Contractor shall comply with all applicable statutes, laws, regulations, and orders of federal, state, county or municipal 3.2 If the Contractor commences the Services prior to the Effective authorities which impose any obligation or duty upon the Date, all Services performed by the Contractor prior to the Effective Contractor, including, but not limited to, civil rights and equal Date shall be performed at the sole risk of the Contractor, and in the employment opportunity laws and the Governor's order on Respect event that this Agreement does not become effective, the State shall and Civility in the Workplace, Executive order 2020-01. In addition, have no liability to the Contractor, including without limitation, any if this Agreement is funded in any part by monies of the United obligation to pay the Contractor for any costs incurred or Services States, the Contractor shall comply with all federal executive orders, rules, regulations and statutes, and with any rules, regulations and 3.3 Contractor must complete all Services by the Completion Date guidelines as the State or the United States issue to implement these regulations. The Contractor shall also comply with all applicable intellectual property laws.

6.2 During the term of this Agreement, the Contractor shall not Notwithstanding any provision of this Agreement to the contrary, all discriminate against employees or applicants for employment obligations of the State hereunder, including, without limitation, the because of age, sex, sexual orientation, race, color, marital status, continuance of payments hereunder, are contingent upon the physical or mental disability, religious creed, national origin, gender availability and continued appropriation of funds. In no event shall identity, or gender expression, and will take affirmative action to the State be liable for any payments hereunder in excess of such prevent such discrimination, unless exempt by state or federal law. available appropriated funds. In the event of a reduction or The Contractor shall ensure any subcontractors comply with these

appropriation or availability of funding for this Agreement and the representatives in connection with this Agreement have or shall be Scope for Services provided in EXHIBIT B, in whole or in part, the made which have the purpose or effect of public or commercial State shall have the right to withhold payment until such funds bribery, or acceptance of or acquiescence in extortion, kickbacks, or

giving the Contractor notice of such reduction or termination. The access to any of the Contractor's books, records and accounts for the State shall not be required to transfer funds from any other account purpose of ascertaining compliance with this Agreement and all or source to the Account identified in block 1.6 in the event funds in rules, regulations and orders pertaining to the covenants, terms and conditions of this Agreement.

7. PERSONNEL.

7.1 The Contractor shall at its own expense provide all personnel necessary to perform the Services. The Contractor warrants that all personnel engaged in the Services shall be qualified to perform the 5.2 Notwithstanding any provision in this Agreement to the Services, and shall be properly licensed and otherwise authorized to

event shall the total of all payments authorized, or actually made 7.2 The Contracting Officer specified in block 1.9, or any hereunder, exceed the Price Limitation set forth in block 1.8. The successor, shall be the State's point of contact pertaining to this

8. EVENT OF DEFAULT/REMEDIES.

Contractor shall constitute an event of default hereunder ("Event of Agreement, shall be the property of the State, and shall be returned Default"):

8.1.1 failure to perform the Services satisfactorily or on schedule; 8.1.2 failure to submit any report required hereunder; and/or

Agreement.

8.2 Upon the occurrence of any Event of Default, the State may take any one, or more, or all, of the following actions:

Default and requiring it to be remedied within, in the absence of a independent contractor, and is neither an agent nor an employee of greater or lesser specification of time, thirty (30) calendar days from the State. Neither the Contractor nor any of its officers, employees, the date of the notice; and if the Event of Default is not timely cured, agents or members shall have authority to bind the State or receive terminate this Agreement, effective two (2) calendar days after any benefits, workers' compensation or other emoluments provided giving the Contractor notice of termination;

8.2.2 give the Contractor a written notice specifying the Event of Default and suspending all payments to be made under this 12. ASSIGNMENT/DELEGATION/SUBCONTRACTS. Agreement and ordering that the portion of the contract price which 12.1 Contractor shall provide the State written notice at least fifteen would otherwise accrue to the Contractor during the period from the (15) calendar days before any proposed assignment, delegation, or date of such notice until such time as the State determines that the other transfer of any interest in this Agreement. No such assignment, Contractor has cured the Event of Default shall never be paid to the delegation, or other transfer shall be effective without the written Contractor:

8.2.3 give the Contractor a written notice specifying the Event of 12.2 For purposes of paragraph 12, a Change of Control shall Default and set off against any other obligations the State may owe constitute assignment. "Change of Control" means (a) merger, to the Contractor any damages the State suffers by reason of any consolidation, or a transaction or series of related transactions in Event of Default; and/or

Default, treat the Agreement as breached, terminate the Agreement or similar equity interests, or combined voting power of the and pursue any of its remedies at law or in equity, or both.

9. TERMINATION.

9.1 Notwithstanding paragraph 8, the State may, at its sole without prior written notice and consent of the State. discretion, terminate the Agreement for any reason, in whole or in 12.4 The State is entitled to copies of all subcontracts and part, by thirty (30) calendar days written notice to the Contractor assignment agreements and shall not be bound by any provisions that the State is exercising its option to terminate the Agreement. contained in a subcontract or an assignment agreement to which it 9.2 In the event of an early termination of this Agreement for any is not a party. reason other than the completion of the Services, the Contractor shall, at the State's discretion, deliver to the Contracting Officer, 13. INDEMNIFICATION. The Contractor shall indemnify, not later than fifteen (15) calendar days after the date of defend, and hold harmless the State, its officers, and employees termination, a report ("Termination Report") describing in detail all from and against all actions, claims, damages, demands, judgments, Services performed, and the contract price earned, to and including fines, liabilities, losses, and other expenses, including, without the date of termination. In addition, at the State's discretion, the limitation, reasonable attorneys' fees, arising out of or relating to Contractor shall, within fifteen (15) calendar days of notice of early this Agreement directly or indirectly arising from death, personal termination, develop and submit to the State a transition plan for injury, property damage, intellectual property infringement, or other Services under the Agreement.

10. PROPERTY OWNERSHIP/DISCLOSURE.

data, information and things developed or obtained during the by the Contractor arising under this paragraph 13. Notwithstanding performance of, or acquired or developed by reason of, this the foregoing, nothing herein contained shall be deemed to Agreement, including, but not limited to, all studies, reports, files, constitute a waiver of the State's sovereign immunity, which formulae, surveys, maps, charts, sound recordings, video immunity is hereby reserved to the State. This covenant in paragraph recordings, pictorial reproductions, drawings, analyses, graphic 13 shall survive the termination of this Agreement. representations, computer programs, computer printouts, notes, letters, memoranda, papers, and documents, all whether finished or unfinished.

10.2 All data and any Property which has been received from the 8.1 Any one or more of the following acts or omissions of the State, or purchased with funds provided for that purpose under this to the State upon demand or upon termination of this Agreement for anv reason.

10.3 Disclosure of data, information and other records shall be 8.1.3 failure to perform any other covenant, term or condition of this governed by N.H. RSA chapter 91-A and/or other applicable law. Disclosure requires prior written approval of the State.

11. CONTRACTOR'S RELATION TO THE STATE. In the 8.2.1 give the Contractor a written notice specifying the Event of performance of this Agreement the Contractor is in all respects an by the State to its employees.

consent of the State.

which a third party, together with its affiliates, becomes the direct 8.2.4 give the Contractor a written notice specifying the Event of or indirect owner of fifty percent (50%) or more of the voting shares Contractor, or (b) the sale of all or substantially all of the assets of the Contractor.

12.3 None of the Services shall be subcontracted by the Contractor

claims asserted against the State, its officers, or employees caused by the acts or omissions of negligence, reckless or willful misconduct, or fraud by the Contractor, its employees, agents, or 10.1 As used in this Agreement, the word "Property" shall mean all subcontractors. The State shall not be liable for any costs incurred

14. INSURANCE.

14.1 The Contractor shall, at its sole expense, obtain and discharged only by an instrument in writing signed by the parties continuously maintain in force, and shall require any subcontractor hereto and only after approval of such amendment, waiver or or assignee to obtain and maintain in force, the following insurance: discharge by the Governor and Executive Council of the State of 14.1.1 commercial general liability insurance against all claims of New Hampshire unless no such approval is required under the bodily injury, death or property damage, in amounts of not less than circumstances pursuant to State law, rule or policy. \$1,000,000 per occurrence and \$2,000,000 aggregate or excess; and 14.1.2 special cause of loss coverage form covering all Property subject to subparagraph 10.2 herein, in an amount not less than 80% of the whole replacement value of the Property.

14.2 The policies described in subparagraph 14.1 herein shall be on policy forms and endorsements approved for use in the State of New Hampshire by the N.H. Department of Insurance, and issued by insurers licensed in the State of New Hampshire.

14.3 The Contractor shall furnish to the Contracting Officer identified in block 1.9, or any successor, a certificate(s) of insurance for all insurance required under this Agreement. At the request of the Contracting Officer, or any successor, the Contractor shall provide certificate(s) of insurance for all renewal(s) of insurance required under this Agreement. The certificate(s) of insurance and any renewals thereof shall be attached and are incorporated herein 20. CONFLICTING TERMS. In the event of a conflict between the by reference.

15. WORKERS' COMPENSATION.

15.1 By signing this agreement, the Contractor agrees, certifies and warrants that the Contractor is in compliance with or exempt from, 21. THIRD PARTIES. This Agreement is being entered into for the the requirements of N.H. RSA chapter 281-A ("Workers' Compensation").

15.2 To the extent the Contractor is subject to the requirements of benefit, or remedy of any nature upon any other person. N.H. RSA chapter 281-A, Contractor shall maintain, and require any subcontractor or assignee to secure and maintain, payment of 22. HEADINGS. The headings throughout the Agreement are for Workers' Compensation in connection with activities which the reference purposes only, and the words contained therein shall in person proposes to undertake pursuant to this Agreement. The no way be held to explain, modify, amplify or aid in the Contractor shall furnish the Contracting Officer identified in block interpretation, construction or meaning of the provisions of this 1.9, or any successor, proof of Workers' Compensation in the Agreement. manner described in N.H. RSA chapter 281-A and any applicable renewal(s) thereof, which shall be attached and are incorporated 23. SPECIAL PROVISIONS. Additional or modifying provisions herein by reference. The State shall not be responsible for payment set forth in the attached EXHIBIT A are incorporated herein by of any Workers' Compensation premiums or for any other claim or reference. benefit for Contractor, or any subcontractor or employee of Contractor, which might arise under applicable State of New 24. FURTHER ASSURANCES. The Contractor, along with its Hampshire Workers' Compensation laws in connection with the agents and affiliates, shall, at its own cost and expense, execute any performance of the Services under this Agreement.

16. WAIVER OF BREACH. A State's failure to enforce its rights with respect to any single or continuing breach of this Agreement shall not act as a waiver of the right of the State to later enforce any such 25. SEVERABILITY. In the event any of the provisions of this rights or to enforce any other or any subsequent breach.

17. NOTICE. Any notice by a party hereto to the other party shall Agreement will remain in full force and effect. be deemed to have been duly delivered or given at the time of mailing by certified mail, postage prepaid, in a United States Post 26. ENTIRE AGREEMENT. This Agreement, which may be Office addressed to the parties at the addresses given in blocks 1.2 and 1.4, herein.

18. AMENDMENT. This Agreement may be amended, waived or

19. CHOICE OF LAW AND FORUM.

19.1 This Agreement shall be governed, interpreted and construed in accordance with the laws of the State of New Hampshire except where the Federal supremacy clause requires otherwise. The wording used in this Agreement is the wording chosen by the parties to express their mutual intent, and no rule of construction shall be applied against or in favor of any party.

19.2 Any actions arising out of this Agreement, including the breach or alleged breach thereof, may not be submitted to binding arbitration, but must, instead, be brought and maintained in the Merrimack County Superior Court of New Hampshire which shall have exclusive jurisdiction thereof.

terms of this P-37 form (as modified in EXHIBIT A) and any other portion of this Agreement including any attachments thereto, the terms of the P-37 (as modified in EXHIBIT A) shall control.

sole benefit of the parties hereto, and nothing herein, express or implied, is intended to or will confer any legal or equitable right,

additional documents and take such further actions as may be reasonably required to carry out the provisions of this Agreement and give effect to the transactions contemplated hereby.

Agreement are held by a court of competent jurisdiction to be contrary to any state or federal law, the remaining provisions of this

executed in a number of counterparts, each of which shall be deemed an original, constitutes the entire agreement and understanding between the parties, and supersedes all prior agreements and understandings with respect to the subject matter hereof.

APPLICATION AND CERTIFIC	CATE FOR PAYMEN	AIA DOCUMENT G702 PAGE 1 OF 2	2 PAGES
TO (OWNER):	PROJECT:	APPLICATION NO: Distribution to: OWNER	
		Period to: ARCHITECT CONTRACTO	ВС
FROM:	VIA (ARCHITECT):	ARCHITECT'S PROJECT NO: CONTRACT DATE:	
CONTRACT FOR:			
CONTRACTOR'S APPLICATIC	ON FOR PAYMENT	Application is made for Payment, as shown below, in connection with the Contr Continuation Sheet, AIA Document G703, is attached.	tract.
CHANGE ORDER SUMMARY		1. ORIGINAL CONTRACT SUM	
Change Orders approved ir ADDITION	IS DEDUCTIONS	2. Net change by Change Orders	
previous months by Owner TOTAL		3. CONTRACT SUM TO DATE	
Approved this Month		5. RETAINAGE:	
Number Date Approved		a. 10% of Completed Work	
		b. 10% of Stored Material Total Retainage	
TOTALS	1	8. CURRENT PAYMENT DUE	
Net change by Change Orders	\$0.00	9. BALANCE TO FINISH, PLUS RETAINAGE	
The undersigned Contractor certifies that to the best of the Contract	tor's knowledge, information and belief the		
Work covered by this Application for Payment has been completed i	in accordance with the Contract Documents,	State of: County of:	
that all amounts have been paid by the Contractor for Work for whic	ch previous Certificates for Payment were	Subscribed and sworn to before me this day of, 20	
issued and payments received from the Owner, and that current pay	yment shown herein is now due.	Notary Public:	
CONTRACTOR:		My Commission expires:	
By:	Date:		
		AMOUNT CERTIFIED\$	
ARCHITECT'S CERTIFICATE	FOR PAYMENT	(Attach explanation if amount certified differs from the amount applied for.)	
In accordance with the Contract Documents, based	l on on-site observations and the	ARCHITECT:	
data comprising the above application, the Architect	t certifies to the Owner that to the	By: Date:	
best of the Architect's knowledge, information and t	belief the Work has progressed as	This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to	o the without
the contractor is entitled to payment of the AMOUNT	T CERTIFIED.	prejudice to any rights of the Owner or Contractor under this Contract	
AIA DOCUMENT G702 • APPLICATION AND CERTIFICA THE AMEBICAN INSTRUME OF APCHITECTS 1735 NE	ATE FOR PAYMENT • MAY 1983 EDITI EW YORK AVENITE N W WASHINGT	ION AIA 1983 TON D.C. 20006	02-1083
THE AMERICAN INSTITUTE OF ARCHITECTS, 1733 NE			02-1303

0 C C	NTINUATION SHEET			AIA DOCUM	IENT G703				PAGE 2 OF 2 PAGES
AIA Do Contrae	ocument G702, APPLICATION AND CE ctor's signed Certification is attached.	RTIFICATE FOF	R PAYMENT, conta	tining		APPLICATION NU APPLICATION	UMBER: N DATE:		
In tabu Use Cc	lations below, amounts are stated to th slumn I on Contracts where variable ret	e nearest dollar. ainage for line ite	ms may apply.		ARC	PERI CHITECTS PROJE	IOD TO: ECT NO:		
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THE AN	AERICAN INSTITUTE OF ARCHITECTS, 17	35 NEW YORK AV	/ENUE, N.W., WASH	HINGTON, D.C. 200	006				G703-1983

fice Use Only DSFM 106 rev 6/2019) te Rcv: v By: nount: t #: t #: ev: rmit #:	STATE OF NEW HA	MPSHIRE DEPART Robert L. Quinn Division of Fire Safety e of the State Fire Man J. Parisi, State Fire Man S: 33 Hazen Drive Con 23-4289, Fax 603-223- 1-800-735-2964 Arson	MENT OF SAFETY rshal rshal cord NH 03305 .4294 Hotline 1-800-400-3.	Y 526
	STATE BUILI Submit a	bing PERMIT APPLI separate application per per	mit	
Applicant Information	on (Pronerty Owner)	APPLICATION Property In	formation	
Neppicant Information	on (Hoperty Owner)			
Name:		Building Nat	me:	
Title:		Map/Lot#:		
Address:		Address:		
City:	State :Zip:	City:	State:	Zip:
Email:				
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Telephone #	APPLI	CATION INFORMATION	N	
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Company:				
Address:				

Brief Description:		

Owner's Signature____

Date:

I hereby certify, subject to the penalties of unsworn falsification pursuant to RSA 641:3, that all statements made on this application are true to the best of my knowledge and that I am responsible to ensure that all construction work will be completed in accordance with all Federal, State and local laws and ordinances, including local Zoning Ordinances as applicable and the State of NH Building Code, and that I further authorize employees and or agents of the NH Fire Marshal's Office to enter this property for purposes of inspections.

PERMIT FEES PURSUANT TO NH CODE OF ADMINISTRATIVE RULES Saf-C 8105 *Please make checks payable to "Treasurer, State of New Hampshire"

Calculations: (Electrical/Mechanical/Plumbing)

Total cost of construction for permit calculation :\$_____(electrical/mechanical/plumbing only)

JOB COST	AMOUNT	MULTIPLY	INSP. FEE (MIN \$75.00)
1st 100,000 0.01-100,000		1.2%	
Cost 100,000.01-300,000	+	0.5%	+
Costs 300,000.01 +	+	0.3%	+
Total:	=	Total Fee:	=

<u>Re-Inspection Fee (Electrical/Mechanical /Plumbing)</u>

10% Re-inspection Fee: 10% of the fee calculated, provided that the fee shall not be less than \$100.00 nor more than \$500.00.

New Commercial Permit Fee (Building)

FEE TYPE	SQUARE FOOTAGE	FEE AMOUNT	TOTAL INSP. FEE
BUILDING PERMIT		0.30	
OTHER STRUCTURES min. \$35.00		1.00	

New Commercial Renovation Permit Fee (Building)

FEE TYPE	SQUARE FOOTAGE	FEE AMOUNT	TOTAL INSP. FEE
BUILDING PERMIT		0.15	
OTHER STRUCTURES min. \$35.00		\$1.00	

New Commercial Permit & Renovation Permit Fee (Fire Protection)

FEE TYPE	# OF DEVICES	FEE AMOUNT EACH	TOTAL INSP. FEE MIN \$35.00
FIRE PROTECTION		1.00	

Re-Inspection fee for Building, Fire Protection and Other; Permit fee is \$100.00 per inspection

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SECTION 01 10 00

SUMMARY

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Section includes:
 - 1. Project information.
 - 2. Work covered by Contract Documents.
 - 3. Work sequence.
 - 4. Phased construction.
 - 5. Work by Owner.
 - 6. Work under separate contracts.
 - 7. Future work.
 - 8. Purchase contracts.
 - 9. Salvage requirements.
 - 10. Owner-furnished products.
 - 11. Contractor-furnished, Owner-installed products.
 - 12. Access to site.
 - 13. Coordination with occupants.
 - 14. Work restrictions.
 - 15. Specification and drawing conventions.
 - 16. Miscellaneous provisions.
- B. Related Work Specified Elsewhere:
 - 1. SECTION 01 50 00: Temporary Facilities and Controls

1.02 PROJECT INFORMATION

1.

A. Project Identification: NEW RV CAMPGROUND

Jericho Mountain State Park

Project No. ARP 2418

- 1. Project Location: 298 Jericho Lake Road, Berlin NH 03570
- B. Owner: State of New Hampshire, Department of Natural and Cultural Resources

Division of Parks & Recreation

Owner's Representative: Thomas Mansfield, Dept. Architect

Tel: 603-271-3972

Email: thomas.c.mansfield@dncr.nh.gov

- C. Consultants: The Owner has retained the following design professionals who have prepared designated portions of the Contract Documents:
 - 1. Landscape Architect: SE Group, Burlington, VT Contact: Patrick Olstad: 802-682-0098 POLSTAD@SEGROUP.COM

- 2. Civil Engineer: Horizons Engineering, New London NH Contact: Will Davis 603-444-4111 WDAVIS@HORIZONSENGINEERING.COM
- 3. Architect: Samyn-D'Elia Architects, PA, Holderness NH Contact: Ward D'Elia 603-968-7133 <u>WARD@SDARCHITECTS.COM</u>
- 4. Electrical Engineer: CPB & Associates, Rumney NH Contact: Charles Buckley 603-786-9992 <u>CBUCK616@YAHOO.COM</u>

1.03 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and consists of the following:
 - 1. Construction of a Recreational Vehicle (RV) campground with a paved loop road connecting 19 RV campsites on gravel spur roads and one dump station off the paved road.
 - 2. Construction of two in-fill campsites at the existing Jericho Mountain State Park campground.
 - 3. Expanded gravel parking area for walk-in shelter campsites.
 - 4. Underground stormwater infiltration system and sand filter pond.
 - 5. Earthwork expansion of the existing event area adjacent to the RV campground.
 - 6. New underground water and electrical systems to service the new RV campsites.
 - 7. A new septic system using a combination septic/pump tank and concrete leaching chambers.
 - 8. Construction of two remote campsites with new camping shelters.
 - 9. Construction of one standard state park kiosk located off the campground loop road.
- B. Type of Contract: Project will be constructed under a stipulated lump sum grand total contract with the State of New Hampshire in accordance with the General Conditions of the Contract for Construction.
- C. The Contractor shall, except as otherwise specifically stated in Contract Documents, provide and pay for all materials, labor, tools, equipment, water, heat, fuel, light, power, transportation, superintendence, temporary construction of every nature, and all other services and facilities or every nature whatsoever necessary to execute, complete, and deliver the work within the specified time.

1.04 WORK SEQUENCE

A. Work shall commence within 15 days after issuance of Notice to Proceed. Failure to comply shall constitute a Default of Contract.

1.05 PHASED CONSTRUCTION

- A. The Work shall be conducted in one phase, substantially complete as indicated:
 - New RV Campground. Work of this phase shall commence within 15 days after the Notice to Proceed and be substantially completed and ready for occupancy by October 22, 2025.
B. Before commencing Work, submit an updated copy of Contractor's construction schedule showing the sequence, commencement, and completion dates for all phases of the Work.

1.06 WORK BY OWNER

A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.

1.07 WORK UNDER SEPARATE CONTRACTS

A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.

1.08 SALVAGE REQUIREMENTS

- A. Unless otherwise indicated, demolition waste becomes the property of Contractor.
- B. Unless otherwise indicated, all equipment that must be removed due to interference with work of this contract remains the property of the Owner and may be salvaged at Owner's discretion.

1.09 ACCESS TO SITE

- A. Use of Site: Limit use of Project site to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 - 1. Limits: Confine construction operations to the three areas shown on the Overall Existing Conditions Plan Sheet C 1.00
 - 2. Limits: Limit site disturbance, including earthwork and clearing of vegetation to 10-feet beyond surface walkways, patios, surface parking, and utilities less than 12-inches in diameter; 15-feet beyond primary roadway curbs and main utility branch trenches; and 25-feet beyond constructed areas with permeable surfaces (such as pervious paving areas, stormwater detention facilities, and playing fields) that require additional staging areas in order to limit compaction in the constructed area.
 - 3. Driveways, Walkways and Entrances: Keep driveways, loading areas and entrances serving the park clear and available to Owner, Owner's employees, park patrons, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

B. Jericho Mountain State Park campground will remain open and will operate on its regular schedule during construction. Minimize obstruction to camper access to the campground by construction activities.

1.10 COORDINATION WITH OCCUPANTS

- A. Full Owner Occupancy: Owner will occupy site for use as a campground during the portion of the construction period that coincides with the park's normal operating season. Cooperate with owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing campground road entrance. unless otherwise indicated.
 - 1. Notify Owner not less than 72-hours in advance of activities that will affect Owner's operations.

1.11 WORK RESTRICTIONS

- A. Work restrictions, General: Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets and other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work to normal business working hours of 7:00 a.m. to 4:30 p.m., Monday through Friday, unless otherwise indicated.
 - 1. Access for work outside of normal working hours shall be requested in writing to the Contract Administrator, at least one week in advance. The Contract Administrator may accept or reject the request.
 - 2. No access during the following observed holidays:
 - a. New Years' Day.
 - b. Martin Luther King Jr. Civil Rights Day.
 - c. Washington's Birthday.
 - d. Memorial Day.
 - e. Independence Day.
 - f. Labor Day.
 - g. Veterans' Day.
 - h. Thanksgiving Day.
 - i. Day after Thanksgiving.
 - j. Christmas Day.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
 - 1. Notify Owner not less than two days in advance of proposed utility interruptions.
 - 2. Obtain Owners written permission before proceeding with utility interruptions.

- D. Noise, Vibration, and odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruptions to owner occupancy with owner.
 - 1. Notify Owner not less than two days in advance of proposed disruptive operations.
 - 2. Obtain Owner's written permission before proceeding with disruptive operations.
- E. Controlled Substances: Use of tobacco products and other controlled substances on Project site is not permitted.

1.12 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 - 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on drawings to identify materials and products:
 - 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 - 2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SUMMARY

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SECTION 01 20 00

PRICE AND PAYMENT PROCEDURES

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Section Includes:
 - 1. Schedule of Values
 - 2. Applications for Payment
 - 3. Allowances
 - 4. Alternates

1.02 SCHEDULE OF VALUES

- A. Submit printed schedule on AIA Form G703 Continuation Sheet for G702. Contractor's standard for or electronic media printout will be considered.
- B. Submit Schedule of Values in duplicate within 15 days after the date of issuance of Notice to Proceed. Failure to submit within specified time period will constitute Default of Contract.
- A. Utilize the Schedule of Values provided with the bid and any addenda. The Contractor may add line items to the Schedule of Values with approval from the contract administrator. No line items may be deleted. Identify each line item with number and title of specification Section. Identify General Conditions, bonds, and insurance.
- C. Include separate line item for the amount of each Allowance and Alternates Specified in this section. For unit cost Allowances, identify quantities taken from Contract Documents multiplied by unit cost to achieve total for each item.
- D. Revise schedule to list approved Change Orders, with each Application for Payment.

1.03 APPLICATION FOR PAYMENT

- A. Submit three copies of each application or electronic transmittal along with any supporting materials.
- B. Execute on AIA Form G702 Application and Certificate for Payment.
- C. Items on the Application for payment shall be consistent with the items listed on the Proposal Form. Utilize Schedule of Values for listing items in Application for Payment.
- D. Submit updated construction schedule with each Application for Payment.
- E. Payment Period: Submit monthly, or as otherwise allowed by the Owner.

1.04 <u>ALLOWANCES</u>

- A. Contingency Allowances: Use the allowance only as directed by Section 00 41 00 "Bid Proposal Form".
- B. Contractor's overhead, profit, and related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, insurance, equipment rental, and similar costs.
- C. Change Orders authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit margins.
- D. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

1.05 <u>ALTERNATES</u>

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation method described in the Contract Documents.
 - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
 - The cost or credit for each alternate is the new addition or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.
- B. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- C. Execute accepted alternates under the same conditions as other work of the Contract.
- D. Schedule of Alternates: Provide separate pricing for adding or removing each of the following alternatives to the Project. Indicate pricing for the alternatives on the lines indicated on the Bid Form.
 - 1. Add Alternative No. 1: Electric power to the event area
 - 2. Add Alternative No. 2: Shelter sites (L1.03)
 - 3. Add Alternative No. 3: Infill camp sites (L1.02)
 - 4. Add Alternative No. 4: Electric power to five existing cabins (E1.03J)

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF PRICE AND PAYMENT PROCEDURES

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SECTION 01 25 00

SUBSTITUTION PROCEDURES

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Work Specified Elsewhere:
 - 1. SECTION 01 20 00: Price and Payment Procedures
 - 2. SECTION 01 60 00: Product Requirements

1.02 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
 - 1. Substitution for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - 2. Substitution for Convenience: Changes proposed by Contractor that are not required in order to meet other Project requirements but may offer advantage to Contractor.

1.03 ACTION SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or installation cannot be provided.
 - b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
 - c. Detailed comparisons of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.

- g. List of similar installation for completed projects with project names and addresses and names and addresses of architects and owners.
- h. Material test reports from qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
- i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
- j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
- k. Cost information, including a proposal of change, if any, in the Contract Sum.
- I. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
- m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
- Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
 - a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.04 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.05 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 – PRODUCTS

2.01 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

- 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Requested substitution provides sustainable design characteristics that specified product provided.
 - c. Substitution request is fully documented and properly submitted.
 - d. Requested substitution will not adversely affect Contractor's construction schedule.
 - e. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - f. Requested substitution is compatible with other portions of the Work.
 - g. Requested substitution has been coordinated with other portions of the Work.
 - h. Requested substitution provides specified warranty.
 - i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Not allowed.

PART 3 – EXECUTION (Not Used)

END OF SUBSTITUTION PROCEDURES

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SECTION 01 26 00

CONTRACT MODIFICATION PROCEDURES

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Work Specified Elsewhere:
 - 1. SECTION 01 20 00: Price and Payment Procedures
 - 2. SECTION 01 25 00: Substitution Procedures
 - 3. SECTION 01 30 00: Administrative Requirements

1.02 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions (ASI) authorizing minor changes in Work, not involving adjustment to the Contract Sum or the Contract Time.

1.03 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specification.
 - 1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within time specified by Proposal Request or 14 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for change to Architect.

- 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
- 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
- 3. Indicate applicable delivery charges, equipment rental, and amounts of trade discounts.
- 4. Include costs of labor and supervision directly attributable to the change.
- 5. Include an updated Contractor's construction schedule that indicated effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available float before requesting an extension of the Contract Time.
- 6. Comply with requirements in Section 01 25 00 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.

1.04 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Change Proposal Request, Architect will issue a Contract Change Order for signatures of Owner and Contractor on Owner's standard form.

1.05 CONSTRUCTION CHANGE DIRECTIVE

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

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF CONTRACT MODIFICATION PROCEDURES

SECTION 01 30 00

ADMINISTRATIVE REQUIRMENTS

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Section includes administrative provisions for coordinating construction operations, submittal procedures, delegated design, and Contractor's construction schedule including, but not limited to, the following:
 - 1. Project management and coordination
 - 2. Submittal procedures
 - 3. Delegated design
 - 4. Construction schedule
- B. Related Work Specified Elsewhere:
 - 1. SECTION 01 70 00: Execution and Closeout Requirements

1.02 PROJECT MANAGEMENT AND COORDINATION

- A. Subcontract List: Submit a written summary identifying individuals or firms proposed for each portion of the Work.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at project site. List e-mail addresses and telephone numbers.
- C. Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work.
- D. Requests for Information (RFIs): On discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI. Use forms acceptable to Architect.
- E. Schedule and conduct progress meetings at Project site at biweekly intervals. Notify Owner of meeting dates and times. Require attendance of each subcontractor or other entity concerned with current progress or involved in planning, coordination, or performance of future activities.
 - 1. Contractor will record minutes and distribute to all attendees, including Owner/Architect.

1.03 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: Requests for Electronic digital data files of the Contract Drawings will be considered on a case-by-case basis and documents may be provided by Architect for Contractor's use in preparing submittals. Contractor is to submit request for specific drawing file pertinent to shop drawing preparation.

- 1. Architect may furnish Contractor specific digital data drawing files of the Contract Drawings for use in preparing Shop Drawings.
 - a. The decision to provide digital file data is at the sole discretion of the architect. No damages or claims will be accepted for failure to provide requested digital data.
 - b. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
 - c. Contractor shall execute a liability release and/or data licensing agreement in the form acceptable to the Architect.
- B. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 1. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 - 2. Architect will discard submittals received from sources other than Contractor.
- C. Paper Submittals: Place a permanent label or title block on each submittal for identification. Provide a space approximately on label or beside title block to record Contractor's review and approval markings and action taken by Architect. Include the following information on the label:
 - 1. Project name.
 - 2. Date.
 - 3. Name and address of Contractor.
 - 4. Name and address of subcontractor or supplier.
 - 5. Number and title of appropriate Specification Section.
- D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
 - 1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 - 2. Name file with unique identifier, including project identifier, Specification Section number, and revision identifier.
 - 3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
- E. Identify options requiring selection by Architect.
- F. Identify deviations from the Contract Documents on submittals.
- G. Contractor's Construction Schedule Submittal Procedure:
 - 1. Submit required submittals in the following format:
 - a. Working electronic copy of schedule file, where indicated.
 - b. PDF electronic file

- c. Three paper copies.
- 2. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
- 3. Coordinate Contractor's construction schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.

PART 2 – PRODUCTS

2.01 SUBMITTAL PROCEDURES

- A. General Submittal procedure Requirements: Prepare and submit submittals required by individual Specification Sections.
 - 1. Submit electronic submittals vie email as PDF electronic files.
- B. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2.02 ACTION SUBMITTALS

- A. Submit electronic copies of each submittal or three paper copies unless otherwise indicated. Architect will return one copy.
- B. Product Data: Mark each copy to show applicable products and options. Include the following:
 - 1. Manufacturer's written recommendations, product specifications, and installation instructions.
 - 2. Wiring diagrams showing factory-installed wiring.
 - 3. Printed performance curves and operational diagrams.
 - 4. Testing by recognized testing agency.
 - 5. Compliance with specified standards and requirements.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data. Submit on sheets at least 8-1/2 by 11-inches but not larger than 24 by 36-inches. Include the following:
 - 1. Dimensions and identification of products.
 - 2. Fabrication and installation drawings and roughing-in and setting diagrams.
 - 3. Wiring diagrams showing field-installed wiring.
 - 4. Notation of coordination requirements.
 - 5. Notation of dimensions established by field measurement.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture and for comparison of these characteristics between submittal and actual component as delivered and installed. Include name of manufacturer and product name on label.

1. If variation is inherent in material or product, submit at least three sets of paired units that show variations.

2.03 INFORMATIONAL SUBMITTALS

- A. Informational Submittals: Submit electronic copies or three paper copies of each submittal unless otherwise indicated. Architect will return one copy.
- B. Qualification Data: Include lists of completed projects with project names and addresses, names, and addresses of architects and owners, and other information specified.
- C. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

2.04 DELEGATED DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit electronic copies or three paper copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

2.05 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, schedule in the format outlined in the General Conditions.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
- C. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.
- D. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by with Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew size, and equipment required to achieve compliance, and indicate date by which recovery will be accomplished.

PART 3 – EXECUTION

3.01 SUBMITTAL REVIEW

- A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Architect will review each action submittal, make marks to indicate corrections or modification required, will signify each submittal with an action stamp, and will signify appropriately to indicate action.
- C. Informational Submittals: Architect will review each submittal and will return a copy. Architect will forward each submittal to appropriate party.
- D. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

3.02 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule a minimum of one day before each regularly scheduled progress meeting.
 - 1. As the Work progresses, indicate Actual Completion percentage for each activity.
- B. Distribute copies of approved schedule to Owner/Architect, subcontractors, testing and inspecting agencies, and parties identified by Contractor with a need-to-know schedule responsibility. When revisions are made, distribute updated schedules to the same parties.

END OF ADMINISTRATIVE REQUIREMENTS

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SECTION 01 40 00

QUALITY REQUIREMENTS

PART 1 – GENERAL

1.01 DESCRIPTION

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and –control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related activities do not limit Contractor's other qualityassurance and –control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and –control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.02 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Level: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.03 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

- C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installation of the system, assembly, or products that are similar to those indicated for this Project in material, design, and extent.
- F. Specialists: Certain sections of the Specification require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirement for specialists shall not supersede building codes and regulations governing the Work.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
 - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Mockups: Before installing portions of the Work requiring mockups, build mockups for each for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
 - 2. Notify Architect/Engineer seven days in advance of dates and times when mockups will be constructed.
 - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 4. Obtain Architect's/Engineer's approval of mockups before starting work, fabrication, or construction.
 - 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 6. Demolish and remove mockups when directed, unless otherwise indicated.

1.04 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 - 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 - 2. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
- C. Manufacturer's Field Services: Where indicated, engage a manufacturer's representative to observe and inspect the Work. Manufacturer's representative's services include examination of substrates and conditions, verification of materials, inspection of completed portions of the Work, and submittal of written reports.
- D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- E. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
 - 1. Access to the Work.
 - 2. Incidental labor and facilities necessary to facilitate tests and inspection.
 - 3. Adequate quantities of representative sample of materials that require testing and inspecting. Assist agency in obtaining samples.
 - 4. Facilities for storage and of test samples.
 - 5. Delivery of samples to testing agencies.
- F. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1.05 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of the Owner, and as follows:

- 1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
- 2. Notify Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
- 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
- 4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
- 5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- 6. Retesting and reinspecting corrected work.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.01 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with Contract Document requirements for cutting and patching in Section 01 70 00 "Execution and Closeout Requirements."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF QUALITY REQUIREMENTS

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
 - 1. The Work shall include, but shall not necessarily be limited to:
 - a. Use charges
 - b. Temporary utilities
 - c. Construction facilities
 - d. Temporary controls
 - e. Project Identification
- B. Related Work Specified Elsewhere:
 - 1. SECTION 01 26 00: Contract Modification Procedures
 - 2. SECTION 01 70 00: Execution and Closeout Requirements

1.02 USE CHARGES

- A. General: Installation and removal of temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, Engineers, occupants of Project, testing agencies, and authorities having jurisdiction.
- B. Electric Power Service: Contractor will pay electric-power-service use charges for electricity used by all entities for construction operations.

1.03 INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

1.04 QUALITY ASSURANCE

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

1.05 PROJECT CONDITIONS

- A. The Contractor shall provide temporary sanitary facilities for the workmen and temporary fire safety devices such as fire extinguishers.
- B. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 – PRODUCTS

2.01 TEMPORARY FACILITIES

- A. Field Offices: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

2.02 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

2.03 PROJECT IDENTIFICATION

- A. Project Identification Sign:
 - 1. Provide one painted sign of construction and design indicated below and as shown in sample layout at the end of this section. Minimum of 4 feet by 8 feet in size.
 - 2. Content: Specific information will be determined after award of the contract. The sign shall include the following information and format.
 - a. Project Number, title, and name of state entity as indicated on the contract documents.
 - b. Names of the Commissioner and Governor.
 - c. Names and titles of Architect / Engineer and Consultants
 - d. Name of the prime contractor.
 - e. Contract amount.
 - f. Legislation that authorized the project.
 - 3. Logos: The sign shall bear the NH State Parks Logo, in color.
 - a. The NH State Parks Logo is available from the Owners Representative upon request.
 - 4. Lettering: Typeface Times New Roman, Univers, Arial, or CG Omega.
- B. Design sign and structure to withstand 60 mile per hour wind velocity.
- C. Sign Painter: Experienced as professional sign painter with a minimum of three years' experience.
- D. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.

- E. Sign Materials:
 - 1. Structure and Framing: New, structurally adequate.
 - 2. Sign Surfaces: exterior grade plywood with medium density overlay, minimum 3/4 inches thick.

PART 3 – EXECUTION

3.01 INSTALLATION, GENERAL

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

3.02 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities. Permanent sanitary facilities installed under this Contract shall not be used during construction.
- D. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installation or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installation or elements being installed.
- E. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installation or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
- F. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

3.03 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
 - 1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30-feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
 - Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Parking: Use designated areas of Owner's existing parking areas for construction personnel.

3.04 PROJECT IDENTIFICATION SIGN INSTALLATION

- A. Installation:
 - 1. Install sign prior to the start of construction.
 - 2. Erect at location of high public visibility adjacent to main entrance to site.
 - 3. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.
 - 4. Install sign plumb and level, with butt joints. Anchor securely.
 - 5. Paint exposed surfaces of sign, supports, and framing.
- B. Maintenance: Maintain signs and supports clean, repair deterioration and damage.
- C. Removal: Remove signs, framing, supports, and foundations at completion of project and restore area.

3.05 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
- C. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in manner that will prevent people and animals from easily entering site except by entrance gate.
- D. Barricades, Warning Signs, and Lights: Comply with authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

E. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

3.06 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- **B.** Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot by satisfactorily repaired.

END OF TEMPORARY FACILITIES AND CONTROLS

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Department of Natural and Cultural Resources **DIVISION of PARKS & RECREATION** STATE OF NEW HAMPSHIRE

American Rescue Plan Act Project ARP 2418

NEW RV CAMPPGROUND **JERICHO MOUNTAIN STATE PARK**

AUTHORIZATION: ARPA DNCR Capital Project Fund State Fiscal Recovery Fund Section 602 (c) (1) (A) Contract: \$0.00

Honorable***********, Governor Sarah L. Stewart, Commissioner

ARCHITECT ********

CONTRACTOR *************** 01 50 10 Jericho Project Sign Sample

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SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Section includes administrative and procedural requirements for selection of products for use in Project.
 - 1. The Work shall include, but shall not necessarily be limited to:
 - a. Product delivery, storage, and handling
 - b. Manufacturers' standard warranties
 - c. Special warranties
 - d. Comparable products
- B. Related Work Specified Elsewhere:
 - 1. SECTION 01 20 00: Price and Payment Procedures
 - 2. SECTION 01 25 00: Substitution Procedures

1.02 **DEFINITIONS**

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Products: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.03 ACTION SUBMITTALS

- A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and drawing numbers and titles. <u>Note that no substitutions for convenience are</u> <u>allowed per Section 01 25 00.</u>
 - 1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
 - Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
 - a. Form of Approval: As specified in Section 01 30 00 "Administrative Requirements."
 - b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01 30 00 "Administrative Requirements."

1.04 QUALITY ASSURANCE

A. Compatibility of Options: If contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
 - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 - 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - 4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.
- C. Storage:
 - 1. Store products to allow for inspection and measurement of quantity or counting of units.

- 2. Store materials in a manner that will not endanger Project structure.
- 3. Store products that are subject to damage by elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
- 4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
- 5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
- 6. Protect stored products from damage and liquids from freezing.
- 7. Provide a secure location and enclosure at Project site for storage of materials and equipment by owner's construction forces. Coordinate location with owner.

1.06 **PRODUCT WARRANTIES**

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 - 1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to owner.
 - 2. Special Warranty: Written warranty required by Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
 - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 - 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
 - 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 01 70 00 "Execution and Closeout Requirements."

PART 2 – PRODUCTS

2.01 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
 - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 - 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.

- 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
- 4. Where products are accompanied by the term "as selected", Architect will make selection.
- 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
- B. Product Selection Procedures:
 - 1. Product: Where Specifications name a single manufacturer and product, provide the named product which complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - 2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - 3. Products:
 - a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements.
 - 4. Manufacturers:
 - a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
 - 5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers and/or products, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product names. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
- C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
 - 1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 01 25 00 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.
E. Domestic Preference for Procurement: The Contractor, consistent with 2 CFR 200.322, should, to the greatest extent practicable, provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products).

2.02 COMPARABLE PRODUCTS

- A. Conditions for Consideration: Architect will consider Contractor's request for comparable products when the following conditions are satisfied. <u>Note that substitutions for convenience are not allowed per Section 01 25 00.</u> If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
 - 1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 - 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - 3. Evidence that proposed product provides specified warranty.
 - 4. List of similar installations for completed projects with project names and addresses and names and addresses or architects and owners, if requested.
 - 5. Samples, if requested.

PART 3 – EXECUTION (Not Used)

END OF PRODUCT REQUIREMENTS

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SECTION 01 70 00

EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Section includes general administrative and procedural requirements governing execution and closeout of the Work including, but not limited to, the following:
 - 1. Execution
 - 2. Cutting and patching
 - 3. Closeout procedures
 - 4. Operations and maintenance manuals
 - 5. Project record documents
- B. Related Work Specified Elsewhere:
 - 1. SECTION 01 10 00: Summary
 - 2. SECTION 01 30 00: Administrative Requirements

1.02 INFORMATIONAL SUBMITTALS

A. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

1.03 CLOSEOUT SUBMITTALS

- A. Contractor's List of Incomplete Items ("punch list"): Initial submittal at Substantial Completion.
- B. Operations and Maintenance Manuals:
 - 1. Submit the following manuals. Manuals are to be placed into separate binders and electronic files, or if placed into a comprehensive volume, manuals shall be placed into separate sections clearly labeled with the manual title.
 - a. Emergency Manual.
 - b. Operations Manual.
 - c. Product Maintenance Manual.
 - d. Systems and Equipment Manual.
 - 2. Format: Submit operations and maintenance manuals in the following format:
 - a. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.
 - b. Two paper copies. Include complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves.

- C. Project Record Documents:
 - 1. Record Drawings: Submit one paper-copy set of marked-up record prints and an annotated PDF electronic file of marked-up record prints.

1.04 QUALITY ASSURANCE

- A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 - 1. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
 - 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
 - 3. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architects opinion, reduce the buildings aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

1.05 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractors List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - a. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting the Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - b. Submit closeout submittals specified in other Division 1 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
 - c. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - d. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturers name and model number where applicable.
 - Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architects signature of receipt of submittals.
 - e. Submit test/adjust/balance records.

- f. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - a. Advise Owner of pending insurance changeover requirements.
 - b. Make final changeover of permanent locks and deliver keys to Owner. Advise Owners personnel of changeover in security provisions.
 - c. Complete startup and testing of systems and equipment.
 - d. Perform preventative maintenance on equipment prior to Substantial Completion.
 - e. Instruct Owners personnel in operation, adjustment, and maintenance of products, equipment, and systems.
 - f. Advise Owner of changeover in heat and other utilities.
 - g. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 - h. Terminate and remove temporary facilities from project site, along with mockups, construction tools, and similar elements.
 - i. Complete final cleaning requirements, including touchup painting.
 - j. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificates will be issued.

1.06 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
 - 1. Submit a final Application for Payment according to Section 01 20 00 "Price and Payment procedures."
 - 2. Certified List of Incomplete Items: Submit certified copy of Architects Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy shall state that each item has been completed or otherwise resolved for acceptance.
 - 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
- B. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

2.02 OPERATION AND MAINTENANCE DOCUMENTATION

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information.
- B. Organization: Unless otherwise indicated, organize manuals into separate sections for each system and subsystem, and separate sections for each piece of equipment not part of a system.
- C. Organize data into three-ring binders with identification on front and spine of each binder, and envelopes for folded drawings. Include the following:
 - 1. Emergency Manual: Listing type of emergency, emergency instructions and emergency procedures.
 - 2. Operations Manual: Indicating operating standards, operating procedures, and wiring and control diagrams.
 - 3. Product Maintenance Manual: Organize manuals into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, including product color, pattern, and texture.
 - 4. Systems and Equipment Maintenance Manuals: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, including maintenance procedures, maintenance and service schedules, and testing and inspection schedules.
 - 5. Copies of warranties. Include procedures to follow and required notifications for warranty claims.

2.03 <u>RECORD DRAWINGS</u>

A. Record Prints: Maintain a set of prints of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued. Mark to show actual

installation where installation varies from that shown originally. Accurately record information in an acceptable drawing technique.

- 1. Record drawings are to be updated at a minimum weekly.
- 2. Review markings with Architect and Owner at Project Meetings.
- 3. Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
- B. Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect.

PART 3 – EXECUTION

3.01 EXAMINATION AND PREPARATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
 - 1. Comply with the "Underground Utility Damage Prevention System" per NH RSA 374 by notification to DIG-SAFE SYSTEM, Inc., of intent to excavate within 100 feet of an underground utility. Contact DIG-SAFE at least seventy-two (72) hours in advance of starting any excavation.
- B. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.
- C. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- D. Space Requirements: Verify space requirements and dimension of items shown diagrammatically on Drawings.

3.02 CONSTRUCTION LAYOUT AND FIELD ENGINEERING

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
- C. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

3.03 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
- B. Comply with manufacturers written instructions and recommendations for installing products in applications indicated.
- C. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- D. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed.
- E. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place. Where size and type of attachments are not indicated, verify size and type required for load conditions.
- F. Joints: Make joints uniform in width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- G. Use products, cleaners, and installation materials that are not considered hazardous.

3.04 CUTTING AND PATCHING

- A. Temporary Support: Provide temporary support of work to be cut.
- B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

- C. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.
- D. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installers written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering, and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
- E. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
 - 1. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into adjoining construction in a manner that will minimize evidence of patching and refinishing.
 - 2. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance.

3.05 <u>CLEANING</u>

- A. General: Clean Project site and work areas daily, including common areas. Dispose of materials lawfully.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
 - 3. Remove debris from concealed spaces before enclosing space.
- B. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion:
 - 1. Clean Project site, yard, and grounds, in areas disturbed by construction activities. Sweep paved areas; remove stains, spills, and foreign deposits. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - 2. Remove labels that are not permanent.
 - 3. Clean transparent materials, including mirrors. Remove excess glazing compounds.
 - 4. Clean exposed finishes to a dust-free condition, free of stains, films, and foreign substances. Sweep concrete floors broom clean.
 - 5. Vacuum carpeted surfaces and wax resilient flooring.
 - 6. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and foreign substances. Clean plumbing fixtures. Clean light fixtures, lamps, globes, and reflectors.

7. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

3.06 OPERATION AND MAINTENANCE MANUAL PREPARATION

- A. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
- B. Manufacturer's Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - 1. Prepare supplementary text if manufacturers' standard printed data are unavailable and where the information is necessary for proper operation and maintenance of equipment or systems.
- C. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams.

3.07 DEMONSTRATION AND TRAINING

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system. Include detailed review of the following:
 - 1. Include instructions for basis of system design and operational requirements, review of documentation, emergency procedures, operations, adjustments, troubleshooting, maintenance, and repairs.

END OF EXECUTION AND CLOSEOUT REQUIREMENTS

SECTION 02 01 00

EXISTING UTILITIES AND UNDERGROUND STRUCTURES

PART 1 – GENERAL

1.1 DESCRIPTION

- A. The Engineer and Owner have made limited investigations to determine the locations of underground utilities and structures. Because of the nature of subsurface utilities and the difficulty in determining exact locations, the locations as shown on the plans should be considered approximate. Wherever underground utilities are encountered by the Contractor during construction they shall be protected by the Contractor, at his own expense, until the construction work is complete and the existing structures are made secure. Injury to any such utilities/structures caused by or resulting from the Contractor's work shall be repaired at the Contractor's expense. No additional compensation will be allowed for any delays sustained by the Contractor due to any interference from underground utilities.
- **B.** It shall be the Contractor's responsibility to notify Dig Safe and locate all utilities within the construction area prior to proceeding with construction.
- **C.** The restoration of existing property shall be done as promptly as practicable and shall not be left until the end of the construction period.
- **D.** Cooperation with Utilities:
 - 1. The Contractor shall allow the Owner or its agents and other contractors, and public service corporations, or their agents, to enter upon the work for the purpose of constructing, maintaining, repairing, removing, altering or replacing such pipes, sewers, conduits, manholes, wires, poles, or other structures and appliances as are now located or as may be required or permitted at or on the work by the Engineer.
 - 2. The Contractor shall cooperate with all aforesaid parties and shall allow reasonable facilities for the prosecution of any other work by the Owner, or of public service corporation, to be done in connection with this work. Care shall be taken at all times to inconvenience abutters as little as possible.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

End of Section

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SECTION 03 30 53

CAST-IN-PLACE CONCRETE – SITE

PART 1 – GENERAL

1.1 SUMMARY

A. This Section specifies cast-in-place concrete, including formwork, reinforcing, mix design, placement procedures, and finishes for work 5 feet outside the face of a building. See also Cast-in-Place Concrete – Architectural.

1.2 SUBMITTALS

- A. General: Provide submittals in accordance with Specification 01 30 00.
- **B.** Manufacturer's Data: Provide manufacturer's data with installation instructions for proprietary materials including reinforcement and forming accessories, admixtures, joint materials, hardeners, curing materials, bonding compounds, sealing compounds, and others as requested by Engineer.
- **C.** Test Reports: Laboratory test or evaluation reports for concrete materials and mix designs that include (1) compressive strength test results, (2) corresponding slump and watercement ratio, (3) weights and test results of the ingredients, and (4) other physical properties necessary to check each mix design. Provide reports from the concrete supplier certifying that all concrete materials comply with the specifications and all test requirements. All test reports including compressive strength tests must be less than 12 months old.
- **D.** Ready-Mixed Concrete Truck Delivery Tickets: Each load of ready-mixed concrete delivered to the job site shall be accompanied by a delivery ticket showing the information listed in ASTM C94.

1.3 QUALITY ASSURANCE

- A. All concrete testing will be done in accordance with the Contract to demonstrate conformance with the specified requirements for cast-in-place concrete. The Owner will provide the services of an Engineer-approved independent testing laboratory that shall comply with the requirements of ASTM E329. Costs of testing laboratory services shall be borne by the Owner unless otherwise specified.
- **B.** Codes and Standards: ACI 301, "Specifications for Structural Concrete Buildings"; ACI 318, "Building Code Requirements for Reinforced Concrete"; comply with applicable provisions except as otherwise indicated.

- C. Quality Control: Perform sampling and testing during concrete placement, as follows:
 - 1. Sampling: ASTM C172 and C31.
 - 2. Slump: ASTM C143, one of test for each load at point of discharge.
 - 3. Air Content: ASTM C173, one for each set of compressive strength specimens.
 - 4. Compressive Strength: ASTM C39, one set for each 50 cubic yards or fraction thereof of each class of concrete; one specimen tested at 7 days, one specimen tested at 28 days, and one retained for later testing if required.
 - 5. When the total quantity of a given class of concrete is less than 50 cubic yards, Engineer may waive strength tests if field experience indicates evidence of satisfactory strength.
 - 6. If compressive test results indicate concrete in place may not meet structural requirements, tests shall be made to determine if the structure or portion thereof is structurally sound. Tests may include, but not be limited to, cores in accordance with ASTM C42 and any other analyses or load tests acceptable to the Engineer. Costs of such tests shall be borne by the Contractor.
- **D.** Test results will be reported in writing to Engineer, Contractor, and concrete producer within 24 hours after tests are made.
- **E.** Mix Proportions and Design: Proportion mixes complying with mix design procedures specified in ACI 301.
 - 1. Submit written report to Engineer for each proposed concrete mix at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed and are acceptable to Engineer.
 - 2. Mix designs may be adjusted when material characteristics, job conditions, weather, test results, or other circumstances warrant. Do not use revised concrete mixes until submitted to and accepted by Engineer.
 - 3. Classes of concrete are:

	Class	Class	Class	Class
	AA	А	В	С
28 Day Comp. Strength	4000	3000	3000	2000
(PSI)				
Max. Water-Cement Ratio	0.444	0.464	0.488	0.532
(LB/LB)				
Min. Cement Factor	658	611	564	489
(LBS/CY)				
Entrained Air Content (%)	5 - 8	4 - 7	3 - 6	3 - 6
Slump (Inches)	2 - 3	2 - 4	1 - 3	0 - 4

PART 2 – PRODUCTS

2.1 MATERIALS

A. Concrete Class: Unless otherwise specified, all concrete shall be Class AA.

B. Concrete Materials

- 1. Portland Cement: ASTM C150, Type II unless otherwise specified
- 2. Aggregates: ASTM C33, except local aggregates of proven durability may be used when acceptable to Engineer.
- 3. Water: Drinkable
- 4. Air-Entraining Admixture: ASTM C260
- 5. Water-Reducing Admixture: ASTM C494; type as required to suit project conditions. Use only admixtures that have been tested and accepted in mix designs.
- C. Related Materials
 - 1. Waterstop: Flat dumbbell or centerbulb type, size to suit joints, of either rubber (CRD C 513) or PVC (CRD C 572). Hydrophilic waterstop shall be Adeka Ultra Seal, by Asahi Denka Kogyo K.K.; Hydrotite CJ-1020-2K by Sika; or approved equal.
 - 2. Moisture Barrier: Clear 15-mils-thick polyethylene; polyethylene-coated barrier paper; 1/8-inch-thick asphalt core membrane sheet.
 - 3. Membrane-Forming Curing Compound: ASTM C309, Type I.
 - 4. Joint Fillers: See Division 07.
 - 5. Concrete Floor Sealer: Concrete floor sealer/hardener shall be Curecrete Ashford Formula, Sonneborn Lapidolith or approved equal.
 - 6. Crystalline Waterproofing: Waterproofing shall be Xypex or Euclid Chemical HEY'DI crystalline waterproofing. Waterproofing shall consist of one coat of Xypex Concentrate applied at the rate of 1-1/2 pounds per square yard of concrete surface and one coat of Xypex Modified applied at the rate of 1-1/2 pounds per square yard of concrete surface.

D. Form Materials

- 1. Provide form materials with sufficient stability to withstand pressure of placed concrete without bow or deflection.
- 2. Exposed Concrete Surfaces: Suitable material to suit project conditions.
- 3. Form Liners: Rigid polymer sheets such as Sika Greenstreak Uni-Cast, Multi-Cast, or Dura-Cast, or approved equal, where specified.
- E. Reinforcing Materials

- 1. Deformed Reinforcing Bars: ASTM A615, Grade 60, unless otherwise indicated. ASTM A616 or ASTM A617 steel shall not be used. Bars provided as dowels for future construction and bars where specified shall be epoxy-coated in conformance with ASTM A775.
- 2. Welded Wire Fabric: ASTM A185.
- 3. Tie Wire: Minimum 16 gage annealed steel conforming to FEDSPEC QQ-W-461H.
- 4. Bar Supports: Concrete block supports shall be provided for footing and slabs on grade. Stainless steel or plastic protected plain steel supports shall be provided for other work.
- F. Epoxy Grout For Dowel Anchorage and Crack Repair
 - Except as noted below, epoxy grout shall be a high modulus, two-component, moisture insensitive, 100 percent solids, and thermosetting modified polyamide epoxy compound. The consistency shall be a paste form capable of not sagging in horizontal or overhead anchoring configurations. Material shall conform to ASTM C881 Type 1, Grade 3, such as Sika Corporation Sikadur AnchorFix-4, Adhesive Technology Corporation Ultrabond HS-200, or equal, and shall have a heat deflection temperature in excess of 130 degrees F.
 - Epoxy for pressure grouting/crack injection shall be a two-component, moisture insensitive, high modulus, injection grade, 100 percent solids, and blend of epoxyresin compounds. The consistency shall be as required to achieve complete penetration in hairline cracks and larger. Material shall conform to ASTM C881 Type 1 Grade 1, such as Sika Corporation Sikadur 52, Adhesive Technology Corporation SLV 300 series, or equal.
- **G.** Bonding Compounds
 - Epoxy resin bonding compounds shall be used for wet areas and shall be Sika Chemical Corporation, Sikadur 35 Hi-Mod LV, Sikadur 32 Hi-Mod, or Sikadur 31 Hi-Mod Gel as applicable; or equal. Nonepoxy bonding compounds shall be used for dry areas and shall be Thoro System Products Acryl 60, Thorobond, or equal. Bonding compounds shall be applied in accordance with the manufacturer's written instructions.

PART 3 – EXECUTION

3.1 FORMING AND PLACING CONCRETE

- **A.** Job-Site Mixing: Use drum-type batch machine mixer, mixing not less than 1-1/2 minutes for one cu. yd. or smaller capacity. Increase mixing time at least 15 seconds for each additional cu. yd. or fraction thereof.
- **B.** Ready-Mix Concrete: ASTM C94.

- C. Formwork: Construct so that concrete members and structures are of correct size, shape, alignment, elevation, and position. Formwork shall be installed in accordance with ACI 347. All exposed corners and edges shall have a formed chamfered surface.
- **D.** Provide openings in formwork to accommodate work of other trades. Accurately place and securely support items built into forms.
- **E.** Clean and adjust forms prior to concrete placement. Apply form-release agents or wet forms, as required. Re-tighten forms during concrete placement if required to eliminate mortar leaks.
- F. Reinforcement
 - 1. Reinforcing steel shall be cleaned of mill rust scale, dried concrete, or other coatings that may reduce bond. Reinforcement reduced in section is not acceptable. When concrete placement is delayed, reinforcement shall be cleaned by sandblasting if directed by the Engineer.
 - 2. Position, support, and secure reinforcement against displacement. Locate and support with metal chairs, runners, bolsters, spacers, and hangers, as required. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces. Install welded wire fabric in as long lengths as practicable, lapping at least one mesh.
- **G.** Joints: Provide construction, isolation, and control joints as indicated or required. Locate construction joints so as not to impair strength and appearance of structure. Place isolation and control joints in slabs-on-ground to stabilize differential settlement and random cracking.
- **H.** Installation of Embedded Items: Set and build into work anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting diagrams, templates, and instructions provided by others for locating and setting.
- **I.** Concrete Placement: Comply with ACI, placing concrete in a continuous operation within planned joints or sections. Do not begin placement until work of other trades affecting concrete is completed.
- **J.** Consolidate placed concrete using mechanical vibrating equipment with hand rodding and tamping, so that concrete is worked around reinforcement and other embedded items and into forms.
- **K.** Protect concrete from physical damage or reduced strength due to weather extremes during mixing, placing, and curing.

- 1. In cold weather (ambient air temperature below 40 degrees F), comply with ACI 306.
- 2. In hot weather (ambient air temperature above 80 degrees F), comply with ACI 305.
- L. Repair of Surface Defects: Surface defects, including tie holes, minor honeycombing, or otherwise defective concrete shall be repaired in accordance with ACI 301 Chapter 9. Areas to be patched shall be cleaned. Patches on exposed surfaces shall be finished to match the adjoining surfaces after they have set. Patches shall be cured as specified for the concrete.

3.2 CONCRETE FINISHES

- A. Exposed-to-View Surfaces in General: Provide a smooth finish for exposed concrete surfaces and surfaces to be covered with a coating or covering material applied directly to concrete. Remove fins and projections, patch defective areas with cement grout, and rub smooth.
- **B.** Steel Trowel Finish: Apply steel trowel finish in accordance with ACI 301 Section 11.7.3 to monolithic slab surfaces that are exposed to view or are to be covered with resilient flooring, paint, or other thin film coating. Consolidate concrete surfaces by finish troweling, free of trowel marks, and uniform in texture.
- **C.** Float Finish: Apply float finish in accordance with ACI 301 Section 11.7.2 to surfaces of channel and tank bottom slabs and to footings. Floating shall be performed with a hand or power-driven float. Floating of any one area shall be the minimum necessary to produce the finish specified. Floating shall compact and smooth the surface and close any cracks and checking of surfaces.
- **D.** Broomed Finish: Apply broomed finish in accordance with ACI 301 Section 11.7.4 for walks, tops of walls, wet well floors, and where otherwise specified.
- **E.** Curing: Begin initial curing as soon as free water has disappeared from exposed surfaces or immediately after final troweling. Where possible, keep continuously moist for not less than 72 hours. Continue curing by use of moisture-retaining cover or membrane-forming curing compound. Cure formed surfaces by moist curing until forms are removed. Provide protections as required to prevent damage to exposed concrete surfaces.

3.3 WATERTIGHTNESS, TESTING, AND REPAIR

A. Concrete tanks and channels that have walls or slabs that are subjected to hydrostatic pressure shall be tested for water-tightness. The tests shall be made prior to application of waterproofing coating. Testing shall consist of filling the tank or channel with water to the maximum operating water surface for at least 24 hours. Wet spots, leakage, or seepage revealed by the test, including those caused by shrinkage of concrete,

honeycombed areas, construction joints, or other sources shall be repaired by either or both of the following methods:

- 1. Grouting of the joint by drilling grout holes to the affected crack or honeycombed area, installing injection ports, and forcing expansive urethane grout into the joint under pressure.
- Cutting of a bevel groove on the water side of the joint. The groove shall be ¹/₂- to ³/₄-inch in width and depth and shall be caulked with joint sealer in accordance with manufacturer's instructions.

3.4 DISINFECTION

A. Perform wet well disinfection in accordance with AWWA C653. The Contractor shall provide for disinfection after the work has been completed. All oil, grease, soil, and other materials that could harbor and protect bacteria from disinfectants shall be removed from all surfaces exposed to water. Equipment shall be installed prior to or during disinfection and be thoroughly hosed, scrubbed or otherwise cleaned of foreign material.

3.5 <u>CLEANUP</u>

A. Upon completion of the work and prior to final inspection, the Contractor shall clean all concrete surfaces, except outside sidewalks or paved areas and those having curing and sealing compound.

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SECTION 03 41 00

STRUCTURAL PRECAST CONCRETE

PART 1 – GENERAL

1.1 SUMMARY

- A. Extent of structural precast concrete work is shown on drawings and in schedules.
- **B.** Structural precast concrete includes the following:
 - 1. Precast piers
 - 2. Manholes
 - 3. Septic tanks
 - 4. Leaching chambers and D box
 - 5. Concrete piers

1.2 SUBMITTALS

- A. General: Provide submittals in accordance with Specification 01 30 00.
- **B.** Product Data: Submit manufacturer's specifications and instructions for manufactured materials and products. Include manufacturer's certifications and laboratory test reports as required. Indicate standard component configurations, design loads, deflections, cambers, and bearing requirements.
- **C.** Mix Designs: Submit written reports of proposed concrete mix as specified in Part-2 of this section.
- **D.** Shop Drawings: Submit shop drawings showing complete information for fabrication and installation of precast concrete units. Indicate member dimensions and cross-section; location, size and type of reinforcement, including special reinforcement and lifting devices necessary for handling and erection.
- **E.** Indicate layout, dimensions, and identification of each precast unit corresponding to sequence and procedure of installation. Indicate welded connections by AWS standard symbols. Detail inserts, connections, and joints, including accessories and construction at openings in precast units.
- **E.** Provide location and details of anchorage devices that are to be embedded in other construction. Furnish templates if required for accurate placement.
- F. Include erection procedure for precast units and sequence of erection.

H. Provide complete design calculations prepared by a registered engineer, licensed in State where project is erected.Samples: Provide samples of bearing pads.

1.3 QUALITY ASSURANCE

- **A.** Codes and Standards: Comply with provisions of following codes, specifications and standards, except as otherwise indicated:
 - 1. ACI 301 "Specifications for Structural Concrete for Buildings.
 - 2. ACI 318 "Building Code Requirements for Reinforced Concrete".
 - 3. Concrete Reinforcing Steel Institute, "Manual of Standard Practice".
 - 4. Prestressed Concrete Institute MNL 116, "Manual for Quality Control for Plants and Production of Precast Concrete Products".
- **B.** Fabricator Qualifications: Firms which have 2 years successful experience in fabrication of precast concrete units similar to units required for this project will be acceptable. Fabricator must have sufficient production capacity to produce required units without causing delay in work.
 - 1. Fabricator must be producer member of the Prestressed Concrete Institute (PCI) and/or participate in its Plant Certification Program.
- **C.** Design by Fabricator: Design precast slab units to support superimposed dead loads and live loads as indicated on drawings and as required for compliance with State Building Code requirements.
- **D.** Fabrication Qualifications: Produce precast concrete units at fabricating plant engaged primarily in manufacturing of similar units, unless plant fabrication or delivery to project site is impractical.
- **E.** If units are not produced at precast concrete fabricating plant, maintain procedures and conditions for quality control which are equivalent to plant production.
- **F.** Fire-resistance Rated Precast Units: Where precast concrete units are shown or scheduled as requiring fire-resistance classification, provide units tested and listed by U.L. in "Fire Resistance Directory", or with each unit bearing U.L. label and marking.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver precast concrete units to project site in such quantities and at such times to assure continuity of installation. Store units at project site to prevent cracking, distortion, staining, or other physical damage, and so that markings are visible. Lift and support units at designated lift points.

B. Deliver anchorage items which are to be embedded in other construction before start of such work. Provide setting diagrams, templates, instructions and directions as required for installation.

PART 2 – PRODUCTS

2.1 FORMWORK

- **A.** Provide forms and, where required, form facing materials of metal, plastic, wood, or other acceptable material that is non-reactive with concrete and will produce required finish surfaces.
- **B.** Accurately construct forms, mortar-tight, of sufficient strength to withstand pressures due to concrete placing operations, temperature changes, and when prestressed, pretensioning and detensioning operations. Maintain formwork to provide completed precast concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified in PCI MNL 116.
- **C.** Unless forms for plant-manufactured prestressed concrete units are stripped prior to detensioning, design forms so that stresses are not induced in precast units due to deformation of concrete under prestress or to movement during detensioning.

2.2 <u>REINFORCING MATERIALS</u>

- A. Reinforcing Bars: ASTM A 615, Grade 60, unless otherwise indicated.
- **B.** Low-Alloy Steel Reinforcing Bars: ASTM A 706.
- **C.** Galvanized Reinforcing Bars: ASTM A 767, Class II (2.0 oz. zinc psf), hot-dip galvanized after fabrication and bending.
- **D.** Steel Wire: ASTM A 82, plain, cold-drawn, steel.
- **E.** Welded Wire Fabric: ASTM A 185.
- **F.** Welded Deformed Steel Wire Fabric: ASTM A 497.
- **G.** Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing, complying with CRSI recommendations.
 - 1. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).

2.3 PRESTRESSING TENDONS

- **A.** Uncoated, 7-wire stress-relieved strand complying with ASTM A 416. Use Grade 250 unless Grade 270 indicated.
- **B.** Strand similar to above, but having size and ultimate strength of wires increased so that ultimate strength of the strand is increased approximately 15 percent, or strand with increased strength but with fewer number of wires per strand, may be used at manufacturer's option.

2.4 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type III.
- **B.** Use only one brand and type of cement throughout project, unless otherwise acceptable to Architect.
- **C.** Aggregates: ASTM C 33, and as herein specified. Provide aggregates from a single source for exposed concrete.
 - 1. Local aggregates not complying with ASTM C 33, but which have shown by special test or actual service to produce concrete of adequate strength and durability, may be used when acceptable to Architect.
 - 2. Aggregate, Sand, Water, Admixtures: Determined by precast fabricator as appropriate to design requirements and PCI MNL-116.
- **D.** Lightweight Aggregate: ASTM C 330.
- **E.** Water: Potable.
- **F.** Air-Entraining Admixture: ASTM C 260.
- **G.** Water-Reducing Admixture: ASTM C 494, Type A, or other Type approved for fabricator's units.
- H. Structural Precast Concrete Piers: Basis-of-design Product: Michie Corporation.
- **I.** Other Cementitious Materials:
 - 1. Fly Ash or Natural Pozzolans: Comply with ASTM C618.
 - 2. Ground Granulated Blast Furnace Slag: ASTM C989/C989M.
 - 3. Silica Fume: Comply with ASTM C1240.

2.5 CONNECTION MATERIALS

- A. Steel Plates: Structural quality, hot-rolled carbon steel, ASTM A 283, Grade C.
- **B.** Steel Shapes: ASTM A 36.
- **C.** Anchor Bolts: ASTM A 307, low-carbon steel bolts, regular hexagon nuts and carbon steel washers.
- **D.** High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon bolts, and hardened washers complying with ASTM A 324.
- **E.** Finish of Steel Units: Exposed units galvanized per ASTM A 153; others painted with rust-inhibitive primer.
- F. Bearing Pads: Provide bearing pads for precast concrete units as indicated on drawings.
 - 1. Elastomeric Pads: Vulcanized, chloroprene elastomeric compound, molded to size or cut from a molded sheet, 50-60 shore A durometer.
 - 2. Laminated Fabric-Rubber Pads: Preformed, unused synthetic fibers and new, unvulcanized rubber. Surface hardness of 70-80 shore A durometer.
 - 3. Frictionless Pads: Tetrafluoroethylene (TFE), with glass fiber reinforcing as required for service load bearing stress.
 - 4. Tempered Hardboard Pads: Smooth both sides.
- G. Welding Electrodes: Comply with AWS standards.
- **H.** Accessories: Provide clips, hangers, and other accessories required for installation of project units and for support of subsequent construction or finishes.
- I. Reinforcing Steel: ASTM A615/A615M, Grade 40 (40,000 psi) (280 MPa).

2.6 GROUT MATERIALS

- **A.** Cement Grout: Portland cement, ASTM C 150, Type I, and clean, natural sand, ASTM C 404. Mix at ratio of 1.0 part cement to 3 parts sand, by volume, with minimum water required for placement and hydration.
- **B.** Metallic Shrinkage-Resistant Grout: Pre-mixed factory-packaged ferrous aggregate grouting compound.
 - 1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
 - 2. Products: Subject to compliance with requirements, provide one of the following:

- a. Firmix; Euclid Chemical Co.
- b. Embeco 153; Master Builders.
- c. Ferrolith G; Sonneborn/Building Products.
- d. Kemox C; Sika Chemical.
- e. Vibra-Foil; W.R. Grace.
- **C.** Non-metallic Shrinkage-Resistant Grout: Pre-mixed, non-metallic, non-corrosive, non-staining product containing selected silica sands, Portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with CRD-C621.
 - 1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Euco N.S.; Euclid Chemical Co.
 - b. Crystex; L&M Construction Chemicals.
 - c. Masterflow 713; Master Builders
 - d. Five Star Grout; U.S. Grout Corp.
 - e. Upcon; Upco Chem. Div., USM Corp.
 - f. Propak; Protex Industries, Inc.
 - g. Set Non-Shrink; Set Products, Inc.

2.7 PROPORTIONING AND DESIGN OF MIXES

- A. Prepare design mixes for each type of concrete required.
- **B.** Design mixes may be prepared by independent testing facility or by qualified precast manufacturing plant personnel, at precast manufacturer's option.
- **C.** Proportion mixes by either laboratory trail batch or field experience methods, using materials to be employed on the project for each type of concrete required, complying with ACI 318.
 - 1. Produce standard-weight concrete consisting of specified portland cement, aggregates, admixtures, and water to produce the following properties.
 - a. Compressive strength; 5000 psi minimum at 28 days. Release strength for prestressed units: 3500 psi.
 - 2. Produce lightweight concrete consisting of specified portland cement, aggregates, admixtures, and water to produce the following properties:
 - a. Compressive strength; 5000 psi minimum at 28 days.

- b. Air-dry density; not less than 90 nor more than 115 lbs. per cu. ft.
- c. Release strength for prestressed units: 3500 psi.
- 3. Cure compression test cylinders using same methods as used for precast concrete work.
- **D.** Submit written reports to Architect of proposed mix for each type of concrete at least 15 days prior to start of precast unit production. Do not begin concrete production until mixes and evaluations have been reviewed by Architect.
- **E.** Adjustment to Concrete Mixes: Mix design adjustments may be requested when characteristics of materials, job conditions, weather, test results, or other circumstances warrant. Laboratory test data for revised mix designs and strength results must be submitted to and accepted by Architect before using in the work.
- **F.** Admixtures:
 - 1. Use air-entraining admixture in concrete, unless otherwise indicated.
 - 2. Use water-reducing admixtures in strict compliance with manufacturer's directions. Admixtures to increase cement dispersion, or provide increased workability for low-slump concrete, may be used subject to Architect's acceptance.
 - 3. Use amounts as recommended by admixture manufacturer for climatic conditions prevailing at time of placing. Adjust quantities of admixtures as required to maintain quality control.

2.8 FABRICATION

- A. General: Fabricate precast concrete units complying with manufacturing and testing procedures, quality control recommendations, and dimensional tolerances of PCI MNL-116, and as specified for types of units required.
- **B.** Job-Site Casting: Use ready-mix concrete for units produced at location other than precast concrete fabricating plant, complying with ASTM C 94.
- C. Ready-Mix Concrete: Comply with requirements of ASTM C 94, and as herein specified.
 - 1. Delete references for allowing additional water to be added to batch for material with insufficient slump. Addition of water to batch will not be permitted.
- **D.** During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required.
 - 1. When the air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hour to 75 minutes and when air

temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

- **E.** Cast-in holes for openings larger than 10" diameter or 10" square in accordance with final shop drawings. Other smaller holes will be field cut by trades requiring them, as acceptable to Architect.
- **F.** Coat surfaces of forms with bond-breaking compound before reinforcement is placed. Provide commercial formulation form- coating compounds that will not bond with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces requiring bond or adhesion. Apply in compliance with manufacturer's instructions.
- G. Clean reinforcement of loose rust and mill scale, earth and other materials which reduce or destroy bond with concrete.
- **H.** Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers and hangers, as required.
- I. Place reinforcement to obtain at least the minimum coverages for concrete protection. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- **J.** Pretensioning of tendons for prestressed concrete may be accomplished either by single strand tensioning method or multiple-strand tensioning method. Comply with PCI MNL-116 requirements.
- **K.** Place concrete in a continuous operation to prevent formation of seams or planes of weakness in precast units, complying with requirements of ACI 304. Thoroughly consolidate placed concrete by internal and external vibration without dislocation or damage to reinforcement and built-in items.
- **L.** Identification: Provide permanent markings to identify pick-up points and orientation in structure, complying with markings indicated on final shop drawings. Imprint date of casting on each precast unit on a surface which will not show in finished structure.
- **M.** Curing by low-pressure steam, by steam vapor, by radiant heat and moisture, or other similar process may be employed to accelerate concrete hardening and to reduce curing time.
- **N.** Delay detensioning of prestressed units until concrete has attained at least 70 percent of design stress, as established by test cylinders.

- **O.** If concrete has been heat-cured, perform detensioning while concrete is still warm and moist, to avoid dimensional changes which may cause cracking or undesirable stresses in concrete.
- **P.** Detensioning of pretensioned tendons may be accomplished either by gradual release of tensioning jacks or by heat cutting tendons, using a sequence and pattern to prevent shock or unbalanced loading.
- **Q.** Finish of Formed Surfaces: Provide finishes for formed surfaces of precast concrete as indicated for each type of unit, and as follows:
 - 1. Standard Finish: Normal plant run finish produced in forms that impart a smooth finish to concrete. Small surface holes caused by air bubbles, normal form joint marks, and minor chips and spalls will be tolerated, but no major or unsightly imperfections, honeycomb, or structural defects will be permitted.
 - 2. Commercial Finish: Remove fins and large protrusions and fill large holes. Rub or grind ragged edges. Faces to be true, well-defined surfaces.
 - 3. Ensure exposed-to-view finish surfaces of precast concrete members are uniform in color and appearance.
- **S.** Finish of Unformed Surfaces: Apply trowel finish to unformed surfaces unless otherwise indicated. Consolidate concrete, bring to proper level with straightedge, float, and trowel to a smooth uniform finish.
 - 1. Apply scratch finish to precast units which will receive concrete topping after installation. Following initial strikeoff, transversely scarify surface to provide ridges approximately 1/4" deep.

2.9 STRUCTURAL FRAMING UNITS

- A. Type: Precast prestressed concrete units produced under a rigidly inspected process.
- **B.** Furnish units which are free of voids or honeycomb, with straight true edges and surfaces.Provide "Standard Finish" units as specified.
- **D.** Where ends of strands will not be enclosed or covered, cut flush and cover with a high strength mortar bonded with an epoxy resin bonding agent.
- **E.** Fabrication: Manufacture units of concrete materials which will provide a minimum 3500 psi compressive strength at time of initial prestress and a 28-day strength of 5000 psi.
- **F.** Adequately reinforce units to resist transporting and handling stresses.Include cast-in weld plates where required for anchorage or lateral bracing to other supporting members.

H. Coordinate with other trades for the installation of items to be cast-in precast structural framing units.

2.10 SOURCE QUALITY CONTROL

- **A.** The Owner may employ a separate testing laboratory to evaluate precast manufacturer's quality control and testing methods.
- **B.** The precast manufacturer shall allow Owner's testing facility access to materials storage areas, concrete production equipment and concrete placement and curing facilities. Cooperate with Owner's testing laboratory and provide samples of materials and concrete mixes as may be requested for additional testing and evaluation.
- **C.** Dimensional Tolerances: Units having dimensions smaller or greater than required, and outside specified tolerance limits, will be subject to additional testing as herein specified.
- **D.** Precast units having dimensions greater than required will be rejected if appearance or function of the structure is adversely affected, or if larger dimensions interfere with other construction. Repair, or remove and replace rejected units as required to meet construction conditions.
- **E.** Strength of Units: The strength of precast concrete units will be considered potentially deficient if the manufacturing processes fail to comply with any of the requirements which may affect the strength of the precast units, including the following conditions.
 - 1. Failure to meet compressive strength tests requirements.
 - 2. Reinforcement, and pretensioning and detensioning of tendons of prestressed concrete, not conforming to specified fabrication requirements.
 - 3. Concrete curing, and protection of precast units against extremes in temperature, not as specified.
 - 4. Precast units damaged during handling and erection.
- **F.** Testing Precast Units: When there is evidence that strength of precast concrete units does not meet specification requirements, the concrete testing service shall take cores drilled from hardened concrete for compressive strength determination, complying with ASTM C 42 and as follows:
 - 1. Take at least 3 representative cores from precast units of suspect strength, from locations directed by Architect.

- 2. Test cores in a saturated-surface-dry condition per ACI 318 if concrete will be wet during use of completed structure.
- 3. Test cores in an air-dry condition per ACI 318 if concrete will be dry during use of completed structure.
- 4. Strength of concrete for each series of cores will be considered satisfactory if their average compressive strength is at least 85 percent of 28-day design compressive strength.
- 5. Test results will be made in writing on same day that tests are made, with copies to Architect, Contractor, and precast manufacturer. Include in test reports the project identification name and number, date, name of precast concrete manufacturer, name of concrete testing service, identification letter, name, and type of member or members represented by core tests, design compressive strength compression breaking strength and type of break (corrected for length-diameter ratio), direction of applied load to core with respect to horizontal plan of concrete as placed, and moisture condition of core at time of bearing.
- **G.** Patching: Where core test results are satisfactory and precast units are acceptable for use in work, fill core holes solid with patching mortar, and finish to match adjacent concrete surfaces.
- **H.** Defective Work: Precast concrete units which do not conform to specified requirements, including strength, tolerances, and finishes, shall be replaced with precast concrete units that meet requirements of this section. Contractor shall also be responsible for cost of corrections to other work affected by or resulting from corrections to precast concrete work.

PART 3 – EXECUTION

3.1 INSTALLATION GENERAL

- A. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.
 - 1. Erect members without damage to structural capacity, shape, or finish. Replace or repair damaged members.
- **B.** Bearing Pads: Install flexible bearing pads where indicated, as precast units are being erected. Set pads on level, uniform bearing surfaces and maintain in correct position until precast units are placed.

- **C.** Welding: Perform welding in compliance with AWS D 1.1, including qualification of welders.
 - 2. Protect units from damage by field welding or cutting operations and provide non-combustible shield as required.
 - 3. Repair damaged metal surfaces by cleaning and applying a coat of liquid galvanizing repair compound to galvanized surfaces and compatible primer to painted surfaces.
- **D.** Powder-Actuated Fasteners: Do not used powder-actuated fasteners for surface attachment of accessory items in precast, prestressed unit unless otherwise accepted by precast manufacturer.
- **E.** Erection Tolerances: Install precast units without exceeding following tolerance limits specified in PCI MNL-127 "Recommended Practice for Erection of Precast Concrete".
 - 1. Grouting Connections and Joints: After precast concrete units have been placed and secured, grout open spaces at connection and joints as follows:
 - a. Cement grout consisting of 1 part Portland cement, 2-1/2 parts sand, and only enough water to properly mix and for hydration.
 - 2. Grouting Connections and Joints: After precast concrete units have been placed and secured, grout open spaces at connection and joints as follows:
 - a. Resistant grout consisting of premixed compound and water to provide a flowable mixture without segregation or bleeding.
 - 3. Provide forms or other acceptable method to retain grout in place until sufficiently hard to support itself. Pack spaces with stiff grout material, tamping until voids are completely filled. Place grout to finish smooth, plumb, and level with adjacent concrete surfaces.
 - 4. Keep grouted joints damp for not less than 24 hours after initial set. Promptly remove grout material from exposed surfaces before it hardens.

End of Section

SECTION 04 43 02

SITE STONEWORK

PART 1 – GENERAL

1.01 SUMMARY

- A. Extent of stonework is shown on drawings and in the schedules. The work includes but is not necessarily limited to furnishing and installing the following:
 - 1. Barrier Rock
 - 2. Ledge Pack

1.02 SUBMITTALS

- A. Product Data: Submit specifications and other data for each type of stonework required. Include instructions for handling, storage, installation, and protection of each type.
- B. Samples: Submit sample 1-quart bag for ledge pack.

1.03 QUALITY ASSURANCE

- A. Source Quality Control:
 - 1. Obtain stone from quarry with consistent color range and texture throughout the work.
 - 2. Subcontract fabrication of stone to a firm which has successfully fabricated stone similar to the quality specified for a period of not less than 5 years and is equipped to provide the quantity shown and specified.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Protect stone during storage and construction against moisture, soiling, staining and physical damage.
- B. Handle stone to prevent chipping, breakage, soiling or other damage. Do not use pinch or wrecking bars without protecting edges of stone with wood or other rigid materials. Lift with wide-belt type slings; do not use wire rope or ropes containing substances which might cause staining. If required, use wood rollers and provide cushion at end of wood slides.
- C. Store stone on wood skids or pallets, covered with non-staining, waterproof covers. Place and stack skids and stones to distribute weight evenly and to prevent breakage or cracking of stones. Protect stored stone from weather with waterproof, non-staining covers or enclosures, but allow air to circulate around stones.

PART 2 - PRODUCTS

- 2.01 Contractor shall use the following materials in the construction. All stonework products shall be approved by the Landscape Architect prior to ordering or installing. All proposed substitutions shall be submitted to the Landscape Architect for review and approval.
 - A. Barrier Rock
 - a. Material: Boulders should be of native rock material. Rock shall be sound, free of rifts, seams, laminations, and minerals that could deteriorate as a result of weathering.
 - b. Finish: Natural, handle with care to avoid chips or scars from equipment
 - c. Size: Refer to plans and details

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- d. Source: On-site or local supplier
- e. Color: Tan/gray
- B. Ledge Pack
 - a. Material: Sur-Pac, Hard Pack, or approved equal
 - b. Finish: Crushed
 - c. Size: 3/8" minus with fines
 - d. Source: Local supplier
 - e. Color: Gray
 - f. Sieve Analysis:

Sieve Designation	Percent Passing	
3/8"	99%	
No. 4	65-85%	
No. 8	40-70%	
No.30	25-50%	
No. 50	20-25%	
No. 100	10-20%	
No. 200	5-10%	

PART 3 - EXECUTION

3.01 PREPARATION

A. Clean stone before setting by thoroughly scrubbing with fiber brushes followed by a thorough drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh fillers or abrasives.

3.02 INSTALLATION

- A Set stone in accordance with drawings and as directed by the Landscape Architect in the field.
- B. Install crushed Ledge Pack in 2" lifts to the depths identified in the plans and compact individually. Compact to 95% std. proctor to provide a firm and stable ADA-compliant surface.

3.03 ADJUST AND CLEAN

- A. Clean stonework not less than 6 days after completion of work, using clean water and stiffbristle brushes. Do not use wire brushes, acid type cleaning agents or other cleaning compounds with caustic or harsh fillers.
- B. Provide final protection and maintain conditions which ensures stonework being without damage, discolorations, or deterioration during subsequent construction and until time of substantial completion.

END OF SECTION

SECTION 06 10 00 ROUGH CARPENTRY

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide technical data on wood preservative materials and application instructions.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
 - 2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

2.02 EXPOSED DIMENSION LUMBER

- A. Submit manufacturer's certificate that products meet or exceed specified requirements, in lieu of grade stamping.
- B. Sizes: Nominal sizes as indicated on drawings.
- C. Surfacing: S4S.
- D. Moisture Content: S-dry or MC19.

2.03 EXPOSED TIMBERS

- A. Moisture Content: S-dry (23 percent maximum).
- B. Surfacing: S4S.
- C. Species: SYP & S-P-F.
- D. Grade: No. 2.

2.04 EXPOSED BOARDS

- A. Submit manufacturer's certificate that products meet or exceed specified requirements, in lieu of grade stamping.
- B. Moisture Content: S-dry (19 percent maximum).
- C. Surfacing: S4S.
- D. Species: S-P-F.
- E. Grade: No. 2, 2 Common, or Construction.

2.05 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations.
 - 2. Exterior structural wood screws for floor decking & roof decking. Basis-of-Design Product: FastenMaster Guard Dog 3" exterior wood screws.
- B. Die-Stamped Connectors: Hot dipped galvanized steel, sized to suit framing conditions.
- C. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.

2.06 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.

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1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.02 FRAMING INSTALLATION

- A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.
- B. Install structural members full length without splices unless otherwise specifically detailed.
- C. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AWC (WFCM) Wood Frame Construction Manual.
- D. Install horizontal spanning members with crown edge up and not less than 1-1/2 inches (38 mm) of bearing at each end.

END OF SECTION
SECTION 06 15 00 WOOD DECKING

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. AWC WCD2 Tongue and Groove Roof Decking; 2003.
- B. SPIB (GR) Standard Grading Rules; 2021.

1.02 SUBMITTALS

- A. See Section 01 30 00 Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate deck framing system, loads and cambers, bearing details, and framed openings.

PART 2 PRODUCTS

2.01 WOOD MATERIALS

- A. Lumber Decking: Fabricated to AWC WCD2.
 - 1. Species: S-P-F, graded under SPIB (GR) rules as AITC Select quality.
 - 2. Size: 2 by 6 (2 by 10), nominal.
 - 3. Pattern: AITC standard beveled V-joint with single tongue and groove.
 - 4. Moisture Content: 19 percent, maximum.

2.02 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Fastener Type and Finish: Hot-dipped galvanized steel for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

2.03 WOOD TREATMENT

A. Factory-Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.

PART 3 EXECUTION

3.01 INSTALLATION - BOARD DECKING

- A. Install decking perpendicular to framing members, with ends staggered over firm bearing.
- B. Engage decking tongue and groove edges.
- C. Secure with fasteners. Side spike planks together, through pre-drilled holes.

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SECTION 07 31 13 ASPHALT SHINGLES

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Provide data indicating material characteristics, performance criteria, and limitations.
- B. Shop Drawings: For metal flashings, indicate specially configured metal flashings, jointing methods and locations, fastening methods and locations, and installation details.
- C. Samples: Submit two samples of each shingle color indicating color range and finish texture/pattern ; for color selection.

1.02 WARRANTY

- A. Provide lifetime manufacturer's warranty for coverage against black streaks caused by algae.
- B. Provide 5-year manufacturer's warranty for wind damage.

PART 2 PRODUCTS

2.01 ASPHALT SHINGLES

- A. Asphalt Shingles: Asphalt-coated glass felt, mineral granule surfaced, complying with ASTM D3462/D3462M.
 - 1. Fire Resistance: Class A, complying with ASTM E108.
 - 2. Wind Resistance: Class A, when tested in accordance with ASTM D3161/D3161M.
 - 3. Fire or Wind Resistance Criteria: Provide UL (DIR) listed and labeled products.
 - 4. Warranted Wind Speed: Not greater than 90 mph (145 km/h).
 - 5. Algae resistant.
 - 6. Self-sealing type.
 - 7. Style: Laminated overlay.
 - 8. Color: As selected by Architect.
 - 9. Manufacturer: CertainTeed Roofing; Landmark Premium AR Algae Resistant Shingles.
 - 10. Manufacturer: GAF; Ultra HD Shingles with StainGuard Plus.
 - 11. Manufacturer: IKO Industries inc.; CAMBRIDGE.

2.02 SHEET MATERIALS

A. Underlayment: Asphalt-saturated organic roofing felt, unperforated, complying with ASTM D226/D226M, Type I, No. 15.

2.03 FLASHING

- A. Metal Flashings: Provide sheet metal eave edge, gable edge, and other flashing as indicated.
- B. Aluminum Flashing: Prefinished aluminum, 26 gauge, 0.017 inch (0.43 mm) minimum thickness.

2.04 ACCESSORIES

A. Roofing Nails: Standard round wire shingle type, galvanized steel, minimum 3/8-inch (9.5 mm) head diameter, 12-gauge, 0.109-inch (2.77 mm) nail shank diameter, 1 inch (25.4 mm) long and complying with ASTM F1667/F1667M.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Shingles:
 - 1. Install shingles in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
 - 2. Place shingles in straight coursing pattern with 5-inch (125 mm) weather exposure to produce double thickness over full roof area, and provide double course of shingles at eaves.

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SECTION 07 46 23 WOOD SIDING

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Provide manufacturer's data on materials, component profiles, fastening methods, jointing details, sizes, surface texture, finishes, and accessories; showing compliance with requirements, including:
- B. Samples: Submit two samples 12 by 12 inches (305 by 305 mm) in size illustrating surface texture.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

2.02 WOOD SIDING MATERIALS

- A. Board Siding for use on Shelters: Tapered siding with waney edge or live-edge, cut from 1 x 10 pine with 7" exposure. Taper from 3/4" to 1/4" tips.
- B. Board Siding for use on Kiosks: Vertical 1 x 6 pine tongue and groove paneling.
- C. Cedar Shingle Siding for use on the Pump House: Western Red Cedar 16" long, No. 2 Red label.

2.03 ACCESSORIES

A. Nails: Corrosion resistant type; nonstaining, of size and strength to securely and rigidly retain the work.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install siding, soffits, and trim in accordance with drawings.
- B. Fasten siding securely in place, level and plumb.
- C. Install wood siding horizontally with edges and ends over firm bearing.

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SECTION 09 91 13 EXTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
- B. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factoryapplied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Floors, unless specifically indicated.

1.02 SUBMITTALS

- A. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. MPI product number (e.g. MPI #47).
 - 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
- B. Samples: Submit two paper chip samples, 2 inch by 2 inch in size illustrating range of colors available for each surface finishing product scheduled.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
- B. See drawings for manufacturers and types.

2.02 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready-mixed, unless required to be a field-catalyzed paint.
 - 1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Supply each paint material in quantity required to complete entire project's work from a single production run.
 - 3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is described explicitly in manufacturer's product instructions.
- B. Colors: As indicated on drawings.
 - 1. Extend colors to surface edges.

2.03 PAINT SYSTEMS - EXTERIOR

- A. Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including primed wood.
 - 1. Two top coats and one coat primer.
 - 2. Top Coat(s): Exterior Latex, High Performance Architectural; MPI #311 or 315.
- B. Wood, Opaque, Alkyd, 3 Coat:
 - 1. One coat of alkyd primer sealer.

PART 3 EXECUTION

3.01 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

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3.02 APPLICATION

- A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

SECTION 09 93 00 STAINING AND TRANSPARENT FINISHING

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and catalog number, and general product category.
 - 2. Manufacturer's installation instructions.
- B. Manufacturer's Qualification Statement.

1.02 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with at least three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide finishes from the same manufacturer to the greatest extent possible.

2.02 STAINS AND TRANSPARENT FINISHES - GENERAL

- A. Finishes:
 - 1. Provide finishes capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Provide materials compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 - 3. Supply each finish material in quantity required to complete entire project's work from a single production run.
 - 4. Do not reduce, thin, or dilute finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

2.03 EXTERIOR STAIN AND TRANSPARENT FINISH SYSTEMS

- A. Finish on Wood:
 - 1. Stain: Exterior solid stain for wood, water based; MPI #16.
 - 2. Stain: Exterior semi-transparent stain for wood, water based; MPI #156.
 - 3. Manufacturers: As indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 APPLICATION

- A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- C. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

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SECTION 12 93 00

SITE FURNISHINGS

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. ADA Picnic Table
 - 2. Fire Ring
 - 3. ADA Fire Ring

1.2 SUBMITTALS

- A. Product Data: For each product indicated.
- B. Samples: Contractor to provide a sample for each type of exposed finish and for each color and texture required.
- C. Maintenance data.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.

2.2 MATERIALS

- A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
 - 1. Rolled or Cold-Finished Bars, Rods, and Wire: ASTM B 211 (ASTM B 211M).
 - 2. Extruded Bars, Rods, Wire, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
 - 3. Structural Pipe and Tube: ASTM B 429.
 - 4. Sheet and Plate: ASTM B 209 (ASTM B 209M).
 - 5. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester-TGIC, powder-coat finish complying with finish manufacturer's written

instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

- B. Steel:
 - 1. Plates, Shapes, and Bars: ASTM A 36/A 36M.
 - 2. Steel Pipe: Standard-weight steel pipe complying with ASTM A 53, or electric-resistance-welded pipe complying with ASTM A 135.
 - 3. Tubing: Cold-formed steel tubing complying with ASTM A 500.
 - 4. Mechanical Tubing: Cold-rolled, electric-resistance-welded carbon or alloy steel tubing complying with ASTM A 513, or steel tubing fabricated from steel complying with ASTM A 569/A 569M and complying with dimensional tolerances in ASTM A 500; zinc coated internally and externally.
- C. Products:
 - 1. Fire Ring
 - a. Supplier: Pilot Rock
 - b. Model: FA30/7/TB
 - c. Dimensions: 32" Dia., 7-3/8" tall
 - d. Finish and color: Black Finish
 - e. Installation Method: Mount to 8" diameter x 24" deep concrete footing with tilt-back anchors, refer to details and manufacturers installation details.
 - 2. Fire Ring ADA
 - a. Supplier: Pilot Rock
 - b. Model: FSW-30/18/PA
 - c. Dimensions: 32" Dia., 16-7/8" tall
 - d. Finish and color: Black Finish
 - e. Installation Method: Mount to 8" diameter x 24" deep concrete footing with tilt-back anchors, refer to details and manufacturers installation details.
 - 3. Picnic Table ADA
 - a. Supplier: Pilot Rock
 - b. Model: UT/G-8UP/E
 - c. Dimensions: 9'-11-1/2" Length, 4'-11" Wide, 29-3/4" Tall

- d. Finish and color: Powder coat brown frame, timber top and seats stained Cordovan Brown.
- e. Installation Method: Set on surface, refer to details and manufacturers installation details.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Complete field assembly of site and street furnishings, where required.
- B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.
- C. Install site furnishings level, plumb, true, and positioned at locations indicated on Drawings.

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SECTION 26 01 11 BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following electrical materials and methods:
 - 1. Building wire, connectors, and splices for branch circuits and feeders.
 - 2. Supporting devices for electrical components.
 - 3. Electrical identification.
 - 4. Cutting and patching for electrical construction.
 - 5. Touchup painting.
 - 6. Meter sockets.

1.03 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 01 Specification Sections.
- B. Product Data for each type of product specified.

1.04 QUALITY ASSURANCE

- A. Comply with NFPA 70 for components and installation.
- B. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
 - 1. The Terms "Listed and Labeled": As defined in the National Electrical Code, Article 100.

1.05 SEQUENCING AND SCHEDULING

- A. Coordinate electrical equipment installation with other building components.
- B. Arrange for chases, slots, and openings in building structure during progress of construction to allow for electrical installations.
- C. Coordinate installing required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- D. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning prior to closing in

the building.

- E. Coordinate connecting electrical service to components furnished under other Sections.
- F. Coordinate connecting electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- G. Coordinate requirements for access panels and doors where electrical items requiring access are concealed by finished surfaces. Access panels and doors are specified in Division 8 Section "Access Doors."
- H. Coordinate installing electrical identification after completion of finishing where identification is applied to field-finished surfaces.
- I. Coordinate installing electrical identifying devices and markings prior to installing acoustical ceilings and similar finishes that conceal such items.

PART 2 PRODUCTS

2.01 BUILDING WIRE

- A. Description: Single conductor, copper. Solid conductor for No. 10 AWG and smaller; stranded conductor for larger than No. 10 AWG.
- B. Thermoplastic Insulated Wire: Conform to NEMA WC 5.
- C. Cross-Linked, Polyethylene Insulated Wire: Conform to NEMA WC 7.
- D. Connectors and Splices: Units of size, ampacity rating, material, type, and class suitable for service indicated. Select to comply with Project's installation requirements.

2.02 SUPPORTING DEVICES

- A. Channel and angle support systems, hangers, anchors, sleeves, brackets, fabricated items, and fasteners are designed to provide secure support from the building structure for electrical components with <u>seismic restraint</u> supports and anchorage throughout.
 - 1. Material: Steel, except as otherwise indicated, protected from corrosion with zinc coating or with treatment of equivalent corrosion resistance using approved alternative finish or inherent material characteristics.
 - 2. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel, except as otherwise indicated.
- B. Steel channel supports have 9/16-inch diameter holes at a maximum of 8 inches o.c., in at least 1 surface.
 - 1. Fittings and accessories mate and match with channels and are from the same manufacturer.

- C. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring steel clamps or "click"- type hangers.
- D. Sheet-Metal Sleeves: 0.0276-inch or heavier galvanized sheet steel, round tube, closed with welded longitudinal joint.
- E. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.
- F. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable iron casting with hot-dip galvanized finish.
- G. Expansion Anchors: Carbon-steel wedge or sleeve type.
- H. Toggle Bolts: All-steel springhead type.
- I. Powder-Driven Threaded Studs: Heat-treated steel.

2.03 ELECTRICAL IDENTIFICATION

- A. Manufacturer's Standard Products: Where more than one type is listed for a specified application, selection is Installer's option, but provide single type for each application category. Use colors prescribed by ANSI A13.1, NFPA 70, and these Specifications.
- B. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape not less than 3 mils thick by 1 inch wide.
- C. Underground Line Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape with the following features:
 - 1. Size: Not less than 4 mils thick by 6 inches wide.
 - a. Compounded for permanent direct-burial service.
 - 2. Embedded continuous metallic strip or core.
 - a. Printed Legend: Indicates type of underground line.
- D. Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.
- E. Color-Coding Cable Ties: Type 6/6 nylon, self-locking type. Colors to suit coding scheme.
- F. Engraved, Plastic-Laminated Labels, Signs, and Instruction Plates: Engraving stock, melamine plastic laminate punched for mechanical fasteners 1/16-inch minimum thick for signs up to 20 sq. in., 1/8 inch thick for larger sizes. Engraved legend in black letters on white face.
- G. Interior Warning and Caution Signs: Preprinted, aluminum, baked-enamel finish signs, punched for fasteners, with colors, legend, and size appropriate to the application.

- H. Exterior Warning and Caution Signs: Weather-resistant, nonfading, preprinted, cellulose acetate butyrate signs with 0.0396-inch, galvanized steel backing, with colors, legend, and size appropriate to the application. 1/4-inch grommets in corners for mounting.
- I. Fasteners for Plastic-Laminated and Metal Signs: Self-tapping stainless-steel screws or No. 10/32 stainless-steel machine screws with nuts and flat and lock washers.

2.04 METER SOCKETS

A. Meter sockets comply with serving utility company requirements.

2.05 TOUCHUP PAINT

- A. For Equipment: Provided by equipment manufacturer and selected to match equipment finish.
- B. For Nonequipment Surfaces: Matching type and color of undamaged, existing adjacent finish.
- C. For Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 EXECUTION

3.01 EQUIPMENT INSTALLATION REQUIREMENTS

- A. Install components and equipment to provide the maximum possible headroom where mounting heights or other location criteria are not indicated.
- B. Install items level, plumb, and parallel and perpendicular to other building systems and components, except where otherwise indicated.
- C. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.
- D. Give right of way to raceways and piping systems installed at a required slope.

3.02 WIRING METHODS

- A. Feeders: Type THHN/THWN, copper conductor, in raceway, except as otherwise indicated.
- B. Underground Feeders: Type UF, copper conductor, 90C insulation, in raceway, except as otherwise indicated.
- C. Branch Circuits: Type THHN/THWN, in raceway.
- D. Class 2 and Class 3 Control Circuits: Type THHN/THWN, in raceway.

3.03 ELECTRICAL SUPPORTING METHODS

- A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.
- B. Dry Locations: Steel materials.
- C. Support Clamps for PVC Raceways: Click-type clamp system.
- D. Conform to manufacturer's recommendations for selecting supports.
- E. Strength of Supports: Adequate to carry all present and future loads, times a safety factor of at least 4; 200-lb- minimum design load.

3.04 INSTALLATION

- A. Install wires in raceway according to manufacturer's written instructions and NECA's "Standard of Installation."
- B. Conductor Splices: Keep to the minimum and comply with the following:
 - 1. Install splices and taps that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
 - 2. Use splice and tap connectors that are compatible with conductor material.
- C. Wiring at Outlets: Install with at least 12 inches of slack conductor at each outlet.
- D. Connect outlets and components to wiring systems and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening requirements specified in UL 486A.
- E. Install devices to securely and permanently fasten and support electrical components.
- F. Raceway Supports: Comply with NFPA 70 and the following requirements:
 - 1. Conform to manufacturer's recommendations for selecting and installing supports.
 - Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.
 - 3. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.
 - 4. Spare Capacity: Size supports for multiple conduits so capacity can be increased by a 25 percent minimum in the future.
 - 5. Support individual horizontal raceways with separate, malleable iron pipe hangers or clamps.
 - 6. Hanger Rods: 1/4-inch diameter or larger threaded steel, except as otherwise indicated.
 - Spring Steel Fasteners: Specifically designed for supporting single conduits or tubing. May be used in lieu of malleable iron hangers for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to channel and slotted angle supports.
 - 8. In vertical runs, arrange support so the load produced by the weight of the raceway and

the enclosed conductors is carried entirely by the conduit supports, with no weight load on raceway terminals.

- G. Vertical Conductor Supports: Install simultaneously with conductors.
- H. Miscellaneous Supports: Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices except where components are mounted directly to structural features of adequate strength.
- I. In open overhead spaces, cast boxes threaded to raceways need not be separately supported, except where used for fixture support; support sheet-metal boxes directly from the building structure or by bar hangers. Where bar hangers are used, attach the bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches from the box.
- J. Sleeves: Install for cable and raceway penetrations of concrete slabs and walls, except where core-drilled holes are used. Install for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.
- K. Firestopping: Apply to cable and raceway penetrations of fire-rated floor and wall assemblies. Perform firestopping as specified in Division 07 Section "Firestopping" to reestablish the original fire-resistance rating of the assembly at the penetration.
- L. Fastening: Unless otherwise indicated, securely fasten electrical items and their supporting hardware to the building structure. Perform fastening according to the following:
 - 1. Fasten by means of wood screws or screw-type nails on wood; toggle bolts on hollow masonry units; concrete inserts or expansion bolts on concrete or solid masonry; and by machine screws, welded threaded studs, or spring-tension clamps on steel.
 - 2. Select fasteners so the load applied to any fastener does not exceed 25 percent of the proof-test load.
- M. Install utility-metering equipment according to utility company's written requirements. Provide grounding and empty conduits as required by company.
 - 1. For panelboards, provide framed, typed circuit schedules with explicit description and identification of items controlled by each individual breaker.

3.05 CUTTING AND PATCHING

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for electrical installations. Perform cutting by skilled mechanics of the trades involved.
- B. Repair disturbed surfaces to match adjacent undisturbed surfaces.

3.06 TOUCHUP PAINTING

A. Thoroughly clean damaged areas and provide primer, intermediate, and finish coats to suit the degree of damage at each location.

B. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.

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SECTION 26 05 13 WIRES AND CABLES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes building wires and cables and associated splices, connectors, and terminations for wiring systems rated 600 volts and less.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 07 Section "Firestopping."
 - 2. Division 26 Section "Basic Electrical Materials and Methods" for insulation color coding and wire and cable markers.

1.03 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 01 Specification Sections.
- B. Field test reports indicating and interpreting test results relative to compliance with performance requirements of testing standard.

1.04 QUALITY ASSURANCE

- A. Testing Firm Qualifications: In addition to the requirements specified in Division 01 Section "Quality Requirements," an independent testing firm shall meet OSHA criteria for accreditation of testing laboratories, Title 29, Part 1907, or shall be a full member company of the International Electrical Testing Association (NETA).
 - 1. Testing Firm's Field Supervisor Qualifications: A person currently certified by the NETA National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- B. Comply with NFPA 70 "National Electrical Code" for components and installation.
- C. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
 - 1. The Terms "Listed and Labeled": As defined in the "National Electrical Code," Article 100.

1.05 SEQUENCING AND SCHEDULING

- A. Coordination: Coordinate layout and installation of cable with other installations.
 - 1. Revise locations and elevations from those indicated as required to suit field conditions and as approved by the Architect.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver wire and cable according to NEMA WC-26.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
 - 1. Wires and Cables:
 - a. American Insulated Wire Corporation, Leviton Manufacturing Co.
 - b. Brand-Rex Cable Systems, Brintec Corp.
 - c. Carol Cable Company, Inc.
 - d. Senator Wire & Cable Co.
 - e. Southwire Co.
 - 2. Connectors for Wires and Cables:
 - a. AFC, Monogram Co.
 - b. AMP, Inc.
 - c. Anderson, Square D Co.
 - d. Electrical Products Division, 3M Co.
 - e. O-Z/Gedney Unit, General Signal.

2.02 BUILDING WIRES AND CABLES

- A. UL-listed building wires and cables with conductor material, insulation type, cable construction, and rating as specified in Part 3 "Applications" Article.
- B. Rubber Insulation: Conform to NEMA WC 3.
- C. Thermoplastic Insulation: Conform to NEMA WC 5.
- D. Cross-Linked Polyethylene Insulation: Conform to NEMA WC 7.
- E. Ethylene Propylene Rubber Insulation: Conform to NEMA WC 8.
- F. Solid conductor for 10 AWG and smaller; stranded conductor for larger than 10 AWG.

2.03 CONNECTORS AND SPLICES

A. UL-listed factory-fabricated wiring connectors of size, ampacity rating, material, and type and class for application and for service indicated. Select to comply with Project's installation requirements and as specified in Part 3 "Applications" Article.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine raceways and building finishes to receive wires and cables for compliance with installation tolerances and other conditions. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 APPLICATIONS

- A. Feeders: Type THHN/THWN, copper conductor, in raceway.
- B. Branch Circuits (Exposed): Type THHN/THWN, copper conductor, in raceway.
- C. Branch Circuits (Concealed): Type MC cable, copper conductor, 75C insulation.
- D. Fire Alarm Circuits: Power-limited fire protective signaling circuit cable.
- E. Class 1 Control Circuits: Type THHN/THWN, copper conductor, in raceway.
- F. Class 2 Control Circuits: Power-limited cable, concealed in building finishes.

3.03 INSTALLATION

- A. Install wires and cables as indicated, according to manufacturer's written instructions and the NECA "Standard of Installation."
- B. Connect outlets and components to wiring and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening torques specified in UL Standard 486A.

3.04 FIELD QUALITY CONTROL

- A. Testing Firm: Provide the services of a qualified independent testing firm to perform specified field quality-control testing.
- B. Testing: Upon installation of wires and cables and before electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
 - 1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA Standard ATS, Section 7.3.1. Certify compliance with test parameters.

C. Correct malfunctioning products at site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units, and retest.

SECTION 26 05 26 GROUNDING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes grounding of electrical systems and equipment and basic requirements for grounding for protection of life, equipment, circuits, and systems. Grounding requirements specified in this Section may be supplemented in other Sections of these Specifications.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 26 Section "Wires and Cables" for requirements for grounding conductors.

1.03 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Comply with UL 467.
- C. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Apache Grounding; Nashville Wire Products.
 - 2. Boggs: H. L. Boggs & Co.
 - 3. Dossert Corp.
 - 4. Erico Inc.; Electrical Products Group.
 - 5. Galvan Industries, Inc.
 - 6. Hastings Fiber Glass Products, Inc.
 - 7. Heary Brothers Lightning Protection Co.
 - 8. Ideal Industries, Inc.
 - 9. Kearney.
 - 10. Korns: C. C. Korns Co.
 - 11. Lightning Master Corp.
 - 12. Lyncole XIT Grounding.

- 13. Salisbury: W.H. Salisbury & Co., Utility.
- 14. Thomas & Betts, Electrical.
- 15. Utilco Co.

2.02 GROUNDING AND BONDING PRODUCTS

A. Governing Requirements: Where types, sizes, ratings, and quantities indicated are in excess of National Electrical Code (NEC) requirements, the more stringent requirements and the greater size, rating, and quantity indications govern.

2.03 MISCELLANEOUS CONDUCTORS

- A. Grounding Bus: Bare, annealed-copper bars of rectangular cross section.
- B. Braided Bonding Jumpers: Copper tape, braided No. 30 AWG bare copper wire, terminated with copper ferrules.
- C. Bonding Straps: Soft copper, 0.05 inch thick and 2 inches wide, except as indicated.

2.04 CONNECTOR PRODUCTS

- A. Pressure Connectors: High-conductivity-plated units.
- B. Bolted Clamps: Heavy-duty type.
- C. Exothermic-Welded Connections: Provided in kit form and selected per manufacturer's written instructions for specific types, sizes, and combinations of conductors and connected items.

2.05 GROUNDING ELECTRODES AND TEST WELLS

- A. Grounding Rods: Copper-clad steel.
 - 1. Size: 3/4 inch by 120 inches.

PART 3 EXECUTION

3.01 APPLICATION

- A. Equipment Grounding Conductors: Comply with NEC Article 250 for types, sizes, and quantities of equipment grounding conductors, except where specific types, larger sizes, or more conductors than required by NEC are indicated.
 - 1. Install equipment grounding conductor with circuit conductors for the items below in addition to those required by Code:
 - a. Feeders and branch circuits.
 - b. Lighting circuits.

- c. Receptacle circuits.
- d. Single-phase motor or appliance branch circuits.
- e. Three-phase motor or appliance branch circuits.
- f. Flexible raceway runs.
- g. Armored and metal-clad cable runs.
- 2. Busway Supply Circuits: Install separate equipment grounding conductor from the grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding-bar terminal on busway.
- 3. Water Heater, Heat-Tracing, and Antifrost Heater Circuits: Install a separate equipment grounding conductor to each electric water heater. Bond conductor to heater units, piping, connected equipment, and components. Provide bonding jumper at the water heater as required by code.
- B. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide a No. 4 AWG minimum insulated grounding conductor in raceway from grounding-electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
 - 1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch grounding bus.
 - 2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

3.02 INSTALLATION

- A. General: Ground electrical systems and equipment according to NEC requirements, except where Drawings or Specifications exceed NEC requirements.
- B. Grounding Rods: Locate a minimum of 1-rod length from each other and at least the same distance from any other grounding electrode.
 - 1. Drive until tops are 2 inches below finished floor or final grade, except as otherwise indicated.
 - 2. Interconnect with grounding-electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make these connections without damaging copper coating or exposing steel.
- C. Grounding Conductors: Route along the shortest and straightest paths possible, except as otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- D. Underground Grounding Conductors: Use bare copper wire. Bury at least 24 inches below grade.
- E. Metal Water Service Pipe: Provide insulated copper grounding conductors, sized as indicated, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding-clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Do not install a grounding jumper across dielectric fittings. Bond grounding-conductor conduit to conductor at each end.

- F. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding-clamp connectors.
- G. Water Heater: Use braided-type bonding jumpers to electrically bypass water heater. Connect hot water piping to cold water pipe with grounding-clamp connectors.

3.03 CONNECTIONS

- A. General: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
 - 1. Use electroplated or hot-tin-coated materials to assure high conductivity and to make contact points closer in order of galvanic series.
 - 2. Make connections with clean, bare metal at points of contact.
 - 3. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- B. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells. Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
- C. Equipment Grounding-Wire Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
- D. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. Where these requirements are not available, use those specified in UL 486A and UL 486B.
- E. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by manufacturer of connectors. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.
- F. Moisture Protection: Where insulated grounding conductors are connected to grounding rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.04 FIELD QUALITY CONTROL

A. Tests: Subject the completed grounding system to a megger test at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than 2 full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests by the 2-point method according to IEEE 81.

- B. Maximum grounding to resistance values are as follows:
 - 1. Equipment Rated 500 kVA and Less: 10 ohms.
 - 2. Equipment Rated 500 to 1000 kVA: 5 ohms.
 - 3. Equipment Rated More than 1000 kVA: 3 ohms.
 - 4. Unfenced Substations and Pad-Mounted Equipment: 5 ohms.
 - 5. Manhole Grounds: 10 ohms.
- C. Excessive Ground Resistance: Where resistance to ground exceeds specified values, notify Owner promptly and include recommendations to reduce ground resistance and to accomplish recommended work.
- D. Report: Prepare test reports, certified by the testing organization, of ground resistance at each test location. Include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

3.05 ADJUSTING AND CLEANING

A. Restore surface features, including vegetation, at areas disturbed by work of this Section. Reestablish original grades, except as otherwise indicated. Where sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition. Include topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching.

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SECTION 26 05 33 RACEWAYS AND BOXES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
 - 1. Raceways include the following:
 - a. EMT.
 - b. Rigid Galvanized.
 - c. PVC Schedule 40.
 - d. MC
 - e. FMC.
 - f. Wireways.
 - g. (Reference Section 3.2 Wiring Methods)
 - 2. Boxes, enclosures, and cabinets include the following:
 - a. Device boxes.
 - b. Floor boxes.
 - c. Outlet boxes.
 - d. Pull and junction boxes.
 - e. Cabinets and hinged-cover enclosures.
- B. Related Sections include the following:
 - a. Division 07 Section "Firestopping."
 - b. Division 26 Section "Basic Electrical Materials and Methods" for raceways and box supports.
 - c. Division 26 Section "Wiring Devices" for devices installed in boxes and for floor-box service fittings.

1.03 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. FMC: Flexible metal conduit.
- C. MC: Metal-Clad Cable.

1.04 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

1.05 COORDINATION

A. Coordinate layout and installation of raceways and boxes with other construction elements to ensure adequate headroom, working clearance, and access.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Metal Conduit and Tubing:
 - a. Alflex Corp.
 - b. Anamet, Inc.; Anaconda Metal Hose.
 - c. Anixter Brothers, Inc.
 - d. Carol Cable Co., Inc.
 - e. Cole-Flex Corp.
 - f. Grinnell Co.; Allied Tube and Conduit Div.
 - g. Monogram Co.; AFC.
 - h. Wheatland Tube Co.
 - 2. Nonmetallic Conduit and Tubing:
 - a. Anamet, Inc.; Anaconda Metal Hose.
 - b. Arnco Corp.
 - c. Cole-Flex Corp.
 - d. Condux International; Electrical Products.
 - e. Electri-Flex Co.
 - f. George-Ingraham Corp.
 - g. Hubbell, Inc.; Raco, Inc.
 - h. Lamson & Sessions; Carlon Electrical Products.
 - i. R&G Sloan Manufacturing Co., Inc.
 - j. Thomas & Betts Corp.
 - 3. Conduit Bodies and Fittings:
 - a. American Electric; Construction Materials Group.
 - b. Crouse-Hinds; Div. of Cooper Industries.
 - c. Emerson Electric Co.; Appleton Electric Co.

- d. Hubbell, Inc.; Killark Electric Manufacturing Co.
- e. Lamson & Sessions; Carlon Electrical Products.
- f. O-Z/Gedney; Unit of General Signal.
- g. Scott Fetzer Co.; Adalet-PLM.
- h. Spring City Electrical Manufacturing Co.
- 4. Metal Wireways:
 - a. Hoffman Engineering Co.
 - b. Keystone/Rees, Inc.
 - c. Square D Co.
- 5. Nonmetallic Wireways:
 - a. Hoffman Engineering Co.
 - b. Lamson & Sessions; Carlon Electrical Products.
- 6. Surface Metal Raceways:
 - a. Airey-Thompson Co., Inc.; A-T Power Systems.
 - b. American Electric; Construction Materials Group.
 - c. Butler Manufacturing Co.; Walker Division.
 - d. Wiremold Co. (The); Electrical Sales Division.
- 7. Surface Nonmetallic Raceways:
 - a. Anixter Brothers, Inc.
 - b. Butler Manufacturing Co.; Walker Division.
 - c. Hubbell, Inc.; Wiring Device Division.
 - d. Wiremold Co. (The); Electrical Sales Division.
- 8. Boxes, Enclosures, and Cabinets:
 - a. American Electric; FL Industries.
 - b. Butler Manufacturing Co.; Walker Division.
 - c. Crouse-Hinds; Div. of Cooper Industries.
 - d. Electric Panelboard Co., Inc.
 - e. Hoffman Engineering Co.; Federal-Hoffman, Inc.
 - f. Hubbell Inc.; Killark Electric Manufacturing Co.
 - g. Hubbell Inc.; Raco, Inc.
 - h. Robroy Industries, Inc.; Electrical Division.
 - i. Thomas & Betts Corp.

2.02 METAL CONDUIT AND TUBING

- A. EMT and Fittings: ANSI C80.3.
 - 1. Fittings: Compression type.

B. Fittings: NEMA FB 1; compatible with conduit/tubing materials.

2.03 METAL WIREWAYS

- A. Material: Sheet metal sized and shaped as indicated.
- B. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, holddown straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- C. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.
- D. Wireway Covers: Screw-cover type.
- E. Finish: Manufacturer's standard enamel finish.

2.04 NONMETALLIC WIREWAYS

- A. Description: PVC plastic, extruded and fabricated to size and shape indicated, with snap-on cover and mechanically coupled connections using plastic fasteners.
- B. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, holddown straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- C. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

2.05 OUTLET AND DEVICE BOXES

- A. Sheet Metal Boxes: NEMA OS 1.
- B. Cast-Metal Boxes: NEMA FB 1, Type FD, cast box with gasketed cover.

2.06 FLOOR BOXES

A. Floor Boxes: Cast metal, fully adjustable, rectangular.

2.07 PULL AND JUNCTION BOXES

- A. Small Sheet Metal Boxes: NEMA OS 1.
- B. Cast-Metal Boxes: NEMA FB 1, cast aluminum with gasketed cover.

2.08 ENCLOSURES AND CABINETS
- A. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive raceways, boxes, enclosures, and cabinets for compliance with installation tolerances and other conditions affecting performance of raceway installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 WIRING METHODS

- A. Outdoors: Use the following wiring methods:
 - 1. Exposed: Rigid steel or EMT with weatherproof fittings
 - 2. Concealed: Rigid steel or EMT with weatherproof fittings.
 - 3. Underground: PVC.
 - 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 - 5. Boxes and Enclosures: NEMA 250, Type 3R or Type 4.
- B. Indoors: Use the following wiring methods:
 - 1. Exposed: EMT.
 - 2. Concealed: MC.
 - 3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except in wet or damp locations, use LFMC.
 - 4. Damp or Wet Locations: Rigid steel conduit.
 - 5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
 - a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel.

3.03 INSTALLATION

- A. Install raceways, boxes, enclosures, and cabinets as indicated, according to manufacturer's written instructions.
- B. Minimum Raceway Size: 3/4-inch trade size.
- C. Conceal areas, unless otherwise indicated, within finished walls, ceilings, and floors shall be MC installation.
- D. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

- E. Install raceways level and square and at proper elevations. Provide adequate headroom.
- F. Complete raceway installation before starting conductor installation.
- G. Support raceways as specified in Division 26 Section "Basic Electrical Materials and Methods."
- H. Use temporary closures to prevent foreign matter from entering raceways.
- I. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above the finished slab.
- J. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.
- K. Use raceway fittings compatible with raceways and suitable for use and location. For intermediate steel conduit, use threaded rigid steel conduit fittings, unless otherwise indicated.
- L. Run concealed raceways, with a minimum of bends, in the shortest practical distance considering the type of building construction and obstructions, unless otherwise indicated.
- M. Raceways Embedded in Slabs: Install in middle third of slab thickness where practical, and leave at least 1-inch concrete cover.
 - 1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
 - 2. Space raceways laterally to prevent voids in concrete.
 - 3. Run conduit larger than 1-inch trade size parallel to or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
 - 4. Transition from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor.
- N. Install exposed raceways parallel to or at right angles to nearby surfaces or structural members, and follow the surface contours as much as practical.
 - 1. Run parallel or banked raceways together, on common supports where practical.
 - 2. Make bends in parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- O. Join raceways with fittings designed and approved for the purpose and make joints tight.
 - 1. Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight.
 - 2. Use insulating bushings to protect conductors.
- P. Tighten set screws of threadless fittings with suitable tools.
- Q. Terminations: Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against the box. Where terminations are not secure with 1 locknut, use 2 locknuts: 1 inside and 1 outside the box.

- R. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align raceways so the coupling is square to the box and tighten the chase nipple so no threads are exposed.
- S. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of the pull wire.
- T. Telephone and Signal System Raceways, 2-Inch Trade Size and Smaller: In addition to the above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.
- U. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with the finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches above the floor. Install screwdriver-operated, threaded flush plugs flush with floor for future equipment connections.
- V. Flexible Connections: Use maximum of 6 feet of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use liquidtight flexible conduit in wet or damp locations. Install separate ground conductor across flexible connections.
- W. Do not install aluminum conduits embedded in or in contact with concrete.

3.04 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure coatings, finishes, and cabinets are without damage or deterioration at the time of Substantial Completion.

3.05 CLEANING

A. On completion of installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

END OF SECTION

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SECTION 26 24 14 DISCONNECT SWITCHES AND CIRCUIT BREAKERS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes individually mounted switches and circuit breakers used for the following:
 - 1. Service disconnect switches.
 - 2. Feeder and equipment disconnect switches.
 - 3. Feeder branch-circuit protection.
 - 4. Motor disconnect switches.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 26 Section "Wiring Devices" for attachment plugs and receptacles, and snap switches used for disconnect switches.
 - 2. Division 26 Section "Panelboards" for individually enclosed, fused power-circuit devices used as feeder disconnect switches.

1.03 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 01 Specification Sections.
- B. Product Data for switches, circuit breakers, and accessories specified in this Section. Include the following:
 - 1. Descriptive data and time-current curves.
 - 2. Let-through current curves for circuit breakers with current-limiting characteristics.
 - 3. Coordination charts and tables and related data.
- C. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- D. Maintenance data for tripping devices to include in the operation and maintenance manual specified in Division 1.

1.04 QUALITY ASSURANCE

- A. Testing Agency Qualifications: In addition to the requirements specified in Division 1 Section "Quality Control," an independent testing agency shall meet OSHA criteria for accreditation of testing laboratories, Title 29, Part 1907, or shall be a full member company of the InterNational Electrical Testing Association (NETA).
 - 1. Testing Agency's Field Supervisor: Person currently certified by NETA or the National Institute for Certification in Engineering Technologies, to supervise on-site testing specified in Part 3.
- B. Source Limitations: Obtain disconnect switches and circuit breakers from one source and by a single manufacturer.
- C. Comply with NFPA 70 for components and installation.
- D. Listing and Labeling: Provide disconnect switches and circuit breakers specified in this Section that are listed and labeled.
 - 1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering disconnect switches and circuit breakers that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Fusible Switches:
 - a. Eaton Corp.; Cutler-Hammer Products.
 - b. General Electric Co.; Electrical Distribution and Control Division.
 - c. General Switch Corp.
 - d. Siemens Energy & Automation, Inc.
 - e. Square D Co.
 - f. Westinghouse Electric Corp.; Distribution & Control Business Unit.
 - 2. Molded-Case Circuit Breakers:
 - a. American Circuit Breaker Corp.
 - b. Eaton Corp.; Cutler-Hammer Products.
 - c. General Electric Co.; Electrical Distribution and Control Division.
 - d. General Switch Corp.
 - e. Klockner-Moeller.
 - f. Siemens Energy & Automation, Inc.
 - g. Square D Co.
 - h. Westinghouse Electric Corp.; Distribution & Control Business Unit.
 - 3. Combination Circuit Breaker and Ground Fault Trip:
 - a. American Circuit Breaker Corp.
 - b. General Electric Co.; Electrical Distribution and Control Division.

- c. Siemens Energy & Automation, Inc.
- d. Square D Co.
- e. Westinghouse Electric Corp.; Distribution & Control Business Unit.
- 4. Molded-Case, Current-Limiting Circuit Breakers:
 - a. General Electric Co.; Electrical Distribution and Control Division.
 - b. Siemens Energy & Automation, Inc.
 - c. Square D Co.
 - d. Westinghouse Electric Corp.; Distribution & Control Business Unit.

2.02 DISCONNECT SWITCHES

- A. Enclosed, Nonfusible Switch: NEMA KS 1, Type GD, with lockable handle.
- B. Enclosed, Fusible Switch, 800 A and Smaller: NEMA KS 1, Type GD, clips to accommodate specified fuses, enclosure consistent with environment where located, handle lockable with 2 padlocks, and interlocked with cover in CLOSED position.
- C. Enclosure: NEMA KS 1, Type 1, unless otherwise specified or required to meet environmental conditions of installed location.
 - 1. Outdoor Locations: Type 3R.
 - 2. Other Wet or Damp Indoor Locations: Type 4.

2.03 ENCLOSED CIRCUIT BREAKERS

- A. Enclosed, Molded-Case Circuit Breaker: NEMA AB 1, with lockable handle.
- B. Characteristics: Frame size, trip rating, number of poles, and auxiliary devices as indicated and interrupting rating to meet available fault current.
- C. Application Listing: Appropriate for application, including switching fluorescent lighting loads or heating, air-conditioning, and refrigerating equipment.
- D. Circuit Breakers, 200 A and Larger: Trip units interchangeable within frame size.
- E. Current-Limiting Trips: Where indicated, let-through ratings less than NEMA FU 1, Class RK-5.
- F. Current Limiters: Where indicated, integral fuse listed for circuit breaker.
- G. Molded-Case Switch: Where indicated, molded-case circuit breaker without trip units.
- H. Lugs: Mechanical lugs and power-distribution connectors for number, size, and material of conductors indicated.
- I. Shunt Trip: Where indicated.
- J. Accessories: As indicated.

- K. Enclosure: NEMA AB 1, Type 1, unless otherwise specified or required to meet environmental conditions of installed location.
 - 1. Outdoor Locations: Type 3R.
 - 2. Other Wet or Damp Indoor Locations: Type 4.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install disconnect switches and circuit breakers in locations as indicated, according to manufacturer's written instructions.
- B. Install disconnect switches and circuit breakers level and plumb.
- C. Install wiring between disconnect switches, circuit breakers, control, and indication devices.
- D. Connect disconnect switches and circuit breakers and components to wiring system and to ground as indicated and instructed by manufacturer.
 - 1. Tighten electrical connectors and terminals according to manufacturer's published torquetightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- E. Identify each disconnect switch and circuit breaker according to requirements specified in Division 26 Section "Basic Electrical Materials and Methods."

3.02 FIELD QUALITY CONTROL

- A. Testing: After installing disconnect switches and circuit breakers and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
 - 1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.5 for disconnect switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
- B. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

3.03 CLEANING

A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish including chips, scratches, and abrasions.

END OF SECTION

SECTION 26 24 16 PANELBOARDS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes lighting and power panelboards and associated auxiliary equipment rated V and less.
- B. Related Sections include the following:
 - 1. Division 26 Section "Basic Electrical Materials and Methods" for general materials and installation methods.

1.03 SUBMITTALS

- A. Product Data: For each type of panelboard, accessory item, and component specified.
- B. Shop Drawings: For panelboards. Include dimensioned plans, sections, and elevations. Show tabulations of installed devices, major features, and voltage rating. Include the following:
 - 1. Enclosure type with details for types other than NEMA 250, Type 1.
 - 2. Bus configuration and current ratings.
 - 3. Short-circuit current rating of panelboard.
 - 4. Features, characteristics, ratings, and factory settings of individual protective devices and auxiliary components.
 - 5. Wiring Diagrams: Details of schematic diagram including control wiring and differentiating between manufacturer-installed and field-installed wiring.
- C. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.
- D. Maintenance Data: For panelboard components to include in the maintenance manuals specified in Division 01. Include manufacturer's written instructions for testing circuit breakers.

1.04 QUALITY ASSURANCE

- A. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
 - 1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
- B. Comply with NFPA 70.

C. Comply with NEMA PB 1.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Eaton Corp.; Westinghouse & Cutler-Hammer Products.
 - 2. General Electric Co.; Electrical Distribution & Control Div.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D Co.

2.02 PANELBOARD FABRICATION

- A. Enclosures: Flush- or surface-mounted cabinets as indicated. NEMA PB 1, Type 1, unless otherwise indicated to meet environmental conditions at installed location.
- B. Front: Secured to box with concealed trim clamps, unless otherwise indicated. Front for surface-mounted panelboards shall be same dimensions as box. Fronts for flush panelboards shall overlap box, unless otherwise indicated.
- C. Directory Frame: Metal, mounted inside each panelboard door.
- D. Bus: Aluminum.
- E. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors. Bonded to box.
- F. Service Equipment Approval: Listed for use as service equipment for panelboards with main service disconnect.
- G. Special Features: Include the following features for panelboards as indicated:
 - 1. Hinged Front Cover: Entire front trim hinged to box with standard door within hinged trim cover.
 - 2. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and floor.

2.03 DISTRIBUTION PANELBOARDS

- A. Doors: In panelboard front, except omit in fusible-switch panelboard, unless otherwise indicated. Secure door with vault-type latch with tumbler lock, all keyed alike.
- B. Branch-Circuit Breakers: Where overcurrent protective devices are indicated to be circuit breakers, use bolt-on circuit breakers, except circuit breakers 225-A frame size and greater may be plug-in type where individual positive-locking device requires mechanical release for

removal.

2.04 OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker: NEMA AB 1, handle lockable.
 - 1. Characteristics: Frame size, trip rating, number of poles, and auxiliary devices as indicated and interrupting capacity rating to meet available fault current.
 - 2. Application Listing: Appropriate for application, including Type SWD for switching fluorescent lighting loads and Type HACR for heating, air-conditioning, and refrigerating equipment.
 - 3. Circuit Breakers, 200 A and Larger: Trip units interchangeable within frame size.
 - 4. Current-Limiting Trips: Where indicated, let-through ratings less than NEMA FU 1, Class RK-5.
 - 5. Current Limiters: Where indicated, integral fuse listed for circuit breaker.
 - 6. Lugs: Mechanical lugs and power-distribution connectors for number, size, and material of conductors indicated.
 - 7. Shunt Trip: Where indicated.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install panelboards and accessory items according to NEMA PB 1.1.
- B. Mounting Heights: Top of trim 74 inches above finished floor, unless otherwise indicated.
- C. Mounting: Plumb and rigid without distortion of box. Mount flush panelboards uniformly flush with wall finish. Mount in accordance with seismic restraint requirements as required by Code and local Authorities having jurisdiction.
- D. Circuit Directory: Type directory to indicate installed circuit loads after balancing panelboard loads. Obtain approval before installing.
- E. Install filler plates in unused spaces.
- F. Wiring in Panelboard Gutters: Arrange conductors into groups, and bundle and wrap with wire ties after completing load balancing.

3.02 IDENTIFICATION

A. Panelboard Nameplates: Label each panelboard with engraved laminated-plastic or metal nameplates mounted with corrosion-resistant screws.

3.03 GROUNDING

A. Provide ground continuity to main electrical ground bus as indicated.

3.04 CONNECTIONS

A. Tighten electrical connectors and terminals, including grounding connections, according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.05 FIELD QUALITY CONTROL

- A. Prepare for acceptance tests as follows:
 - 1. Make insulation-resistance tests of each panelboard bus, component, and connecting supply, feeder, and control circuits.
 - 2. Make continuity tests of each circuit.
- B. Balancing Loads: After Substantial Completion, but not more than 2 months after Final Acceptance, conduct load-balancing measurements and make circuit changes as follows:
 - 1. Perform measurements during period of normal working load as advised by Owner.
 - 2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility. Make special arrangements with Owner to avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
 - 3. Recheck loads after circuit changes during normal load period. Record all load readings before and after changes and submit test records.
 - 4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as required to meet this minimum requirement.

3.06 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges as required.

3.07 CLEANING

A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish.

END OF SECTION

SECTION 31 05 19

GEOTEXTILES

PART 1 – GENERAL

1.1 DESCRIPTION

A. The Contractor shall furnish all labor, materials, equipment and incidentals required for the installation of the various grades and types of geotextiles specified herein or shown on the Drawings.

1.2 SUBMITTALS

- A. General: Provide submittals in accordance with Specification 01 30 00.
- **B.** Shop Drawings.
- C. Sample of each type of material to be used.
- **D.** No material is to be shipped prior to approval of the Shop Drawings.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Stone Fill:

- 1. The filter fabric to be used with Stone Fill shall be a high modulus woven geotextile fabric composed of polypropylene yarns woven into a stable network such that the yarns retain their relative position.
- 2. The fabric must be ultraviolet treated and inert to biological degradation and degradation or damage from naturally encountered chemicals, alkalines, and acids.
- 3. Typical average property values for the fabric must be as follows:

PROPERTV	TYPICAL VALUE	TEST METHOD
Grab Tensile Strength	370 lbs.	ASTM D 4595
Burst Strength	450 lbs.	ASTM D 3786
Trapezoid Tear Strength	100 lbs.	ASTM D 4533
Puncture Strength	120 lbs.	ASTM D 4833
Ultraviolet Stability	90%	ASTM D 4355

4. Fabric shall be Mirafi Filterweave FW 700 or approved equal.

B. <u>Underdrain Wrap</u>:

- 1. The filter fabric shall be a needle punctured non-woven geotextile fabric.
- 2. The fabric must be inert to biological degradation and degradation or damage from naturally encountered chemicals, alkalines, and acids.
- 3. Typical average property values for the fabric must be as follows:

	TYPICAL <u>VALUE</u>	TEST <u>METHOD</u>
<u>PROPERTY</u>		
Grab Tensile Strength	120 lbs.	ASTM D 4632
Burst Strength	225 psi	ASTM D 751
Coefficient of Permeability (k)	0.10 cm/sec	CFMC-FFET-2

4. Fabric shall be Mirafi 140N or approved equal.

PART 3 – EXCAVATION

3.1 INSTALLATION

A. Stone Fill:

- 1. The filter fabric shall be installed after all excavation backfilling (except Stone Fill) and compaction is completed for the application area.
- 2. The application area must be shaped as shown on the Drawings and graded smooth and free of rocks, sticks, or other sharp objects.
- 3. The fabric must be installed in accordance with the manufacturer's instructions.
- 4. The filter fabric shall be furnished in rolls of a width and length which will minimize the number of overlaps. Where overlaps cannot be avoided, a minimum overlap of 2 feet shall be provided. Overlaps shall be pinned.
- 5. Secure the fabric with pins at sufficient intervals to prevent floating. Fabric shall be toed-in at the tops and the bottoms of the slopes.
- 6. The Stone Fill shall be placed from the lowest end of the work towards the top. Care shall be taken, including hand placement if necessary, not to drop or place the fill in a manner which will tear or damage the fabric.

7. At the discharge point, place the fabric in a single piece, avoiding overlaps if possible and backfill as specified above.

B. <u>Underdrain Wrap</u>:

- 1. The filter fabric shall be installed after all excavation is completed for the application area.
- 2. The application area must be shaped as shown on the Drawings and graded smooth and free of rocks, sticks, or other sharp objects.
- 3. The fabric must be installed in accordance with the manufacturer's instructions.
- 4. The filter fabric shall be furnished in rolls of a width and length which will minimize the number of overlaps. Where overlaps cannot be avoided, a minimum overlap of 2 feet shall be provided. Overlaps shall be pinned.
- 5. Secure the fabric with pins at sufficient intervals to prevent floating. Fabric shall be toed-in at the tops and the bottoms of the slopes.

End of Section

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SECTION 31 05 19.16

GEOMEMBRANE LINERS

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes flexible membrane pond and reservoir lining work as shown on drawings.

1.2 SUBMITTALS

- A. General: Provide submittals in accordance with Specification 01 30 00.
- **B.** Product data, installation instructions, and general recommendations from membrane fabricator.
- C. Samples of membrane with field-applied lap joint.
- **D.** Shop drawings indicating location of field fabricated joints, perimeter anchorage, methods of sealing to other structures, openings through lining.

1.3 QUALITY ASSURANCE

- **A.** Manufacturer's Products: Obtain primary membrane lining materials, accessories, and required adhesives from a single manufacturer.
- **B.** Installer: Arrange for installation of liner material by same firm that fabricated the liner.

1.4 WARRANTY

- **A.** Special Project Warranty: Submit written warranty, executed by manufacturer of primary membrane lining materials agreeing to, within warranty period, replace/repair defective materials and workmanship including leakage, abnormal aging or deterioration of materials, and other failures of membrane lining to perform as required.
 - 1. Warranty period is 10 years after date of substantial completion.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- **A.** Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
- **B.** Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Palco Linings, Inc.
 - 2. Staff Industries, Inc.
 - 3. Watersaver Company, Inc.

2.2 MATERIALS

A. General: Provide flexible, impervious membrane liner complying with specified product attributes.

2.3 EPDM-LINER

- **A.** Ethylene propylene diene monomers (EPDM) formed into uniform, flexible sheets, complying with ASTM D3253, Type II (non-reinforced).
- **B.** Ethylene propylene diene monomers (EPDM) formed into uniform, flexible sheets, complying with ASTM D3254, Type II (fabric-reinforced).
 - 1. Thickness: 30 mils, nominal

2.4 CHLOROSULFONATED POLYETHYLENE LINER

- **A.** "Hypalon" synthetic rubber as produced by E.I. du Pont de Nemours & Co., formed into uniform flexible sheets, complying with the following:
 - 1. Tensile Strength (ASTM D 412): 1000 psi.
 - 2. Ultimate Elongation (ASTM D 412): 250 percent.
 - 3. Brittleness Temperature (ASTM D 746): Minus 45 deg F (minus 43 deg C).
 - 4. Resistance to Ozone Aging (ASTM D 1149 Procedure "A"): No cracks after 70 hours' exposure of 30 percent elongated samples at 104 deg F (40 deg C) and 3 pphm ozone.
 - 5. Resistance to Heat Aging (ASTM D 573): Maximum reduction in elongation of 40 percent, maximum loss of tensile strength of 0 percent (336 hours at 212 deg F, 100 deg C).
 - 6. Thickness: 36 mils, nominal.

7. Reinforcing Scrim: Polyester or nylon.

2.5 <u>VINYL LINER</u>

- **A.** Virgin polyvinyl chloride with plasticizers and other modifiers, formed into uniform flexible sheets, complying with ASTM D 3083.
 - 1. Thickness: 30 mils, nominal

2.6 MISCELLANEOUS MATERIALS

- **A.** Adhesives: Provide types of adhesive compounds and tapes recommended by liner manufacture for bonding to structures (if required), for sealing of seams in membrane, and for sealing projections through liner.
- **B.** Battens: Long-length strips of stainless steel or aluminum, size as shown on drawings. Fabricate battens with sharp projections removed and edges eased.

2.7 FABRICATION

A. Fabricate liner membrane in sizes as large as possible with factory-sealed seams, consistent with limitations of weight and installation procedures. Minimize field seaming.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. General: Place flexible membrane liner over prepared surfaces in such a manner as to assure minimum handling. Fit closely and seal around inlets, outlets, and other projections through liner. Follow installation procedures as recommended by liner fabric manufacturer.
- **B.** Field Joints: Use lapped and sealed joints in field, matching factory-fabricated joints. Form lapped joints by lapping edges of pieces 2 inches to 4 inches, unless larger overlap recommended by liner manufacturer. Wipe contact surface of pieces clean and free of dirt, dust, moisture, and other foreign materials. Use solvent cleaning methods when recommended by liner manufacturer. Apply bonding cement to both contact surfaces in joint area and press together immediately, or use other seaming methods recommended by liner manufacturer. Roll to remove wrinkles or fish mouths. Carefully inspect seams and reseal voids.
- **C.** Liner Attached to Concrete: Remove curing compounds and coatings from joint area. Use liner manufacturer's recommended adhesive system. Provide a 8-inch-wide concrete shelf to support adhesive and liner fabric unless otherwise indicated.

- 1. Install batten strips over bonded liner as shown on drawings.
- **D.** Lining Repairs: Repair tears, punctures, and other imperfections in liner fabric using patches of liner material itself and bonding methods recommended by liner fabric manufacturer. Apply bonding solvent to contact surfaces of both patch and liner and press together immediately. Roll as required to remove wrinkles.

3.2 PROTECTION

- **A.** Protect installed liner in accordance with liner manufacturer's instructions. Repair or replace areas of liner showing injury from scuffing, penetration by foreign objects, distress from rough subgrade, or other unacceptable conditions.
- **B.** Inspect seams and patched areas immediately prior to initial filling of pond to ensure tight, properly bonded installation. Repair damaged seams in accordance with membrane manufacturer's recommendations.

End of Section

SECTION 31 08 00

RESTORATION OF SURFACES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work covered in this Section includes the restoration of surfaces and items disturbed during the Work.

1.2 **<u>QUALITY ASSURANCE</u>**

- **A.** Restoration of surfaces and items shall be done in accordance with the requirements of those authorities having jurisdiction.
- **B.** Existing pavements and bituminous walks shall be replaced using new pavement equal to or better than the existing in quality and thickness, except where otherwise specified. Pavements shall be free from all noticeable sags, humps, cracks, or other defects.
- **C.** Replacement curbing shall be of the same size, material, and appearance as adjoining curbing.
- **D.** Grassed and vegetated areas shall be loamed and replanted with healthy vegetation of a type and quality equal to or superior to existing vegetation.
- **E.** Miscellaneous items including but not limited to mailboxes, fencing, signage, etc. shall be carefully removed and replaced.

1.3 SUBMITTALS

A. General: Provide submittals in accordance with Specification 01 30 00.

1.4 <u>SCHEDULING</u>

A. All surfaces shall be restored as soon as possible after completion of that portion of the Work.

PART 2 – MATERIALS

2.1 <u>NEW MATERIALS</u>

A. New materials shall comply with the requirements of the authority having jurisdiction.

2.2 <u>REUSED MATERIALS</u>

A. Items such as granite curbs, fencing, signs, walks, etc. that have been disturbed during the Work may be replaced with existing materials when, in the opinion of the Engineer, such materials are in acceptable condition.

PART 3 – EXECUTION

3.1 **INSPECTION**

A. Prior to restoring any surfaces, carefully inspect the Work to ensure that the work is complete. Unnecessary disturbance of restored surfaces is to be avoided.

3.2 PLANTS

- **A.** Replace in their original locations all surviving plants, shrubs, trees, etc. that were removed during installation of the Work.
- **B.** Replace with the same type and size any vegetation which does not survive moving.

3.3 GRASS AND LAWNS

A. Grassed areas are to be restored in accordance with Section 32 92 00.

3.4 BITUMINOUS PAVING

- **A.** All Work shall conform to Section 32 12 16.31.
- **B.** Replace all pavement markings immediately after installation of new pavement.

3.5 MISCELLANEOUS

A. Replace miscellaneous items such as fencing, gates, signage, mailboxes, etc. in the same location as soon as possible after installation of the Work.

End of Section

SECTION 31 11 00

CLEARING, GRUBBING, and STRIPPING

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the following:

- 1. Protection of existing trees
- 2. Removal of trees and other vegetation
- 3. Topsoil stripping
- 4. Clearing and grubbing
- 5. Removing above-grade improvements
- 6. Removing below-grade improvements

1.2 PROJECT CONDITIONS

- A. Traffic: Conduct site clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction.
- **B.** Protection of Existing Improvements: Provide protections necessary to prevent damage to existing improvements indicated to remain in place.
 - 1. Protect improvements on adjoining properties and on Owner's property.
 - 2. Restore damaged improvements to their original condition, as acceptable to property owners.
- **C.** Protection of Existing Trees and Vegetation: Protect existing trees and other vegetation indicated to remain in place, against unnecessary cutting, breaking or skinning of roots, skinning or bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary guards to protect trees and vegetation to be left standing.
 - 1. Water trees and other vegetation to remain within limits of contract work as required to maintain their health during course of construction operations.
 - 2. Provide protection for roots over 1-1/2 inch diameter that are cut during construction operations. Coat cut faces with an emulsified asphalt, or other acceptable coating, formulated for use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.

- 3. Repair or replace trees and vegetation indicated to remain which are damaged by construction operations, in a manner acceptable to Engineer. Employ a competent arborist to repair damages to trees and shrubs.
- 4. Replace trees which cannot be repaired and restored to full-growth status, as determined by arborist.
- **D.** Salvageable Equipment and Materials: Carefully remove any items indicated to be salvaged, and store on Owner's premises where indicated or directed.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION

3.1 SITE CLEARING

- A. General: Remove trees, shrubs, grass and other vegetation, improvements, or obstructions as required to permit installation of new construction. Do not exceed clearing limits shown on the plans and clear only the minimum area required to install the work. Excessive clearing is to be avoided.
 - 1. Cut minor roots and branches of trees indicated to remain in a clean and careful manner, where such roots and branches obstruct installation of new construction.
- **B.** Clearing and Grubbing: Clear indicated areas of site of trees, shrubs and other vegetation, except for those indicated to be left standing.
 - 1. Completely remove stumps, roots, and other debris protruding through ground surface. Stockpile separate from other materials to avoid contamination.
 - 2. Use only hand methods for grubbing inside drip line of trees indicated to remain.
 - 3. Fill depressions caused by clearing and grubbing operations with common earth, unless further excavation, earthwork or surface treatment is indicated.
 - a. Unless indicated otherwise, place fill material in horizontal layers not exceeding one (1) foot loose depth, and compact to a density nearly equal to that of adjacent, original ground.
- **C.** Removal of Improvements: Remove existing above-grade and below-grade improvements as indicated and as necessary to facilitate new construction.

3.2 DISPOSAL OF WASTE MATERIALS

A. Removal from Owner's Property: Remove and properly dispose of stumps, waste materials and unsuitable or excess earth materials off site unless otherwise directed by the Engineer.

End of Section

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SECTION 31 22 00

SITE GRADING

PART 1 – GENERAL

1.1 DESCRIPTION

A. This Section covers the labor, materials, and equipment necessary to accomplish the earthmoving required to achieve the finished grades for the work. This work includes rough and fine grading of the site and may include roadways, parking areas, building excavations and envelopes, embankments, etc.

1.2 <u>QUALITY ASSURANCE</u>

- **A.** Provide for safe and efficient work conditions during the progress of the work. Apply water and/or calcium chloride to prevent dust from being a nuisance to the public or the workers both on and near the job site and on and near all off-site borrow areas.
- **B.** Use all means necessary to protect all materials, living matter, utilities, pavements, and structures. Particular care shall be exercised to protect tree root systems and tree trunks. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.
- **C.** Use qualified surveyor to ensure that resulting final grades are as required.

1.3 SUBMITTALS

- A. General: Provide submittals in accordance with Specification 01 30 00.
- **B.** Submit gradations of all stone, gravel, and other materials proposed for use, as well as certified copies of all laboratory and field moisture density tests.

1.4 DELIVERY, STOCKPILING, AND HANDLING

A. Deliver, stockpile, and handle fill materials in a manner which will not cause mixing, spillage, or contamination.

1.5 <u>SCHEDULING</u>

A. Coordinate work with an approved testing laboratory. If laboratory services cannot be secured, operations may have to be delayed to ensure adequate testing.

PART 2 – PRODUCTS

2.1 GENERAL

A. All earth materials to be used under this Section shall be as specified under this or other Sections or as indicated on the Drawings. They shall be unfrozen and free of organic material, waste, or other objectionable material. Excess or unsuitable material shall be removed from the job site by the Contractor.

PART 3 – EXECUTION

3.1 INSPECTION

- **A.** Become thoroughly familiar with the site and the site conditions before beginning the work.
- **B.** Confirm that finish elevations and lines are adequately set and staked out prior to doing any grading.

3.2 GRADING

- A. Loamed Areas:
 - 1. Perform all rough grading required to attain elevations indicated on the Drawings or as required.
 - 2. Excavate to the lines and grades shown on the Drawings or as required. Remove all material, including rocks and boulders to a point at least 4 inches below the finished grade of areas to be loamed and seeded.
 - 3. Remove all ruts, hummocks, and other uneven surfaces prior to placement of fill. Do not place, spread or compact any fill material during unfavorable weather conditions and do not conduct further operations until compaction tests indicate favorable results in previous layers. Do not use frozen materials or place a successive layer of fill on frozen material. Use only approved fill material, free of stumps, trees, waste or other unsuitable material.
 - 4. Spread approved fill material in uniform layers not exceeding 12 inches thickness per layer and compact with heavy machinery as required to achieve the specified compaction. Begin the fill layers at the deepest part of the fill. Fill should extend to the point where a relatively uniform layer of topsoil or loam not less than 4 inches deep will produce final grade.

B. Grading Pavement Subbases:

- 1. Perform all rough grading, including excavation, formation of embankments, shaping, sloping, compaction, construction of ditches, disposal of surplus or unsuitable material, and any work necessary to prepare the subgrades of all roadways, walks and parking areas. Grading shall be brought to the bottom of the base course under paved or surfaced areas and to within a minimum of 4 inches of finished grade under side slopes and/or embankment areas to receive loam along roadways, walks, or parking areas.
- 2. Accomplish all excavation and fill within the slope and grade lines as indicated on the Drawings unless otherwise authorized in writing by the Engineer. The roadway shall be graded to full cross section width at subgrade before placing ant type of subbase or pavement except that partial width construction is permissible where necessary for the maintenance of traffic.
- 3. Do not use frozen material and do not place fill upon frozen material. Placement of material shall stop when the sustained air temperature, below 32°F, prohibits the obtaining of the required compaction. If the material is otherwise acceptable, it shall be stockpiled and reserved for future use when its condition is acceptable to the Engineer for use in embankments.
- 4. Place all material being placed in embankments in horizontal layers of uniform thickness across the full width of embankment except when it is impractical to construct full width of the embankment and partial width layers are authorized by the Engineer. Do not allow or place stumps, trees, rubbish, or other unsuitable material in embankments. Begin layers of embankment at the deepest part of the fill.
- 5. Areas of soft, yielding or otherwise unsuitable material that will not meet compaction requirements shall be removed, replaced with suitable material and properly compacted.
- 6. Place fill for paved or surfaces areas in horizontal layers of depths which will result in layers of compacted material not exceeding 12 inches. Compact each layer as specified before placing each new layer. Each layer shall be kept crowned to shed water to the outside edges of embankment and continuous leveling and manipulating will be required to assure uniform conformity.
- 7. All ditches and drains shall be constructed so they will effectively drain the work before any subbase course material is placed. In handling materials, tools, and equipment, the Contractor shall protect the subgrade from damage. The subgrade shall be kept in such condition that it will drain. Subbase, base or surface material shall not be deposited on the subgrade until the subgrade has been checked and approved by the Engineer. After the subgrade has been approved, hauling shall not be done nor equipment moved over the subgrade which will distort the cross section.

After rolling, the surface of the subbase shall not show any deviation in excess of $\frac{3}{8}$ inch when tested with a 10-foot straightedge applied both parallel to and at right angles to the centerline of the area. The elevation of the finished subbase shall not vary more than 0.05 feet from the established grade and cross section.

C. Grading embankments:

- 1. Level off surfaces on which embankments are to be constructed. Where existing ground is left undisturbed, plow or disk the surface and mix it in with the first layer of embankment material to provide a satisfactory bond.
- 2. Ground surfaces steeper than 1 vertical to 4 horizontal shall be plowed, stepped or broken up to permit bonding of the embankment with the existing surface.
- 3. Uniformly place and spread fill in successive layers not more than 1 foot in compacted depth.

3.3 FIELD QUALITY CONTROL

A. Soils testing shall be performed by the approved independent testing laboratory in accordance with Section 31 23 23.23.

End of Section

SECTION 31 23 16

EARTHWORK

PART 1 – GENERAL

1.1 DESCRIPTION

A. This Section includes the following:

- 1. Preparing subgrade, subbase and base for building slabs, walks, and pavements.
- 2. Excavating, trenching and backfilling of underground utilities, structures and foundations.
- 3. Preparing subgrade and installing earthen material courses for site projects.
- **B.** Work performed under this Section is intended to conform with State of New Hampshire, Department of Transportation, "Standard Specifications for Road and Bridge Construction (latest revision)".

1.3 **DEFINITIONS**

- A. <u>Borrow</u> consists of approved material required for the construction of fills or other portions of the work, and shall be obtained from approved sources, which sources may be designated in the Contract.
- **B.** <u>Earth</u> consists of clay, loam, sand, gravel, topsoil and other materials not otherwise classified.
- **C.** <u>Excavation</u> consists of removal of material encountered to subgrade elevations or dimensions indicated and subsequent disposal of materials removed, classified as follows:
 - 1. Earth Excavation includes excavation of pavements and other obstructions visible on surface; underground structures, utilities, and other items indicated to be demolished and removed; together with earth and other materials encountered that are not classified as rock or unauthorized excavation.
 - a. <u>Common Earth Excavation</u> consists of all excavation other than Trench Earth Excavation and Rock Excavation.
 - b. <u>Trench Earth Excavation</u> consists of excavations for pipelines, cables, conduits, manholes and other related work where the bottom-width limit of excavation does not exceed 8 feet.

- 2. Rock Excavation consists of all solid rock which cannot be removed without blasting or ripping. Intermittent drilling, blasting, or ripping performed to increase production and not necessary to permit excavation of material encountered will be classified as earth excavation.
 - a. <u>Site Rock Excavation</u> consists of all rock excavation other than Trench Rock Excavation and includes the excavation of boulders and parts of masonry structures when found to measure 2 cubic yards or more.
 - b. <u>Trench Rock Excavation</u> consists of rock excavation where solid rock and boulders or parts of masonry structures found to measure 1 cubic yard of more are removed from trenches where the bottom-width limit of excavation does not exceed 8 feet.
- 3. <u>Unauthorized Excavation</u> consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be at Contractor's expense.
 - a. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to Engineer.
 - b. In locations other than those above, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Engineer.
- 4. <u>Additional Excavation</u>: When excavation has reached required subgrade elevations, notify Engineer, who will observe subgrade conditions. If Engineer believes that bearing materials at required subgrade elevations are unsuitable, continue excavation until suitable bearing materials are encountered and replace excavated material as directed by Engineer.
 - a. Removal of unsuitable material and its replacement as directed will be paid on basis of Conditions of the Contract relative to changes in work.
- **D.** <u>Subgrade</u> consists of the undisturbed earth or the compacted soil layer immediately below indicated surface treatment systems.
- **E.** <u>Structure</u>: Buildings, foundations, slabs, tanks, curbs, or other man-made stationary features occurring above or below ground surface.

- **F.** <u>Unstable Material</u> consists of debris, frozen materials, topsoil, quick-sand, and all wet, soft or loose material which does not provide sufficient bearing capacity to satisfactorily support pipes or other work, as determined by the Engineer.
- **G.** <u>Unsuitable Material</u> consists of excavated material which does not meet requirements for backfilling purposes and includes solid and loose rock, earth overburden, and unstable material, as determined by the Engineer.
- **H.** <u>Paved Areas</u> consist of the area which lies directly under a paved surface, whether it is asphalt, concrete, or other paving materials.
- I. <u>Select Fill</u> consists of Select Earth, imported sand, and/or other granular materials as specified and/or approved by the Engineer.
- **J.** <u>Earth Overburden</u>: Earth overlying solid rock and in place during blasting operations or earth not classified as Select or Common Earth.
- **K.** <u>Pipe Bedding</u>: Sand, crushed stone, or other processed granular materials as approved by the Engineer. Pipe bedding material(s) shown on the Drawings take precedence over this paragraph.
- L. <u>Wood Sheeting and Bracing</u>: Sound timber, free from defects which might impair its strength and effectiveness.
- M. <u>Steel Sheeting and Bracing</u> shall be in accordance with ASTM A328.
- N. <u>Backfill General</u>: To the extent suitable materials are available, backfill shall consist of excavated material. Where excavation does not provide sufficient approved material, import additional material from off-site.
- **O.** <u>Backfill Trenches</u>: Pipe Bedding material up to a minimum of 12 inches over the top of pipe; suitable Common Earth, Select Earth, or Select Fill for the remainder of the trench. Backfill materials shown on the Drawings take precedence over this paragraph.
- **P.** <u>Backfill Around Structures</u>: In paved areas, Select Fill, or a better material when required, for the full depth. In unpaved areas, Select Fill for the full depth. Backfill materials shown on the Drawings take precedence over this paragraph.
- Q. <u>Concrete for Cradles and Encasements</u>: Class C concrete in accordance with Specification 03 30 53.

1.4 SUBMITTALS

A. General: Provide submittals in accordance with Specification 01 30 00.

- **B.** Test Reports: Submit the following reports directly to Engineer from the testing laboratory with copy to Contractor:
 - 1. Certified copies of all results of moisture-density tests and field compaction density tests.
 - 2. Gradations of proposed materials.
 - 3. Copies of measurements and computed volumes of unstable material removed.
 - 4. Certification from testing laboratory that materials meet permeability requirements at required compaction.
 - 5. Verification of suitability of each footing subgrade material, in accordance with specified requirements.
 - 6. Report of actual unconfined compressive strength and/or results of bearing tests of each strata tested.
- **C.** As a minimum, the laboratory testing reports shall contain the following:
 - 1. Laboratory's name.
 - 2. Date, time and specific location from which sample was taken and name of person who collected the sample.
 - 3. Designation of the test method used.
 - 4. A description of the sample, the test, and the test results.
 - 5. The date the test was performed and the person who performed the test.
 - 6. The Project name, identification, and Contractor's name.

1.5 **QUALITY ASSURANCE**

- **A.** All soils testing will be performed by a testing laboratory of the Owner's choice at the Owner's expense except as specified in Paragraph C below.
- **B.** Where soil material is required to be compacted to a percentage of relative compaction, the maximum density at optimum moisture content will be determined in accordance with ASTM D698 or ASTM D1557 as indicated, except as otherwise stated in these Specifications. Where cohesionless, free draining soil material is required to be compacted to a percentage of relative density, the calculation of relative density will be determined in accordance with ASTM D4253 and D4254. Field density in-place tests

will be performed in accordance with ASTM D1556, ASTM D6938, or by other means acceptable to the Owner.

- **C.** When tests of fill or backfill show noncompliance with the required density, gradations, or other physical properties, Contractor shall take whatever actions are necessary and as may be required to remedy any deficiencies and ensure conformance with specifications and requirements. Subsequent testing to show compliance shall be by a testing laboratory selected by the Owner and shall be at the Contractor's expense.
- **D.** All fill material shall be subject to the approval of the Engineer.
- **E.** Soils shall be described in accordance with ASTM D2488, Visual-Manual Procedure.
- **F.** Codes and Standards: Perform excavation work in compliance with applicable requirements of authorities having jurisdiction.

1.6 PROJECT CONDITIONS

- A. Site Information: Subsurface explorations data, if made available to the Contractor, is for informational purposes only. Conditions are not intended as representations or warranties of accuracy or continuity between subsurface explorations. The Owner will not be responsible for interpretations or conclusions drawn from this data by Contractor.
 - 1. Additional test pits, borings or other explorations may be performed by Contractor, at the Contractor's option; however, no change in the Contract Sum will be authorized for such additional explorations.
- **B.** Existing Utilities: Locate existing underground utilities in areas of excavation work. If utilities are indicated to remain in place, provide adequate means of support and protection during earthwork operations.
 - 1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.
 - 2. Do not interrupt existing utilities serving facilities occupied by Owner or others, during occupied hours, except when permitted in writing by Engineer and then only after acceptable temporary utility services have been provided.
 - a. Provide minimum of 48-hour notice to Engineer, and receive written notice to proceed before interrupting any utility.
 - 3. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shutoff of services if lines are active.

- **C.** Use of Explosives: Do not bring explosives onto site or use in work without prior written permission from authorities having jurisdiction.
- **D.** Protection of Persons and Property: Barricade open excavations occurring as part of this work per applicable regulatory requirements.
 - 1. Operate warning lights as recommended by authorities having jurisdiction.
 - 2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
 - 3. Perform excavation by hand within drip-line of large trees to remain. Protect root systems from damage or dry-out to the greatest extent possible. Maintain moist condition for root system and cover exposed roots with moistened burlap.
- **E.** Maintain excavations and trenches free of groundwater, sewage, storm water, ice and snow.
- **F.** Backfilling with frozen materials or when materials already in place are frozen is not permitted. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

1.7 DELIVERY, STORAGE, AND HANDLING

- **A.** Segregate topsoil, excavated materials, and other earth materials on the site to prevent contamination.
- **B.** Store excavated materials meeting the requirements for backfill a sufficient distance away from excavations and trenches to avoid overloading and to prevent slides or caveins. Do not store materials on, over, or adjacent to structures or utilities, which may collapse or become damaged due to the added weight. Remove excess excavated material promptly and dispose of off- site.
- **C.** No construction activity, access, storage or other use shall take place beyond the construction easement boundaries.

PART 2 – PRODUCTS

2.1 MATERIALS

A. <u>Common Earth</u>: Clay, loam, sand, gravel, topsoil and similar materials which may contain some stones, pebbles, lumps and rock fragments up to 6 inches in largest dimension, nut does not contain debris, organic or frozen material.
- **B.** <u>Select Earth</u>: Sand, gravel and similar materials which may contain small amounts of stones, pebbles, or lumps over 1 inch but not over 2 inches in largest dimension, but does not contain clay, silt, loam, organic material, debris and frozen material.
- C. <u>Sand Buffer and Free Draining Sand</u>: Hard durable natural or washed sand free of deleterious amounts of clay, silt or organic matter.

Gradation:	Passing 3/8" Sieve	=	100%
	Passing No. 4 Sieve	=	95-100%
	Passing No. 16 Sieve	=	45-80%
	Passing No. 50 Sieve	=	10-30%
	Passing No. 100 Sieve	=	2-10%
	Passing No. 200 Sieve	=	0-5%

The calcium carbonate content shall not exceed 15%. The saturated permeability shall not be less than 1 X 10^{-3} cm/sec when compacted to 95% of the maximum density obtainable at optimum moisture content (as determined by ASTM D1557, Method C).

D. <u>Sand</u>: Hard durable natural or crushed sand particles free of deleterious amounts of clay, silt or organic matter, conforming to NHDOT Item No. 304.1.

Gradation:	Passing 1/2" Sieve	=	100%
	Passing No. 4 Sieve	=	70-100%
	Passing No. 200 Sieve	=	0-12%
	(Based on Fraction Passing No. 4)		

E. <u>Gravel (Bank Run)</u>: Satisfactorily graded, free draining, hard, durable stone and coarse sand reasonably free from silt, loam, clay and organic matter, conforming to NHDOT Item No. 304.2.

Gradation:	Passing 6" Sieve	=	100%
	Passing No. 4 Sieve	=	25-70%
	Passing No. 200 Sieve	=	0-12%
	(Based on Fraction Passin	ig No. 4)	

F. <u>Screened Gravel</u>: Uniformly graded, clean, hard, and durable particles free from an excess of soft, thin, elongated, laminated, or disintegrated pieces and be free form silt, loam, clay, or organic matter.

Gradation:	Passing 1-1/2" Sieve	=	100%
	Passing 3/4" Sieve	=	90-100%
	Passing 3/8" Sieve	=	0-30%
	Passing No. 4 Sieve	=	0-5%

- **G.** <u>Pea Gravel</u>: Natural stone, washed free of clay, shale and organic matter, graded in accordance with ANSI/ASTM C136 to the following: maximum size 5/8 inch, minimum size 1/4 inch.
- **H.** <u>Crushed Gravel</u>: Uniformly graded and free from silt, loam. Clay or organic matter conforming to NHDOT Item No. 304.3. At least 50% of the materials retained on the 1 inch sieve shall have a fractured face.

Gradation:	Passing 3" Sieve	=	100%
	Passing 2" Sieve	=	95-100%
	Passing 1" Sieve	=	55-85%
	Passing No. 4 Sieve	=	27-52%
	Passing No. 200 Sieve	=	0-12%
	(Based on Fraction Passin	g No. 4)	

I. <u>Crushed Aggregate For Shoulders</u>: Conforming to NHDOT Item No. 304.33.

Gradation:	Passing 1-1/2" Sieve	=	100%
	Passing 1" Sieve	=	90-100%
	Passing No. 4 Sieve	=	30-65%
	Passing No. 200 Sieve	=	0-10%
	(Based on Total Sample)		

J. Crushed Stone (Fine): Conforming to NHDOT Item No. 304.4.

Gradation:	Passing 2" Sieve	=	100%
	Passing 1-1/2" Sieve	=	85-100%
	Passing 3/4" Sieve	=	45-75%
	Passing No. 4 Sieve	=	10-45%
	Passing No. 200 Sieve	=	0-5%
	(Based on Total Sample)		

K. Crushed Stone (Course): Conforming to NHDOT Item No. 304.5.

Gradation:	Passing 3-1/2" Sieve	=	100%
	Passing 3" Sieve	=	85-100%
	Passing 1-1/2" Sieve	=	60-90%
	Passing 3/4" Sieve	=	40-70%
	Passing No. 4 Sieve	=	15-40%
	Passing No. 200 Sieve	=	0-5%
	(Based on Total Sample)		

L. <u>Loam (Topsoil)</u>: Loam shall be the surface layer of natural workable soil containing 3% minimum to10% maximum organic matter (determined by loss by ignition), capable of sustaining the growth of vegetation, with no admixture of refuse or material toxic to plant

growth. It shall be relatively free from stones, lumps, stumps or similar objects larger than 1 inch in greatest diameter, sterile soil, roots and brush. Ordinary sods of herbaceous growth such as grass and non-noxious weeds will be permitted. The loam shall be free from subsoil. The acidity range of the loam prior to treatment as specified herein shall be between pH 5.0 and 6.0 inclusive. Not more than 65% shall pass the No. 200 Sieve as determined by the wash test in accordance with ASTM D 1140. No more than 20% of the material passing the No. 4 Sieve shall consist of clay particles.

- M. <u>Silt</u>: Silt Loam or Silt, at least 50% of material by weight shall have a particle size less than 0.05 mm. The material shall be free of debris, frozen material, and stones greater than 3 inches in largest dimension. The saturated permeability of the compacted material shall not exceed 1 X 10⁻⁵ as determined by the U.S. Army Corps of Engineers "Falling Head Permeability Test EM1110-2-1906, Appendix 7", when compacted to 85% of the maximum density obtainable at optimum moisture content (as determined by ASTM D1557, Method C).
- N. Spalls: Stones or broken rock ranging downward from the maximum size indicated.
- **O.** <u>Stabilization Fabric</u>: Mirafi Filterweave FW 700 or approved equivalent.
- **P.** <u>Stone Filter Blanket</u>: Clean durable fragments of either ledge rock, boulders or both, reasonably free of thin or elongated pieces and organic material.

Gradation:	Passing 5" Sieve	=	100%
	Passing 4" Sieve	=	85-100%
	Passing 1-1/2" Sieve	=	20-55%
	Passing 3/4" Sieve	=	0-25%

Q. <u>Structural Fill</u>: Hard durable particles or fragments of stone, gravel and natural sand free from deleterious amounts of clay, silt or organic matter. At least 30 percent of the materials retained on the No. 4 sieve shall have a fractured face.

Gradation:	Passing 2" Sieve	=	100%
	Passing 1-1/2" Sieve	=	90-100%
	Passing No. 4 Sieve	=	30-60%
	Passing No. 100 Sieve	=	0-12%
	Passing No. 200 Sieve	=	0-5%
	(Based on Fraction Passin	ng No. 4)	

R. <u>Embedment</u>: Screened gravel and/or crushed stone free from organic matter, clay, and/or loam meeting ASTM C33 Stone Size No. 67.

Gradation:	Passing 1" Sieve	=	100%
	Passing 3/4" Sieve	=	90-100%
	Passing 3/8" Sieve	=	20-55%

Passing No. 4 Sieve	=	0-10%
Passing No. 8 Sieve	=	0-5%

2.2 CONTROLLED LOW STRENGTH MATERIAL

- **A.** The 7 day compressive strength shall be not less than 100 psi or not more than 200 psi. Determine in accordance with ASTM D4832.
- **B.** The soil shall meet the following requirements when tested in accordance with the designations as shown in the Eighth Edition Revised Reprint of the Bureau of Reclamation (USBR) Concrete Manual and the Third Edition of the Bureau of Reclamation Earth Manual, Part 2.
- **C.** Soil producing a color darker than the standard color in the calorimetric test for organic impurities shall be rejected until further tests are performed to determine the nature of the material and its effect on the time of set and strength of cement, refer to the USBR Concrete Manual Appendix Designation 14.
- **D.** The amount of soil passing the No. 200 sieve shall not exceed 30 percent by weight, and the amount of soil passing the No. 100 sieve shall not exceed 50 percent by weight, refer to the USBR Earth Manual Designation USBR 5530). The soil shall be nonplastic or of low plasticity.
- **E.** The soil shall be selected or processed so that the gradation of the soil is such that all particles will remain in suspension, or no segregation will occur, when the controlled low strength material is placed. The maximum particle size in the soil shall not exceed 1/8 of the open distance between the pipe and the trench wall or 1-1/2 inches, whichever is less.
- **F.** The maximum size of any clay balls in the soil shall be one-half inch. The maximum percentage of clay balls, by wet weight of the soil, shall not exceed 10 percent.
- **G.** The Water-Cement Ratio shall not exceed 3.5:1. The water content shall not exceed that required to provide a mix that will flow and can be pumped.
- **H.** Provide batching equipment to obtain the proper weights of soil, cement, and water. All measuring devices shall be sensitive to a 2% variation above or below the actual weights required.
- **I.** Operate mixers such that the slurry is discharged uniformly and is consistent throughout each batch.
- **J.** Consistency shall be such that the controlled low strength material flows easily into all openings between the pipe and the lower portion of the trench. When trenches are on a steep slope, a stiffer mix may be required. When a stiffer mix is used, vibrate to ensure the controlled low strength material completely fills all spaces.

2.3 TRENCH PLUGS

A. Construct from compacted clay soils with Unified Soil Classification System classification of CL or CH and with at least 60 percent fines (passing the No. 200 sieve) and a Plasticity Index of 15 or greater. Alternatively, trench plugs may be constructed with lean concrete, controlled low strength material, or onsite silty sand soils processed with 20 pounds of bentonite clay per cubic yard.

PART 3 – EXECUTION

3.1 EXCAVATION – GENERAL

- A. Identify and mark known underground utilities.
- **B.** Identify required lines, levels, contours and datum.
- C. Comply with local codes, ordinances, and requirements of agencies having jurisdiction.
- **D.** Do not perform rock excavation work until material to be excavated has been measured and classified by Engineer.

3.2 STABILITY OF EXCAVATIONS

- A. Slope sides of excavations to comply with local codes, ordinances, and requirements of agencies having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.
- **B.** Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Extend shoring and bracing as excavation progresses.
 - 1. Provide permanent steel sheet piling or pressure-creosoted timber sheet piling wherever subsequent removal of sheet piling might permit lateral movement of soil under adjacent structures. Unless indicated otherwise, cut off tops a minimum of 2.5 feet below final grade and leave permanently in place.

3.3 <u>DEWATERING</u>

- **A.** Prevent surface and ground water from flowing into excavations and from flooding project site and surrounding area.
 - 1. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of

subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations without erosion or sedimentation.

2. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting or runoff areas. Do not use trench excavations as temporary drainage ditches.

3.4 STORAGE OF EXCAVATED MATERIALS

- **A.** Stockpile excavated materials acceptable for backfill and fill where directed. Place, grade, shape and stabilize stockpiles as necessary to prevent storm water erosion.
 - 1. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.
 - 2. Dispose of excess excavated soil material and materials not acceptable for use as backfill or fill.

3.5 EXCAVATION FOR STRUCTURES

- A. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete form-work, installation of services, and other construction and for inspection.
 - 1. Excavations for footings and foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other work.
 - 2. For pile foundations, stop excavations from 6 inches to 12 inches above bottom of footing before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
 - 3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Structures: Conform to elevations and dimensions indicated within a tolerance of plus or minus 0.10 feet; plus a sufficient distance to permit placing and removal of concrete form-work, installation of services, and other construction and for inspection. Do not disturb bottom of excavations, intended for bearing surface.

3.6 EXCAVATION FOR PAVEMENTS

A. Cut surface under pavements to comply with cross-sections, elevations and grades as indicated.

3.7 TRENCH EXCAVATION FOR PIPES AND CONDUIT

- A. Excavate trenches sufficiently wide to provide ample working room but not wider than the maximum width indicated on the drawings. If trench widths are exceeded, redesign with stronger pipe, concrete cradles, or other special installation procedures as required by the Engineer. All additional costs, including the cost of redesign, shall be borne by the Contractor.
- **B.** Where it is necessary for pipes to be laid in fill, place Select Fill in uniform horizontal layers not over 6 inches in compacted thickness. Carry fill up to elevation at least two feet above the elevation of the top of the pipe to be laid and then excavate trench.
- **C.** Bedding requirements are detailed on the plans.
- **D.** Excavate trenches and conduit to depth indicated or required to establish indicated slope and invert elevations and to support bottom of pipe or conduit on undisturbed soil or compacted bedding material as indicated. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
 - 1. Where rock is encountered, carry excavation 6 inches below invert elevation and backfill with a 6-inch layer of stone bedding prior to installation of pipe.
 - 2. For pipes or conduit less than 6 inches in nominal size, and for flat-bottomed, multiple-duct conduit units, hand-excavate bottom cut to accurate elevations and support pipe or conduit on undisturbed soil or compacted bedding material as indicated.
 - 3. For pipes or conduit 6 inches or larger in nominal size, shape trench bottom or bedding to fit bottom of pipe for 90 degrees (bottom 1/4 of the circumference). Where no bedding is indicated, fill depressions with granular fill-sand and tamp. At each pipe joint, dig bell holes to relieve pipe bell of loads to ensure continuous bearing of pipe barrel on bearing surface.

3.8 COLD WEATHER PROTECTION

A. Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.

3.9 REQUIREMENTS PRIOR TO BACKFILLING

- A. Backfill excavations as promptly as work permits, but not until completion of the following:
 - 1. Acceptance of construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.

- 2. Inspection, testing, approval, and recording locations of underground utilities have been performed and recorded.
- 3. Removal of concrete form-work.
- 4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if required.
- 5. Removal of trash and debris from excavation.
- 6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.
- 7. Inspection, testing and approval of subgrade.

3.10 SUBGRADE PREPARATION

- **A.** Clear, grub and dispose of vegetation. Strip humus, excavate unsuitable materials and remove obstructions. Uniformly grade subgrade to indicated lines, grades and acceptable grading tolerances. Grade subgrade to be free of non-draining depressions where practical.
- **B.** When subgrade density is less than that specified under "Compaction" for particular area classification, break up surface, pulverize, moisture-condition to specified acceptable moisture content range, and compact to required depth and percentage of maximum density.
- **C.** Unless otherwise indicated, roughen sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.

3.11 GENERAL BACKFILL AND FILL PLACEMENT

- **A.** Place backfill and fill materials in layers not more than 12 inches in loose depth for material compacted by heavy compaction equipment, and not more than 6 inches in loose depth for material compacted by hand-operated tampers.
- **B.** Place backfill and fill materials evenly adjacent to structures, piping, or conduit to required elevations. Prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping, or conduit to approximately same elevation in each lift.
- **C.** Backfill trenches with concrete where trench excavations pass within 18 inches of column or wall footings and that are carried below bottom of such footings or that pass under wall footings. Place concrete to level of bottom of adjacent footing.

1. Do not backfill trenches until tests and inspections have been made and backfilling is authorized by Engineer. Use care in backfilling to avoid damage or displacement of pipe systems.

3.12 PLACING SUB-PAVEMENT GRAVEL COURSES

- A. General: Sub-pavement gravel courses consist of placing subbase and base gravel materials, in layers of specified thickness, over subgrade surface to support pavements.
- **B.** Grade Control: During construction, maintain lines and grades including crown and cross-slope of sub-pavement gravel courses.
- **C.** Shoulders: Place shoulders along edges of sub-pavement gravel courses to prevent lateral movement. Construct shoulders of acceptable soil materials, placed in such quantity to compact to thickness of each sub-pavement gravel course layer. Compact and roll at least a 12-inch width of shoulder simultaneous with the compaction and rolling of each layer of sub-pavement gravel.
- **D.** Placing: Place sub-pavement gravel course material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain specified acceptable moisture content range for compacting sub-pavement gravel material during placement operations.
 - 1. When a compacted sub-pavement gravel course is indicated to be 6 inches thick or less, place material in a single layer. When indicated to be more than 6 inches thick, place material in equal layers, except no single layer shall be more than 6 inches or less than 3 inches in thickness when compacted.

3.13 PLACING BUILDING SLAB STRUCTURAL FILL COURSE

- **A.** General: Structural fill course consists of placement of structural fill material, in layers of indicated thickness, over subgrade surface to support concrete building slabs.
- **B.** Placing: Place structural fill material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain specified acceptable moisture content range for compacting material during placement operations.
 - 1. When a compacted structural fill course is indicated to be 6 inches thick or less, place material in a single layer. When indicated to be more than 6 inches thick, place material in equal layers, except no single layer shall be more than 6 inches or less than 3 inches in thickness when compacted.

3.14 BACKFILLING TRENCHES

- A. <u>Pipe Bedding</u> Bedding requirements shall be as shown on the plans. Provide bedding to the spring line of the pipe. Place fill by hand in not greater than 6 inch compacted layers.
- **B.** <u>12 Inches Over Pipes</u> Provide 12 inches of Select Fill over the top of the pipe as detailed on the plans. Place fill by hand in not greater than 6 inch layers. Bring Select Fill up evenly on both sides of pipes and carefully and thoroughly compact.
- C. <u>Remainder of Trench Paved Areas</u> Select Fill, Select Earth, or Common Earth placed no greater than 12 inch compacted layers.
- **D.** <u>Remainder of Trench Other Areas</u> Select Fill, Select Earth, or Common Earth placed no greater than 12 inch compacted layers.
- **E.** <u>Trench Plugs</u> Trench plugs shall be placed every 500 feet along the length of the pipe in wet areas, and where shown on the Drawings or as directed by the Engineer. Trench plugs shall be a minimum thickness of 2 feet as measured along the longitudinal pipe axis and replace the pipe zone material.

3.15 BACKFILLING AROUND STRUCTURES

- **A.** Uniformly spread and deposit backfill in horizontal layers, not over twelve inches in compacted thickness. Take special precautions to prevent damage to new construction.
- **B.** In paved areas, backfill with Select Fill for the full depth. In unpaved areas, backfill with Select Fill, Select Earth or Common Earth.

3.16 SHEETING AND BRACING

- **A.** Provide and maintain adequate sheeting and bracing as required for the safety and protection of the Work, persons and adjacent property and structures in accordance with federal, state and local laws, codes ordinances, and standards.
- **B.** Where sheeting is placed along side pipe and extends below mid-diameter, it shall be cut off and left in place to an elevation not less that one foot above the top of the pipe. The Engineer may, at his discretion, order sheeting and bracing to be cut-off and left in place. Where, in the opinion of the Contractor, damage may result from withdrawing sheeting, he shall immediately notify the Engineer. Sheeting ordered left in place adjacent to piping shall be cut-off at least three feet below grade but not less than one foot above the top of the pipe.
- **C.** Contractor is fully responsible for the design and construction of all sheeting and bracing used and for all damages resulting from improper quality, strength, placing, maintenance or removal of sheeting and bracing.

3.17 UNSTABLE MATERIALS

- **A.** Remove unstable materials in excavations and trench bottoms which are incapable of supporting pipes or structures, to the extent and depths directed by the engineer, and properly dispose of off-site. Refill and compact the excavation as required.
- **B.** Whenever the material encountered is, in the Contractor's opinion, incapable of providing adequate support, he shall immediately notify the Engineer.

3.18 DISPOSAL OF EXCAVATED MATERIALS

- **A.** Excavated materials which meet the requirements for embankment fill or backfill may be used for constructing embankments and backfilling, as possible. Remove excess excavated materials and dispose of off-site.
- **B.** The storing and stockpiling of unsuitable material on-site is not permitted.

3.19 COMPACTION AND MOISTURE CONDITIONING

- **A.** Compaction shall not take place in freezing weather or when materials to be compacted are frozen, too wet or moist, or too dry.
- **B.** Schedule the Work to allow ample time for laboratory tests and to permit the collecting of samples and the performing of field density tests during the backfilling and compaction operations.
- **C.** Utilize the proper compaction methods and equipment to suit the soils and conditions encountered.
- **D.** Verify that layers of material are no thicker than the specified maximum thickness.
- **E.** Control soil and fill compaction and moisture conditioning, providing minimum percentage of density specified for each area classification indicated below. Correct improperly compacted areas or lifts as directed by Engineer if soil density tests indicate inadequate compaction.
 - 1. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density in accordance with ASTM D 1557 and maintaining moisture content between 1% below and 2% above optimum moisture content:
 - a. Under structures, building slabs and steps, and pavements, compact top 12 inches of subgrade and each layer of backfill or fill material at 95 percent maximum density.

- b. Under lawn or unpaved areas, compact top 6 inches of subgrade and each layer of backfill or fill material at 90 percent maximum density.
- c. Under walkways, compact top 6 inches of subgrade and each layer of backfill or fill material at 95 percent maximum density.
- 2. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material. Apply water in minimum quantity as necessary to prevent free water from appearing on surface during or subsequent to compaction operations.
 - a. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.
 - b. Stockpile or spread soil material that has been removed because it is too wet to permit compaction. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.

3.20 FIELD QUALITY CONTROL

- **A.** Quality Control Testing During Construction: Schedule and allow testing service to inspect and approve each subgrade and fill layer before further backfill or construction work is performed. Provide all assistance and cooperation during testing and coordinate operations to allow ample time for the required sampling and testing.
- **B.** Perform a laboratory moisture density test for each type of soil proposed for use or encountered in the Work.
 - 1. Perform field density tests in accordance with ASTM D 1556 (sand cone method) or ASTM D 2167 (rubber balloon method), as applicable.
 - a. Field density tests may also be performed by the nuclear method in accordance with ASTM D 2922, providing that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D 1556. In conjunction with each density calibration check, check the calibration curves furnished with the moisture gages in accordance with ASTM D 3017.
 - b. If field tests are performed using nuclear methods, make calibration checks of both density and moisture gages at beginning of work, on each different type of material encountered, and at intervals as directed by the Engineer.
 - 2. Footing Subgrade: For each strata of soil on which footings will be placed, perform at least one test to verify required design bearing capacities. Subsequent verification and

approval of each footing subgrade may be based on a visual comparison with related tested strata when acceptable to Engineer.

- 3. Paved Areas and Building Slab: Perform at least one field density test of subgrade for every 2,000 square feet of paved area or building slab, but in no case fewer than three tests. In each compacted fill layer, perform one field density test for every 2,000 sq. ft. of overlaying building slab or paved area, but in no case fewer than three tests.
- 4. Foundation Wall Backfill: Perform at least one test for each foot of backfill at intervals of approximately 50 feet around the structure.
- 5. Trenches: Perform at least one field density test for each foot of backfill at intervals of approximately 200 feet along trench.
- 6. Embankments: In each compacted fill layer, perform at least one field density test for every 2,000 sq. ft. of embankment area, but in no case less than three tests.
- 7. Sidewalks: Perform at least one test at intervals of 200 feet along the sidewalk.
- 8. If, in the Engineer's opinion and based on testing service reports and inspection, subgrade or fills that have been placed are below the specified compaction requirements, perform additional compaction and testing until the specified compaction requirements are attained. The testing frequency in Paragraph 3.20 is at the discretion of the Engineer and may be decreased as the Project progresses.

3.21 GRADING

- A. General: Uniformly grade areas within limits of grading, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated or between such points and existing grades.
- **B.** Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes and as follows:
 - 1. Lawn or Unpaved Areas: Finish areas to receive loam to within not more than 0.25 foot above or below required subgrade elevations.
 - 2. Walks and Athletic Fields: Shape surface of areas under walks and athletic fields to line, grade, and cross-section, with finish surface not more than 0.10 foot above or below required subgrade elevation.
 - 3. Pavements: Shape surface of areas under pavement to line, grade, and cross-section, with finish surface not more than 0.05 foot above or below required subgrade elevation.

- **C.** Grading Surface of Fill under Building Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 0.05 foot when tested with a 10-foot straightedge.
- **D.** Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative compaction for each area classification.

3.22 EROSION CONTROL

A. Provide measures as necessary to control all erosion and sedimentation resulting from construction activities as indicated, warranted or required by authorities having jurisdiction.

3.23 MAINTENANCE

- A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
- **B.** Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances.
- **C.** Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.
- **D.** Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.24 DISPOSAL OF EXCESS AND WASTE MATERIALS

- **A.** Do not dispose of spoil materials on or off site in wetlands or other environmentally sensitive areas unless properly permitted through regulatory authorities having jurisdiction and conducted in accordance with the permit conditions thereof.
- **B.** Remove spoil materials and legally dispose of off site.

3.25 CONTROLLED LOW STRENGTH MATERIAL

A. Where controlled low strength material is used for pipe zone material, the pipe shall be laid on sand or earth berms free from rocks larger than 3 inches and placed at pipe quarter points. Controlled strength material shall be placed from one side of the pipe and rodded or vibrated, if necessary, so that it flows under the pipe until it appears on the other side. Controlled strength material shall then be added to both sides of the pipe and rodded or vibrated until it completely fills the space between the pipe and the lower portion of the

trench. Where required to prevent uplift, the controlled strength material shall be placed in two stages, allowing sufficient time for the initial set of the first stage before the remainder is placed. Controlled strength material shall be deposited as nearly as practicable in its final position and shall not disturb the pipe trench or cause foreign material to become mixed with the controlled strength material. Controlled strength material shall be brought to 6 inches above the top of the pipe. Backfill shall not be placed until the controlled strength material has reached the initial set. If it is anticipated that backfill will not be placed over the controlled strength material within 8 hours, a 6-inch minimum cover of moist backfill shall be placed over the controlled strength material. The moisture in the 6-inch minimum cover shall be maintained until additional backfill is placed. If the ambient temperature is 50°F or less, an additional 12-inch minimum cover of loose backfill shall be placed over the 6-inch moist backfill cover prior to the end of the working day.

- **B.** Controlled strength material shall not be mixed or placed when the air temperature is below 40°F. Provided, that if the temperature is 35°F or above, controlled strength material may be placed if the temperature is rising. Temperature of the controlled strength material shall be 50°F or greater at time of placement. If the Engineer determines that weather conditions are unsuitable, controlled strength material shall not be placed.
- **C.** No controlled strength material shall be placed in pipe trenches when the trench bottom or walls are frozen or contain frozen materials. Backfill placed as cover over the controlled strength material shall not contain any frozen material.

End of Section

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SECTION 31 23 16.26

ROCK REMOVAL

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the removal and disposal of rock from the site and trench excavations.

1.2 DEFINITIONS

- A. <u>Rock Excavation</u> consists of all solid rock which cannot be removed without blasting or ripping. Intermittent drilling, blasting, or ripping performed to increase production and not necessary to permit excavation of material encountered will be classified as earth excavation.
 - 1. <u>Site Rock Excavation</u> consists of all rock excavation other than Trench Rock Excavation and includes the excavation of boulders and parts of masonry structures when found to measure two (2) cubic yards or more.
 - 2. <u>Trench Rock Excavation</u> consists of rock excavation where solid rock and boulders or parts of masonry structures found to measure two (2) cubic yards or more are removed from trenches where the bottom-width limit of excavation does not exceed 8 feet.
- **B.** <u>Unauthorized Excavation</u> consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be at Contractor's expense.

1.3 SUBMITTALS

- **A.** General: Provide submittals in accordance with Specification 01 30 00. Contractor shall include unit prices for rock removal.
- **B.** Name, qualifications, experience records, certificates of insurances and copies of licenses.
- C. Listing and description of materials and methods proposed for use.
- **D.** Prior to blasting, the Contractor shall at his own expense have a survey done of all existing structures and utilities on the site and within 500 feet of the site. Said survey shall be conducted by an independent entity approved by the Engineer and shall address the structural integrity of all existing structures and utilities. Upon completion of blasting

operations, the Contractor shall have prepared by the same independent entity, a survey addressing the structural integrity of the same structures and utilities.

- **E.** Written notice to Owner, Engineer, and individual property owners in immediate vicinity at least 48 hours in advance of blasting operations.
- **F.** On a daily basis, the Contractor shall submit to the Engineer accurate records including but not limited to, the location, depth, elevation of blast, maximum explosive weight per delay and the date and time of blast.

1.4 **QUALITY ASSURANCE**

A. All blasting operations shall be conducted in full compliance with all laws of the State, all local ordinances, and with all possible care so as to avoid injury to persons and property. The rock shall be well covered, and sufficient warning given to all persons in the vicinity of the work before blasting. Care shall be taken to avoid injury to all structures, utilities and property. The Contractor, in addition to observing all municipal and other ordinance relating to the storage and handling of explosives, shall also conform to and further requirements the Engineer deems necessary.

1.5 PROJECT CONDITIONS

- A. Site information: Subsurface explorations data, if made available to the Contractor, is for informational purposes only. Conditions are not intended as representations or warranties of accuracy or continuity between subsurface explorations. The Owner will not be responsible for interpretations or conclusions drawn from this data by the Contractor.
 - 1. Additional test pits, borings, or other explorations may be performed by Contractor, at the Contractor's option; however, no change in the Contract Sum will be authorized for such additional explorations.

1.6 DELIVERY, STORAGE, AND HANDLING

- **A.** Handle and store explosives in strict accordance with requirements of regulatory authorities have jurisdiction.
- **B.** Keep explosives on site only in such quantity as may be needed for the work under way and only during such time as they are to be used.
- **C.** Store explosives in a secure manner separate from all tools, with caps or detonators safely stored at a separate point more than 100 feet distant.
- **D.** Disposal of rock shall be by one of the following:

- 1. If rock is suitable in nature and of the proper size, it may be used as rock channel, outlet, or slope lining.
- 2. If the Contract Documents permit or require the use of rock in embankments, fills or other areas, it may be incorporated into the Work accordingly.
- 3. If the Contract Documents designate a spoil or stockpile area, deliver and neatly place the rock in the designated area.
- 4. Delivered to an area designated by the Owner or Engineer.
- 5. If none of the above apply, remove the rock from the project site and dispose of off-site in a lawful manner.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. <u>Concrete</u> used to fill over-excavations shall be Class C (28 day compressive strength of 2,000 psi) as specified in the Specification "Cast-in-Place Concrete".
- **B.** <u>Other Materials</u> required for the complete removal and for providing a safe operation shall be as selected by the Contractor, as complying with the requirements of regulatory authorities having jurisdiction, subject to the approval of the Engineer.

PART 3 – EXECUTION

3.1 <u>GENERAL</u>

- **A.** Where rock is encountered, it shall be uncovered but not excavated until measurements have been made by the Engineer.
- **B.** Attempt to remove rock by mechanical means before resorting to blasting.
- **C.** Protect structures, utilities, sidewalks, pavements, and other facilities and property from blasting hazards.
- **D.** Remove rock to the limits indicated or directed by Engineer.

3.2 UNAUTHORIZED EXCAVATION

A. Rock excavated below foundation subgrades, not authorized by Engineer, shall be refilled with Class C concrete or other materials approved by Engineer, to the indicated subgrade elevation.

- **B.** Other unauthorized rock excavations shall be backfilled and compacted as specified for authorized excavations of same classification, unless otherwise directed by Engineer.
- **C.** Excavations which are made wider than shown on the Drawings, specified or authorized by Engineer, may necessitate redesigns and stronger materials for which all costs shall be borne by Contractor.

End of Section

SECTION 31 23 19

DEWATERING

PART 1 – GENERAL

1.1 WORK INCLUDED

Work included under this Section includes the dewatering equipment for the control of ground and surface water entering excavations on the project site.

1.2 <u>QUALITY ASSURANCE</u>

- **A.** The Contractor shall employ whatever means deemed appropriate to control water on the Site. The Owner and Engineer shall not be responsible for the means and methods of dewatering. Unless otherwise noted, dewatering shall be incidental in the work.
- **B.** The Contractor shall keep work free of standing or flowing groundwater, surface water, sewage, snow, or ice.

PART 2 – PRODUCTS

2.1 GENERAL

- **A.** Provide, operate and maintain a dewatering system to remove all water from excavations and trenches including pumps, drains, wellpoints, piping and any other facilities necessary to keep the excavations and trenches free from water.
- **B.** Assure proper permits have been acquired for dewatering of excavations if the discharge from the dewatering operations will reach surface waters or wetlands. Coverage under any of the following permits, and performance of any of the associated sampling requirements, shall be deemed to satisfy this section:
 - 1. U.S. EPA National Pollution Discharge Elimination System (NPDES) Construction General Permit; or,
 - 2. US EPA National Pollution Discharge Elimination System (NPDES) Dewatering General Permit; or,
 - 3. US EPA National Pollution Discharge Elimination System (NPDES) Remediation General Permit."

PART 3 – EXECUTION

3.1 PERFORMANCE

- **A.** Keep excavations and trenches dry until the structures, pipes and appurtenances have been completed.
- **B.** Dispose of water pumped or drained from the construction site in a suitable manner to avoid public nuisance, injury to public health, damage to public and private property, and damage to work completed or in progress. Water discharged to a natural drainage course or stream shall pass through a sediment trap prior to discharge. Discharge water from excavations shall be treated to meet applicable treatment performance standards specified in state or federal permits. In no case shall discharges to surface waters exceed state water quality standards for turbidity.
- **C.** All damage from dewatering operations, or the failure of the Contractor to maintain the work in a suitable dry condition shall be repaired by the Contractor, at no additional cost to the Owner,
- **D.** Cofferdams shall be utilized where necessary for the dewatering, control and diversion of water to keep excavations and trenches free of water. Design and construct cofferdams to withstand all imposed loads to prevent injury to persons and property. Construct cofferdams to depths to permit a reasonable change in depths of the work, of sufficient height to prevent flooding, and of such dimensions to give sufficient clearance for construction and inspection.
- **E.** Temporary underdrains When and where found necessary, install temporary underdrains in the excavation. Surround the underdrain and fill the space between the underdrain and the pipe or structure with crushed stone to prevent the migration of fines.
- **F.** Wellpoint system If required, dewater the excavations and trenches by an efficient drainage wellpoint system to drain the soil and prevent saturated soils from flowing in to the excavated area.

End of Section

SECTION 31 25 00

EROSION CONTROL

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work covered by this Section includes the control of erosion, siltation, and sedimentation.

1.2 PROJECT REQUIREMENTS

- **A.** Take every reasonable precaution and do whatever is necessary to avoid any erosion and to prevent silting of rivers, streams, lakes, reservoirs, impoundments, wetlands, drainage ditches and swales.
- **B.** The exposure of uncompleted cut slopes, embankments, trench excavations, and site graded areas shall be kept as short as possible. Initiate seeding and other erosion control measures on each segment as soon as reasonably possible, and within 72 hours at a maximum.
- **C.** Adhere to any and all applicable local, state, and federal requirements and permits related to erosion control.

1.3 SEDIMENT CONTROL GUIDELINES

A. New Hampshire Stormwater Manual, Volume 3 Erosion and Sediment Controls During Construction, New Hampshire Department of Environmental Services, latest edition.

1.4 SUBMITTALS

- A. General: Provide submittals in accordance with Specification 01 30 00.
- **B.** The Contractor shall furnish to the Engineer, in writing, its plan for controlling erosion and siltation before beginning the construction work. Said plan shall also include the methods to be utilized for protecting and stabilizing steep slopes, stream banks, and channels which will be affected by the construction work.
- **C.** Where earth disturbance will exceed one acre, the Contractor shall prepare a Storm Water Pollution Prevention Plan (SWPPP) that conforms to the requirements of the USEPA National Pollution Discharge Elimination System (NPDES) Construction General Permit.
 - 1. Contractor shall prepare and submit a Construction General Permit Notice of Intent form at least 14 days prior to beginning earth disturbance activities, and only after a SWPPP has been prepared. Earthwork shall not commence until the Contractor has

received confirmation from EPA that said Contractor has obtained coverage under the Construction General Permit.

D. The Contractor shall provide construction / erosion control monitoring as required by the SWPPP prepared for the Construction General Permit.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Dewatering Bag Dirt Bag as manufactured by ACF or approved equal
- **B.** Erosion Stone See 31 37 13
- C. Matting for erosion control jute mat or excelsior mat
- **D.** Hay bales rectangular-shaped bales of hay or straw weighing at least 40 pounds per bale and free from primary noxious weed seeds and rough or woody materials
- E. Mulch Cured hay free from primary noxious weed seeds and rough or woody materials
- **F.** Seed for erosion control shall be 40% creeping red fescue, 40% Chewing's fescue, 10% Blue Sheep fescue, 10% Hard fescue at a rate of 120 pounds per acre. Any erosion control seeding required outside the seeding window specified in section 32 92 00 Loaming, Seeing, and Fertilizing, shall be reviewed and approved by the Engineer and shall utilize an annual seed such as winter rye, with permanent seed mix application in the spring
- G. Silt fence Envirofence as manufactured by Mirafi, Inc. or approved equal
- H. Wattles Sediment Log as manufactured by the American Excelsior Company or approved equal

PART 3 – EXECUTION

3.1 <u>PERFORMANCE</u>

- **A.** Erosion and sediment controls shall be operated to prevent violations of NH water quality standards (NH Env-Ws 1700).
- **B.** Diverting Surface Water:
 - 1. Perform no earthwork in flowing waters. Build, maintain, and operate all cofferdams, channels, flumes, slope drains, sumps, and other temporary diversion and protection works needed to divert stream flow, runoff, water from seeps in cut slope, and other

surface water through or around the construction site and away from the construction work while construction is in progress.

- 2. Protect areas where existing stream banks are to be excavated by constructing hay bale dikes at the top of slope to divert storm runoff from the disturbed area and at the toe of the slope to retain sediments.
- 3. A diversion shall outlet to a durable surface that prevents erosion at the point of discharge.
- 4. Contain turbid discharge from pumped dewatering operations by a filter bag or a dike located in an upland area at least 20 feet from surface waters or wetlands and constructed to prevent silt from entering the stream and to protect the area of the outlet pipe against erosion by flowing water by the construction of a rock or timber apron.
- 5. Prior to removal of all sediment control dikes, remove all retained silt, filter bags or other materials at no additional cost to the Owner.
- C. Erosion Prevention Provisions:
 - 1. Limit period of time that disturbed soils are exposed to precipitation.
 - a) Apply stabilization measures within 72 hours of completing earth disturbing
 - 2. Apply matting to seeded slopes steeper than 3:1. Apply mulch to all other seeded slopes.
 - 3. Mulch:
 - a) Undertake immediately after each area has been properly prepared.
 - b) Place mulch on the seeded areas immediately after seeding.
 - c) Apply hay that has been thoroughly fluffed at approximately, but not to exceed, 2 tons per acre unless otherwise ordered.
 - 4. Matting:
 - a) Place strips lengthwise in the direction of the flow of water.
 - b) Where strips are laid parallel or meet as in a tee, overlap at least 4 inches.
 - c) Ends: Overlap at least 6 in., shingle fashion.
 - d) The up-slope end of each strip of the matting shall be turned down and buried to a depth of not less than 6 in. with the soil firmly tamped against it.
 - 5. Install rock check dams, hay bale check dams, or other temporary grade controls structures in swales and temporary channels that receive concentrated flow.

D. Sediment Control Provisions:

- 1. Install silt fence and other perimeter controls at early stages of earth disturbance. As shown on plans and as directed by engineer. Avoid usage where concentrated flow may occur. Back up silt fence with wire backing or hay bales as needed.
- 2. Install coarse stone tracking pad at site exit to prevent sediments from being tracked onto pavement by construction vehicles. Supplement with street sweeping.
- 3. Avoid interim grading that concentrates runoff to unstable ground or channels. Utilize temporary water bars or other methods to interrupt long flowpaths on unfinished roads and convey runoff to stable upland areas.
- 4. Install temporary sediment basins in swales and temporary channels that receive concentrated flow. Locate for convenience of frequent maintenance, but do not site in areas where inadvertent basin breeching would cause safety hazards, property damage, or result in preventable environmental impacts.
- 5. Place erodible material stockpiles on level ground and away from drainage channels. Install silt fence along downgradient perimeter of stockpile between pile and nearest surface water or wetlands.
- **E.** Winter Erosion Control
 - 1. All proposed vegetative areas which do not exhibit a minimum of 85% vegetative growth by October 15th. Or which are disturbed after October 15th, shall be stabilized by seeding and installing erosion control blankets on slopes greater than 3:1, and seeding and placing 3 to 4 tons of mulch per acre, secured with anchored netting, elsewhere. The installation of erosion control blankets or mulch and netting shall not occur over accumulated snow or frozen ground and shall be completed in advance of thaw or spring melt events.
 - 2. All ditches or swales which do not exhibit a minimum of 85% vegetative growth by October 15th, or which are disturbed after October 15th, shall be stabilized temporarily with stone or erosion control blankets appropriate for the design flow conditions.
 - 3. After November 15th, incomplete road or parking surfaces, where work has stopped for the winter season, shall be protected with a minimum of 3 inches of crushed gravel per NHDOT Item 304.3.

3.2 MAINTENANCE

A. Maintain all temporarily stabilized surfaces until they are stable

- 1. Repair rills that form on gravel stabilized roadways until paving occurs.
- 2. Apply supplemental seed, fertilizer and lime as needed to achieve final stabilization; defined by NHDES as 85% vegetative growth.
- **B.** If any matting staples become loosened or raised or if any matting becomes loose, torn, or undermined, make satisfactory repairs immediately.
- **C.** Maintain areas mulched or matted, with no extra compensation, until the completion of the Contract.
- **D.** Maintain siltation fence by checking the installation for fallen segments and keep build-up of silt to less than 50% of its height.
- **E.** Check all sediment capturing devices at a regular frequency, after storms, and as dictated by applicable permits. Remove sediments from sediment capturing features when 50% of the devices volume is occupied by sediment and prior to anticipated large storms.
 - 1. Place sediments cleaned from basins and other devices in upland area and out of drainage paths.

3.3 <u>REMOVAL OF TEMPORARY WORKS</u>

A. Remove or level and grade to the extent required to present a sightly appearance and to prevent any obstruction of the flow of water or any other interference with the operation of or access to the permanent works.

End of Sections

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SECTION 31 37 13

STONE FILL AND RIP RAP – NH

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Work Included:
 - 1. Provide all materials, labor, equipment and incidentals required to furnish and install stone fill and rip rap to the dimensions, elevations and at the locations indicated to the plans in accordance with these specifications or as directed by the Engineer.

1.2 SUBMITTALS

- A. General: Provide submittals in accordance with Specification 01 30 00.
- **B.** Identify source for material to demonstrate conformance with specifications.
- **C.** Submit for approval at the project site, samples of stone of the required type at least 10 days in advance of intended use.
- **D.** Reference standard shall be the <u>NHS New Hampshire Standard Specifications for Bridge</u> <u>and Highway Construction (latest edition)</u>.

PART 2 – PRODUCTS

2.1 MATERIALS – STONE FILL

- **A.** Materials shall meet the requirements of Section 585, Stone Fill, New Hampshire Department of Transportation Standard Specifications (NHS) for the appropriate item as indicated on the Drawings.
- **B.** Stone for stone fill shall be approved quarry stone, or broken rock of a hard, sound, and durable quality. Stone shall be locally or regionally sourced with a color similar to existing stone found on site. The stones and spalls shall be so graded as to produce a dense fill with a minimum of voids.
 - 1. Class A stone shall be irregular in shape with approximately 50 % of the mass having a minimum volume of 12 cubic feet, approximately 30 % of the mass ranging between 3 and 12 cubic feet, approximately 10 % of the mass ranging between 1 and 3 cubic feet, and the remainder of the mass composed of spalls.

- 2. Class B stone shall be irregular in shape with approximately 50 % of the mass having a minimum volume of 3 cubic feet, approximately 40 % of the mass ranging between 1 and 3 cubic feet, and the remainder of the mass composed of spalls.
- 3. Class C stone shall consist of clean, durable fragments of ledge rock, of uniform quality, reasonably free from thin or elongated pieces. The stone shall be made from rock which is free from topsoil and other organic material. The stone shall be graded as follows:

Sieve Size	Percentage Passing by Weight
12 inch	100
4 inch	50-90
1-1/2 inch	0-30
3/4 inch	0-10

- 4. Class D stone shall consist of crushed stone, gravel, or other approved inert materials with similar characteristics or combinations thereof, having hard, strong, durable particles, free from surface coating and injurious amounts of soft, friable, or laminated pieces, and free of alkaline, organic, or other harmful matter. The stone shall be Standard Stone Size 467 (No. 4 to 1-1/2").
- 5. Erosion stone shall be irregular in shape with approximately 50% of the mass having a minimum dimension between 6-inches and 8-inches, approximately 40% of the mass having a minimum dimension between 2-inches and 6-inches and the remainder of the mass composed of spalls.
- 6. Spalls for filling voids shall consist of a mixture of stones or rock fragments and particles with 95 to 100% passing the 3-inch sieve and 25 to 70% passing the No. 4 sieve.

2.2 MATERIALS – RIP RAP

- A. Reference standard shall be the <u>NHS New Hampshire Standard Specifications for Bridge</u> <u>and Highway Construction (latest edition) Section 583 - Rip Rap</u>. Materials for rip rap shall be field stone, quarry stone, or rock fragments and shall be sound, of approved quality, and free from structural defects. These stones shall have approximately rectangular shapes with one reasonably flat side for the top surface and shall have minimum dimensions and volumes as follows:
 - 1. <u>Rip rap A, 1 foot thick</u> Seventy-five percent of the stones shall have a minimum volume of 2 cubic feet; the remainder shall have a minimum volume of 1/2 cubic feet.
 - 2. <u>Rip rap B, 1-1/2 feet thick</u> Seventy-five percent of the stones shall have a minimum volume of 8 cubic feet.

- 3. <u>Rip rap C, 2 feet thick</u> Seventy-five percent of the stones shall have a minimum volume of 12 cubic feet.
- 4. <u>Rip rap D, 2-1/2 feet thick</u> Seventy-five percent of the stones shall have a minimum volume of 18 cubic feet.

PART 3 - EXECUTION

3.1 PREPARATION

- A. The slopes to be protected shall be graded and shaped to the lines indicated on the plans or as ordered by the Engineer and if in a fill area, shall be compacted. All slopes shall be maintained to the neat lines indicated on the plans prior to the placing of filter fabric or bedding material and stone.
- **B.** A filter fabric and blanket of gravel backfill for slope stabilization, when indicated on the plans or as ordered by the Engineer, shall be placed and maintained before the stone fill is placed.

3.2 PLACING

- **A.** The specified stone fill shall be placed in one course thickness as shown on the plans in a manner that will result in a reasonably well-graded surface. Care shall be taken in the placing to avoid displacing of the underlying material.
- **B.** The larger stone shall be well distributed and shall be so placed and distributed that there will be no large accumulations of either larger or smaller sized of stones. Rearrangement of the stone fill by hand or mechanical equipment may be required to obtain the specified results. Stone blanket thickness shall be at least the thickness of the largest stone size.
- **C.** Stone shall be placed and graded in a manner which eliminates voids and creates a uniform mass throughout the course. Spalls shall be tamped into voids and spaces using an equipment bucket or other approved method. Stone shall be placed with close joints.
- **D.** The finished surface shall approximate (within six (6) inches) the lines, grades and limits shown on the Drawings.

End of Section

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SECTION 31 41 00

SHORING AND BRACING

PART 1 – GENERAL

1.1 SUMMARY

- A. Extent of shoring and bracing work includes, but is not limited to, the following:
 - 1. Shoring and bracing necessary to protect existing buildings, streets, walkways, utilities, and other improvements and excavation against loss of ground or caving embankments.
 - 2. Maintenance of shoring and bracing.
 - 3. Removal of shoring and bracing, as required.
- **B.** Types of shoring and bracing system includes, but is not limited to, the following:
 - 1. Soldier piles
 - 2. Lagging

1.2 SUBMITTALS

- A. General: Provide submittals in accordance with Specification 01 30 00.
- **B.** Layout Drawings: Provide layout drawings for shoring and bracing system and other data prepared and sealed by a registered Professional Engineer licensed in the State of the project. System design and calculations must be acceptable to local authorities having jurisdiction.

1.3 **QUALITY ASSURANCE**

- **A.** Supervision: Engage and assign supervision of shoring and bracing work to a qualified foundation consultant.
 - 1. Submit name of engaged consultant and qualifying technical experience.
- **B.** Regulations: Comply with local codes and ordinances of governing authorities having jurisdiction.

1.4 JOB CONDITIONS

- A. Before starting work, check and verify governing dimensions and elevations. Survey condition of adjoining properties. Take photographs to record any prior settlement or cracking of structures, pavements, and other improvements. Prepare a list of such damages, verified by dated photographs, and signed by Contractor and others conducting investigation.
- **B.** Survey adjacent structures and improvements, establishing exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations. Locate datum level used to establish benchmark elevations sufficiently distant so as not to be affected by movement resulting from excavation operations.
- **C.** During excavation, resurvey benchmarks weekly, employing a licensed Land Surveyor or registered Professional Engineer, licensed in the State of the Project. Maintain accurate log of surveyed elevations for comparison with original elevations. Promptly notify Engineer if changes in elevations occur or if cracks, sags or other damage is evident.

1.5 EXISTING UTILITIES

- A. Protect existing active sewer, water, gas, electricity and other utility services and structures.
- **B.** Notify municipal agencies and service utility companies having jurisdiction. Comply with requirements of governing authorities and agencies for protection, relocation, removal and discontinuing of services, as affected by this work.

PART 2 – PRODUCTS

2.1 MATERIALS

- **A.** General: Provide suitable shoring and bracing materials which will support loads imposed. Materials need not be new, but should be in serviceable condition.
 - 1. If wood is part of shoring system near existing structures, use pressure preservative treated materials or remove before placement of backfill.

PART 3 – EXECUTION

3.1 SHORING

- **A.** Wherever shoring is required, locate the system to clear permanent construction and to permit forming and finishing of concrete surfaces. Provide shoring system adequately anchored and braced to resist earth and hydrostatic pressures.
- **B.** Shoring systems retaining earth on which the support or stability of existing structures is dependent must be left in place at completion of work.

3.2 BRACING

- **A.** Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move a brace, install new bracing prior to removal of original brace.
- **B.** Do not place bracing where it will be cast into or included in permanent concrete work, except as otherwise acceptable to Engineer.
- **C.** Install internal bracing, if required, to prevent spreading or distortion to braced frames.
- **D.** Maintain bracing until structural elements are rebraced by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.
- **E.** Remove sheeting, shoring and bracing in stages to avoid disturbance to underlying soils and damage to structures, pavements, facilities, and utilities.
- **F.** Repair or replace, as acceptable to Engineer, adjacent work damaged or displaced through the installation or removal of shoring and bracing work.

End of Section

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SECTION 32 01 30

LANDSCAPE MAINTENANCE

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Related Requirements: Review the General Contract Conditions and Division One, General Requirements, which contain information and requirements that apply to this Section.
- B. Work Included: Provide Landscape Maintenance, complete as specified.
 - 1. Work in this Section includes, but is not limited to, furnishing all labor, materials, equipment and incidentals needed to provide complete landscape and irrigation maintenance program to the Owner during the installation period and for (90) days following date of Final Acceptance. Maintenance items shall include all items constructed under this Contract.
 - 2. Work specifically included for maintenance includes:
 - a. Watering, pruning, weed control and replacement of mulch for trees, shrubs, groundcovers, and perennials.
 - b. Mowing, edging, fertilization, watering and weed control within turf areas.
 - c. Winter watering as required.
 - d. Monthly site inspection of potential insect, pest and disease problems and filing of monthly status report.
 - e. Weekly clean-up of trash, litter and debris.
 - 3. Work which may be required under this Section, but which if required will be considered a claim for extra work (see General Conditions), include the following:
 - a. Insect, pest and disease control.
 - b. Plant replacement due to theft, vandalism, or accidental damage by others after final acceptance. (Supplemental unit prices will apply for one (1) year following final acceptance).
 - c. Repair of damages to the irrigation system which have not been caused by Contractor's maintenance practices or negligence.
- C. Related Specification Sections:
 - a. Section 31 23 16: Earthwork.
 - b. Section 32 91 15: Soil Preparation.
 - c. Section 32 92 00: Turf and Grasses.
 - d. Section 32 93 00: Trees, Shrubs and Groundcovers.

1.02 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies
 - 1. Perform all work in accordance with all applicable laws, codes, and regulations required by authorities having jurisdiction over such work.
 - 2. Provide for all inspections and permits required by Federal, State, or local authorities in furnishing, transporting, and installing of all agricultural chemicals.
- B. Applicable Standards: Workmanship and overall maintenance program shall conform to the

highest level of industry standards.

- C Work Force:
 - 1. Experience: The landscape maintenance firm shall have a full time foreman assigned to the job for the duration of the contract. He shall have a minimum of four years experience in landscape maintenance supervision, with experience or training in entomology, pest control, soils, fertilizers and plant identification.
 - 2. Labor Force: The landscape maintenance firm's labor force shall be thoroughly familiar and trained in the work to be accomplished and perform the task in a competent, efficient manner acceptable to the Owner.
 - 3. Supervision: The foreman shall directly employ and supervise the work force at all times. Notify Landscape Architect of all changes in supervision.
 - 4. Identification: Provide proper identification at all times for landscape maintenance firm's vehicles and labor force.

1.03 SUBMITTALS

- A. Submit two (2) copies each of the following items:
 - 1. Schedule of maintenance operations and monthly status report including list of all equipment and materials proposed for the job.
 - 2. All licenses and insurances required by the local governing authority and the State of New Hampshire pertaining to this work.
 - 3. Monthly record of all herbicides, insecticides and disease control chemicals used for the project.

1.04 PROJECT CONDITIONS

- A. Site Visit: At beginning of maintenance period, visit and walk the site with the Landscape Architect to clarify scope of work and understand existing project/site conditions.
- B. Documentation of Conditions: Document general condition of existing trees, shrubs, vines, groundcovers and lawn recording all plant materials which are damaged or dying, if any.
- C. Irrigation System: Document general condition of existing irrigation system, making sure that faulty electrical controllers, broken or inoperable sprinkler heads or emitters are reported.

1.05 SCHEDULING

- A. Perform all maintenance during hours mutually agreed upon between Owner and Contractor.
- B. Work force shall be present at the project site at least once a week and as often as necessary to perform specified maintenance in accordance with the approved maintenance schedule.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Fertilizers:

North Country Organics PO Box 372 Bradford, VT 05033 (802) 222-4277 Or Approved Equal Product.

2.02 MATERIALS

- A. General: All materials and equipment, unless otherwise indicated, shall be provided by the Contractor.
- B. Water: Clean, potable and fresh, furnished and paid for by the Owner.
- C. Fertilizers:
 - 1. Tightly-compressed, slow-release and long-lasting complete fertilizer tablets bearing manufacturer's label of guaranteed analysis of chemicals present.
 - 2. Balanced, once-a-season application controlled-release fertilizers with a blend of coated prills which supply controlled-release nitrogen, phosphorus and potassium, and uncoated, rapidly soluble prills containing nitrogen and phosphorous.
 - 3. Use low-phosphorus fertilizer for new plant installation and maintenance. Apply utilizing manufacturers recommendations.
- D. Annuals/Perennials: Nursery-grown in 4 in. or 6 in. pots, full, healthy plants just ready to bloom.
- E. Lawn Seed for Reseeding: Match seed mix specified for project.
- F. Replacement Tree Guys, Stakes, Ties and Wires: Match existing materials on the site. Provide detail(s) in 8-1/2 in. x 11 in. format if necessary.

PART 3 - EXECUTION

3.01 GENERAL

- A. Duration: Continuously maintain each plant and each portion of groundcover area after installation, during progress of work, and for a period of 90 days after completion of all planting work until Final Acceptance.
- B. Protection:
 - 1. Protect all planting areas from damage of all kinds from beginning of work until Final Acceptance.
 - 2. Maintenance includes temporary protection fences, barriers and signs as required for animal protection.
- C. Replacements:
 - 1. Immediately treat or replace all plants which become damaged or injured as a result of Contractor's operations or negligence, as directed by Landscape Architect at no additional cost to Owner.
 - 2. Replacement plants shall be of acceptable size, condition and variety.

3.02 TREES, SHRUBS AND VINES

- A. Watering Basins:
 - 1. Maintain all watering basins around plants so that enough water can be applied to establish moisture through major root zones.

- 2. For supplemental hand watering of watering basins, use a water wand to break the water force. Do not permit crown roots to become exposed to air through dislodging of soil and mulch.
- 3. Maintain originally called for depth of mulch to reduce evaporation and frequency of watering.
- 4. In rainy season, open basins to allow surface drainage away from the root crown where excess water may accumulate. Restore watering basins at end of rainy season.
- B. Resetting: Reset plants to proper grades or upright position.
- C. Weed Control:
 - 1. All areas between plants, including watering basins, shall be weed free.
 - 2. Use only recommended and legally approved herbicides to control weed growth.
 - 3. Control weeds through proper cultural practices including cultivation, hand removal and hoeing, being careful to avoid damage to plant material.
 - 4. Proceed with the application of pre-emergent and selective systemic herbicides only at the approval of the Owner's Representative.

D. Pruning:

- 1. Prune trees to select and develop permanent scaffold branches that are smaller in diameter than the trunk or branch to which they are attached, and which have vertical spacing of 18 in. to 48 in. in radial orientation so as not to overlay one another.
- 2. Prune trees to eliminate diseased or damaged growth, and narrow V-shaped branch forks that lack strength. Reduce toppling and wind damage by thinning out crowns.
- 3. Prune trees to maintain growth within space limitations, maintaining a natural appearance and balancing crown with roots.
- 4. Stripping of lower branches ("raising up") of young trees will not be permitted.
- 5. Retain lower branches in a "tipped back" or pinched condition to promote caliper trunk growth (tapered trunk). Do not cut back to fewer than six buds or leaves on such branches. Only cut lower branches flush with the trunk after the tree is able to stand erect without staking or other support.
- 6. Thin out and shape evergreen trees when necessary to prevent wind and storm damage. Do primary pruning of deciduous trees during the dormant season. Do not permit any pruning of trees prone to excessive "bleeding" during growth season.
- 7. Prune damaged trees or those that constitute health or safety hazards at any time of year as required.
- 8. Make all cuts clean and close to the trunk, without cutting into the branch collar. "Stubbing" will not be permitted. Cut smaller branches flush with trunk or lateral branch. Make larger cuts (1 in. in diameter or larger) parallel to shoulder rings with the top edge of the cut at the trunk or lateral branch.
- 9. Branches too heavy to handle shall be precut in three stages to prevent splitting or peeling of bark. Make the first two cuts 18 in. or more from the trunk to remove the branch. Make the third cut at the trunk to remove the resulting stub.
- 10. Do not prune or clip shrubs into balled or boxed forms unless specifically called for by design.
- 11. Clip shrubs to be hedged when branches project 2 in. beyond limit of clipped hedge shown on the Drawings.
- E. Staking or Guying of Trees:
 - 1. Inspect stakes and guys at least once a month to check for rubbing that causes bark wounds.
 - 2. Conform to the recommended procedures of staking and guying as outlined in Section

32 93 00 Trees, Shrubs and Groundcovers.

- F. Maintenance of Existing Trees and Shrubs to Remain:
 - 1. General: Conform to all applicable paragraphs regarding pruning, watering, spraying and fertilizing of new plant materials as specified in this section.
 - 2. Be alert to symptoms of construction damage to root systems of existing trees and shrubs as evidenced by wilting, unseasonal or early flowering or loss of leaves, and insect or disease infestation due to declining vigor.
 - 3. Give notification in writing of all evidence of declining tree or shrub vigor immediately upon discerning the problem. Take appropriate interim measures to mitigate the severity of the problem as specified in this section.
 - 4. Submit written proposal and cost estimate for the correction of all conditions before proceeding with permanent correction work.

3.03 GROUNDCOVERS

- A. Watering:
 - 1. Check for moisture penetration throughout the root zone at lease twice a month.
 - 2. Water as frequently as necessary to maintain healthy growth of groundcovers.

3.04 LAWNS

- A. Watering:
 - 1. Water lawns at such frequency as weather conditions require, to replenish soil moisture to 6 in. below root zone.
 - 2. Provide a total of 2 in. of water weekly during hot summer weather, in three (3) applications per week.
 - 3. Water at night if irrigation system is electrically controlled. Otherwise, watering shall be done during early mornings.
- B. Weed Control:
 - 1. Do not control broadleaf weeds with herbicides.
 - 2. Utilize selective hand pulling or burning to reduce and control weed growth.
- C Mowing and Edging:
 - 1. Mow lawns when they reach 2 in. high.
- D Reseeding of Lawn Areas: Match existing seed mix of adjacent areas.
- E Renovating:
 - 1. Top Dress Fertilizer: See Section 32 92 00 Turf and Grasses.

3.05 SEEDED GRASSES

A Watering:

- 1. Water lawns at such frequency as weather conditions require, to replenish soil moisture to 6 in. below root zone.
- 2. Provide a total of 1 in. of water weekly during hot summer weather, in two (2) applications per week.
- 3. Water at night if irrigation system is electrically controlled. Otherwise, watering shall be done during early mornings.
- B. Weed Control:
 - 1. Control broadleaf weeds by selective hand pulling or burning.
 - 2. Do not apply herbicides.
- C. Mowing and Edging:
 - 1. Mow grasses as directed by the Owner.
- D. Reseeding of Lawn Areas: Match existing seed mix of adjacent areas.
- E. Renovating:
 - 1. Top Dress Fertilizer: No compost shall be used.

3.06 ANNUALS AND PERENNIALS

- A. Watering:
 - 1. Species, sizes of plants, container sizes and orientation shall dictate frequency of watering. Submit to Owner a watering schedule for different seasonal requirements.
- B. Weed Control: All planting beds with annuals and perennials shall be weed-free at all times. Utilize hand pulling or burning to reduce weeds in plant beds.
- C. Pruning:
 - 1. Limit pruning to removal of damaged or dead twigs and foliage.
 - 2. Remove spent flowers on a weekly basis.
- D. Replacements of Annuals:
 - 1. Replace annuals when materials exhibit a "spent" condition.
 - 2. Thoroughly cultivate soil after removal of "spent" or "dead" plants prior to planting new materials.
 - 3. Incorporate slow release fertilizers and rake smooth.

3.07 INSECTS, PESTS, AND DISEASE CONTROL

- A. Inspection: Inspect all plant materials for signs of stress, damage and potential trouble from the following:
 - 1. Presence of insects, moles, voles, gophers, ground squirrels, snails and slugs in planting areas.
 - 2. Discolored or blotching leaves or needles.
 - 3. Unusually light green or yellowish green color inconsistent with normal green color of leaves.

- B. Personnel: Perform spraying for insect, pest and disease control only by licensed, qualified, trained personnel.
- C. Application: Spray with extreme care to avoid all hazards to any person or pet in the area or adjacent areas.

3.9 THE 90 DAY MAINTENANCE PERIOD

- A. Preliminary Review: As soon as all plantings are completed per Contract Documents, hold a preliminary review to determine the condition of the work.
- B. Date of Review: Submit a written request at least five (5) working days prior to anticipated date of review.
- C. Beginning of the 90 Day Maintenance Period: The date on which the Landscape Architect issues a letter of Preliminary Acceptance to the Contractor.

3.10 FINAL ACCEPTANCE

- A. Acceptance:
 - 1. Work will be accepted by the Landscape Architect upon satisfactory completion of all work, including maintenance period, but exclusive of replacement of materials under the Warranty Period.
 - Submit a written request to Landscape Architect for review of Final Acceptance at least five (5) working days prior to anticipated Final Review date, which is at the end of the Maintenance Period.
- B. Corrective Work:
 - 1. Work requiring corrective action or replacement shall be performed within ten (10) calendar days after the Final Review.
 - 2. Perform corrective work and materials replacement in accordance with the Drawings and Specifications, and shall be made by the Contractor at no cost to the Owner.
 - 3. After corrective work is completed, the Contractor shall again request a Final Review for Final Acceptance as outlined above.
 - 4. Continue maintenance of all landscaped areas until such time as all corrective measures have been completed and accepted.
- C. Conditions for Acceptance of Work at End of Maintenance Period:
 - 1. Each plant shall be alive and thriving, showing signs of growth and no signs of stress, disease, or any other weaknesses.
 - 2. All plants not meeting these conditions shall be replaced and a 90 Day Maintenance Period commenced for such plants.
- D. Final Acceptance Date: The date on which the Landscape Architect issues a Letter of Final Acceptance. Upon Final Acceptance, the Owner will assume responsibility for maintenance of the work.

3.11 WARRANTY PERIOD AND REPLACEMENTS OF PLANT MATERIALS

- A. Specific Requirements:
 - 1. Turf and Grasses Refer to Section 32 92 00.

- 2. Trees, Shrubs and Groundcover Section 32 93 00.
 - a. Vigor: Warrant that all trees and shrubs planted under this Contract will be healthy and in flourishing condition of active growth one year from date of Final Acceptance. Similarly warranty perennial and groundcover for one full growing season from date of Final Acceptance.
 - b. Condition of Plants: Plants shall be free of dead or dying branches and branch tips, with all foliage of a normal density, size and color.
 - c. Replacements: As soon as weather conditions permit, replace, without cost to Owner all dead plants not in a vigorous, thriving condition, as determined by Project Manager during and at the end of Warranty Period. Replacement trees shall extend warranty period correspondingly for one year from date of replacement planting.
 - d. Exclusions: Contractor shall not be held responsible for failures due to neglect by Owner, vandalism, etc., during Warranty Period. Report such conditions in writing to the Landscape Architect.
- 3. Warranty period shall begin when Landscape Architect issues letter for Final Acceptance.

END OF SECTION

SECTION 32 12 16.31

BITUMINOUS CONCRETE PAVING – NH

PART 1 – GENERAL

1.1 QUALITY ASSURANCE

- A. All work performed under and relating to this Section shall be in conformance to the State of New Hampshire Department of Transportation, Standard Specifications for Road and Bridge Construction (latest revision).
- **B.** Provide at least one person who shall be present at all times during the execution of this portion of the Work and who shall be thoroughly trained and experienced in the placing of the type of asphalt pavement specified and who shall direct all work performed under this Section.
- **C.** All materials and the asphalt plant will be subject to inspections and tests by Engineer and by the approved testing laboratory. Provide all equipment, materials, facilities and labor as specified in the Standard Specification for Road and Bridge Construction.

1.2 SUMMARY

- **A.** This Section includes provisions for hot-mixed asphalt paving over sub-pavement gravel courses and over existing asphalt surfaces.
- **B.** This Section is also applicable to hot-mixed asphalt temporary pavements.
- C. Proof rolling of prepared sub-pavement gravel courses is included in this Section.
- **D.** Saw-cutting of existing pavement edges is included in this Section.
- **E.** Traffic and lane markings are covered by this Section.

1.3 SUBMITTALS

- A. General: Provide submittals in accordance with Specification 01 30 00.
- **B.** Material Certificates signed by material producer and Contractor, certifying that each material item complies with or exceeds specified requirements.

1.4 SITE CONDITIONS

- A. Weather Limitations: Apply prime and tack coats when ambient temperature is above 50 deg F (10 deg C) and when temperature has not been below 35 deg F (1 deg C) for 12 hours immediately prior to application. Do not apply when base is wet or contains an excess of moisture.
- **B.** Construct hot-mixed asphalt surface course when base is dry and when atmospheric temperature is above 40 deg F for courses greater than 1-1/4 inches compacted depth and when atmospheric temperature is above 50 deg F for courses less than 1-1/4 inches in compacted depth. Base course may be placed when air temperature is above 35 deg F and rising.
- C. Grade Control: Establish and maintain required lines and elevations.

PART 2 – PRODUCTS

2.1 MATERIALS

- **A.** General: Use locally available materials and gradations that exhibit a satisfactory record of previous installations.
- **B.** When products are not otherwise specified by Engineer, provide products meeting the requirements of applicable city or town public works department's highway construction standards. In the absence of applicable local highway construction standards, provide products meeting the requirements of the Department of Transportation of the state in which the project is located, as appropriate, based on highway class designation, traffic loading and surfacing requirements.
- **C.** Restore existing pavements damaged by construction in kind with regard to materials and thickness of courses unless otherwise directed by Engineer.

PART 3 – EXECUTION

3.1 SURFACE PREPARATION

- **A.** General: Remove loose material from compacted sub-pavement gravel course surface immediately before applying herbicide treatment or prime coat.
- **B.** Proof-roll prepared sub-pavement gravel course surface to check for unstable areas and areas requiring additional compaction. Do not begin paving work until deficient areas have been corrected and are ready to receive paving.

- **C.** Herbicide Treatment: When indicated or warranted, apply chemical weed control agent in strict compliance with manufacturer's recommended dosages and application instructions. Apply to compacted, dry sub-pavement gravel course surface prior to application of prime coat.
- **D.** Prime Coat & Sealants: When indicated or warranted, apply at rate necessary to penetrate and seal, but not flood, surface. Squeegee excess material from surface. Cure and dry as long as necessary to attain penetration and evaporation of volatile. If the prime coat fails to penetrate within the time specified and the roadway must be used by traffic, blotter material shall be spread in the amounts required to absorb excess bituminous material. When the bituminous material is sufficiently cured, blotter material remaining shall be removed by sweeping.
- **E.** Saw-cut: Neatly saw-cut existing pavements to be joined and damaged pavements to be joined or over-laid. Remove saw cut pavement disturbing adjoining pavements as little as possible.
- **F.** Tack Coat: Clean the edges of previously constructed asphalt or Portland cement concrete pavements to be joined. Apply uniformly to contact surfaces of previously constructed pavements and to drainage or utility casting surfaces abutting or projecting into hot-mixed asphalt pavement. Allow to dry until at proper condition to receive paving. Exercise care in applying bituminous materials to avoid smearing of adjoining concrete surfaces.

3.2 PLACING MIX

- A. General: Place hot-mixed asphalt mixture on prepared surface, spread, and strike off. Spread mixture at minimum temperature of 250 deg F. Use of hand method of placement is limited to the paving of raised islands, slopes, cattle passes, areas between rails at railroad crossings, sidewalks, driveways and aprons and incidental paving in areas inaccessible to equipment. Place each course to required grade, cross-section, and compacted thickness. Place temporary pavements to indicated thickness and in no case less than 1".
- **B.** Paver Placing: Place in strips not less than 10 feet wide, unless otherwise acceptable to Engineer. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete base course for a section before placing surface course.
- **C.** Immediately correct surface irregularities in finish course behind paver. Remove excess material forming high spots with shovel or lute.
- **D.** Joints: Make joints between old and new pavements, or between successive days' work, to ensure continuous bond between adjoining work. Construct joints to have same texture, density, and smoothness as other sections of hot-mixed asphalt course. Clean contact surfaces and apply tack coat.

- **E.** Curbs: Construct curbs over compacted pavement surfaces. Apply a light tack coat unless pavement surface is still tacky and free from dust.
- **F.** Place curb materials to cross-section indicated or, if not indicated, to local standard shapes, by machine or by hand in wood or metal forms. Tamp hand-placed materials and screed to smooth finish. Remove forms as soon as material has cooled.

3.3 <u>ROLLING</u>

- **A.** General: Begin rolling when mixture will bear roller weight without excessive displacement.
- **B.** Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.
- **C.** Breakdown Rolling: Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling and repair displaced areas by loosening and filling, if required, with hot material.
- **D.** Second Rolling: Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been evenly compacted.
- **E.** Finish Rolling: Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained 95 percent laboratory density.
- **F.** Patching: Remove and replace paving areas mixed with foreign materials and defective areas. Cut out such areas and fill with fresh, hot-mixed asphalt. Compact by rolling to specified surface density and smoothness.
- **G.** Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- **H.** Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.4 <u>CLEANUP</u>

A. General: Any bituminous material remaining on exposed surfaces of curbs, sidewalks, or other masonry structures shall be removed at the Contractor's expense.

3.5 TRAFFIC AND LANE MARKINGS

A. Cleaning: Sweep and clean surface to eliminate loose material and dust.

- **B.** Do not apply traffic and lane marking paint until layout and placement have been verified with Engineer.
- **C.** Apply paint with mechanical equipment to produce uniform straight edges. Apply at manufacturer's recommended rates and thickness.
- **D.** Protect painted markings until dry enough to withstand traffic loading.

3.6 FIELD QUALITY CONTROL

- **A.** General: Testing in-place hot-mixed asphalt courses for compliance with requirements for thickness and surface smoothness will be done by Owner's testing laboratory. Repair or remove and replace unacceptable paving as directed by Engineer.
- **B.** Thickness: In-place compacted thickness tested in accordance with ASTM D 3549 will not be acceptable if exceeding following allowable variations:
 - 1. Base Course: Plus or minus 3/8 inch.
 - 2. Surface Course: Plus or minus 3/16 inch.
- **C.** Surface Smoothness: Test finished surface of each hot-mixed asphalt course for smoothness, using 10-foot straightedge applied parallel with and at right angles to centerline of paved area. Any variations from a true profile exceeding 3/16 of an inch shall be satisfactorily eliminated.
 - 1. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.
- **D.** Check surface areas at intervals as directed by Engineer.

End of Section

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SECTION 32 91 15

SOIL PREPARATION

PART 1 -- GENERAL

1.01 DESCRIPTION

- A. Related Requirements: Review the General Provisions, which contain information and requirements that apply to this Section.
- B. The scope of work includes all labor, materials, tools, supplies, equipment, facilities, transportation and services necessary for, and incidental to performing all operations in connection with furnishing, delivery, and installation of Planting Soil for tree, shrub and perennial planting areas, complete as shown on the drawings and as specified herein.
- C. The scope of work in this section includes, but is not limited to, the following:
 - 1. Locate, purchase, deliver and install Imported Planting Soil and soil amendments.
 - 2. Fine grade Planting Soil.
 - 3. Install Compost into Planting Soil.
 - 4. Clean up and disposal of all excess and surplus material.

1.02 RELATED DOCUMENTS AND REFERENCES

- A. Related Documents:
 - 1. Drawings and general provisions of contract, including general and supplementary conditions and Division I specifications, apply to work of this section.
 - 2. Related Specification Sections:
 - a. Section 31 23 16: Earthwork.
 - b. Section 32 92 00: Turf and Grasses.
 - c. Section 32 93 00: Trees, Shrubs and Groundcovers.
- B. References: The following specifications and standards of the organizations and documents listed in this paragraph form a part of the Specification to the extent required by the references thereto. In the event that the requirements of the following referenced standards and specification conflict with this specification section the requirements of this specification shall prevail. In the event that the requirements of any of the following referenced standards and specifications conflict with each other the more stringent requirement shall prevail.
 - 1. ASTM: American Society of Testing Materials cited section numbers.
 - 2. U.S. Department of Agriculture, Natural Resources Conservation Service, 2003. National Soil Survey Handbook, title 430-VI. Available Online.

1.03 VERIFICATION

A. All dimensions on the drawings are approximate. Before proceeding with any work, the Contractor shall carefully check and verify all dimensions and quantities and shall immediately inform the Owner's Representative of any discrepancies between the information on the drawings

and the actual conditions, refraining from doing any work in said areas until given approval to do so by the Owner's Representative.

1.04 DEFINITIONS

- A. Compost: well decomposed stable organic material as defined by the US Composting Council and further defined in this specification.
- B. Finished grade: surface or elevation of Planting Soil after final grading and 12 months of settlement of the soil, and further defined in this specification.
- C. Ped: a clump or clod of soil held together by a combination of clay, organic matter, and fungal hyphae, retaining the original structure of the harvested soil.
- D. Planting Soil: Topsoil that is in conformance with the specifications contained herein and is suitable for planting.
- E. Scarify: Loosening and roughening the surface of soil and sub soil prior to adding additional soil on top, and further defined in this specification.
- F. Subgrade: surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing Planting Soil.
- G. Topsoil: naturally produced and harvested soil from the A horizon or upper layers or the soil as further defined in this specification.
- 1.05 SUBMITTALS
 - A. See the contract General Conditions for policy and procedures related to submittals.
 - B. Submit all product submittals eight weeks prior to the start of the soil work.
 - C. Product data and certificates: For each type of manufactured product, submit data and certificates that the product meets the specification requirements, signed by the product manufacturer, and complying with the following:

1. Submit manufacturers or supplier's product data and literature certified analysis for standard products and bulk materials, complying with testing requirements and referenced standards and specific requested testing.

a. For each Compost product submit the following analysis by a recognized laboratory:

- 1. pH
- 2. Salt concentration (electrical conductivity)
- 3. Moisture content %, wet weight basis
- 4. Particle size % passing a selected mesh size, dry weight basis
- 5. Stability carbon dioxide evolution rate mg CO2-C per g OM per day
- 6. Solvita maturity test
- 7. Physical contaminants (inerts) %, dry weight basis
- 8. US EPA Class A standard, 40CFR § 503.13, Tables 1 and 3 levels Chemical Contaminants mg/kg (ppm)
- D. Samples: Submit samples of each product and material, where required by Part 2 of the specification, to the Owner's Representative for approval. Label samples to indicate product, characteristics, and locations in the work. Samples will be reviewed for appearance only.

1. Submit samples a minimum of 8 weeks prior to the anticipated date of the start of soil installation.

2. Samples of all Topsoil and Compost shall be submitted at the same time as the particle size and physical analysis of that material.

E. Soil testing for Imported Topsoil (or Stockpiled Existing Topsoil if available)

1. Topsoil testing: Submit soil test analysis report for each sample of Topsoil, from the Maine Soil Testing Service (University of Maine) and where indicated in Part 2 of the specification as follows:

a. If tests fail to meet the specifications, obtain other sources of material, retest and resubmit until accepted by the Owner's Representative.

- b. All soil testing will be at the expense of the Contractor
- 1. Provide a particle size analysis (% dry weight) and USDA soil texture analysis. Soil testing of Planting Soil Mixes shall also include USDA gradation (percentage) of gravel, coarse sand, medium sand, and fine sand in addition to silt and clay.
- 2. Provide the following other soil properties:
 - a. pH and buffer pH.
 - b. Percent organic content by oven dried weight.

c. Nutrient levels by parts per million including: phosphorus, potassium, magnesium, manganese, iron, zinc and calcium. Nutrient test shall include the testing laboratory recommendations for supplemental additions to the soil for optimum growth of the plantings specified.

d. Soluble salt by electrical conductivity of a 1:2 soil water sample measured in Milliohm per cm.

e. Cation Exchange Capacity (CEC).

1.06 OBSERVATION OF THE WORK

A. The Owner's Representative shall be informed of the progress of the work so the work may be observed at the following key times in the construction process. The Owner's Representative shall be afforded sufficient time to schedule visit to the site. Failure of the Owner's Representative to make field observations shall not relieve the Contractor from meeting all the requirements of this specification.

1. EXCAVATION REVIEW: Observe each area of excavation prior to the installation of any Planting Soil.

2. COMPLETION OF FINE GRADING AND SURFACE SOIL MODIFICATIONS REVIEW: Upon completion of all surface soil modifications and fine grading but prior to the installation of shrubs, ground covers, or lawns.

1.07 QUALITY ASSURANCE

- A. Soil testing laboratory qualifications: an independent laboratory, with the experience and capability to conduct the testing indicated and that specializes in USDA agricultural soil testing, Planting Soil Mixes, and the types of tests to be performed. Geotechnical engineering testing labs shall not be used.
- B. Any Planting Soil that fails to meet the above criteria, if requested by the Owner's Representative, shall be removed and new soil installed.

1.08 SITE CONDITIONS

A. It is the responsibility of the Contractor to be aware of all surface and subsurface conditions, and to notify the Owner's Representative, in writing, of any circumstances that would negatively impact the health of plantings. Do not proceed with work until unsatisfactory conditions have been corrected.

1. Should subsurface drainage or soil conditions be encountered which would be detrimental to growth or survival of plant material, the Contractor shall notify the Owner's Representative in writing, stating the conditions and submit a proposal covering cost of corrections. If the Contractor fails to notify the Owner's Representative of such conditions, they shall remain responsible for plant material under the warrantee clause of the specifications.

2. This specification requires that all Planting Soil and Irrigation (if applicable) work be completed and accepted prior to the installation of any plants.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Weather: Do not deliver, place or grade soils when frozen or with moisture above field capacity.
- B. Protect soil and soil stockpiles, from wind, rain and washing that can erode soil or separate fines and coarse material, and contamination by chemicals, dust and debris that may be detrimental to plants or soil drainage. Cover stockpiles with plastic sheeting or fabric at the end of each workday.
- C. All manufactured packaged products and material shall be delivered to the site in unopened containers and stored in a dry enclosed space suitable for the material and meeting all environmental regulations. Biological additives shall be protected from extreme cold and heat. All

products shall be freshly manufactured and dated for the year in which the products are to be used.

- D. Deliver all chemical amendments in original, unopened containers with original labels intact and legible, which state the guaranteed chemical analysis. Store all chemicals in a weather protected enclosure.
- E. Bulk material: Coordinate delivery and storage with Owner's Representative and confine materials to neat piles in areas acceptable to Owner's Representative.

1.10 EXCAVATING AND GRADING AROUND UTILITIES

- A. Contractor shall carefully examine the civil, record, and survey drawings to become familiar with the existing underground conditions before digging.
- B. Determine location of underground utilities and perform work in a manner that will avoid damage. Hand excavate as required. Maintain grade stakes set by others until parties concerned mutually agree upon removal.
- C. Notification of the local utility locator service, Dig-Safe, (Telephone: 811), is required prior to excavation in any planting areas. The Contractor is responsible for knowing the location and avoiding utilities that are not covered by the local utility locator service.

PART 2 - PRODUCTS

2.01 IMPORTED TOPSOIL

A. Imported Topsoil definition: Fertile, friable soil containing less than 5% total volume of the combination of subsoil, refuse, roots larger than 1-inch diameter, heavy, sticky or stiff clay, stones larger than 2 inches in diameter, noxious seeds, sticks, brush, litter, or any substances deleterious to plant growth. The percent (%) of the above objects shall be controlled by source selection not by screening the soil. Topsoil shall be suitable for the germination of seeds and the support of vegetative growth. Imported Topsoil shall not contain weed seeds in quantities that cause noticeable weed infestations in the final planting beds. Imported Topsoil shall meet the following physical and chemical criteria:

1. Soil texture: USDA loam, sandy clay loam or sandy loam with clay content between 15 and 25%. And a combined clay/silt content of no more than 55%.

- 2. pH value shall be between 5.5 and 7.0.
- 3. Percent organic matter (OM): 3.0-7.0%, by dry weight.
- 4. Soluble salt level: Less than 2 mmho/cm.
- 5. Soil chemistry suitable for growing the plants specified.
- B. Imported Topsoil shall be a harvested soil from fields or development sites. The organic content and particle size distribution shall be the result of natural soil formation. Manufactured soils where Coarse Sand, Composted organic material or chemical additives has been added to the soil to meet the requirements of this specification section shall not be acceptable. Retained soil peds shall be the same color on the inside as is visible on the outside.

- C. Imported Topsoil for Planting Soil shall NOT have been screened and shall retain soil peds or clods larger than 1 inch in diameter throughout the stockpile after harvesting.
- D. Stockpiled Existing Topsoil meeting the above criteria may be acceptable with approval of the Landscape Architect.
- E. Provide a two-gallon sample from each Imported Topsoil source with required soil testing results. The sample shall be a mixture of the random samples taken around the source stockpile or field. The soil sample shall be delivered with soil peds intact that represent the size and quantity of expected peds in the final delivered soil.

2.02 COMPOST

A. Compost: Blended and ground leaf, wood and other plant-based material, composted for a minimum of 9 months and at temperatures sufficient to break down all woody fibers, seeds and leaf structures, free of toxic material at levels that are harmful to plants or humans. Source material shall be yard waste trimmings blended with other plant or manure-based material designed to produce Compost high in fungal material.

1. Compost shall be commercially prepared Compost and meet US Compost Council STA/TMECC criteria or as modified within these specifications.

http://compostingcouncil.org/admin/wp-content/plugins/wp-pdfupload/pdf/191/LandscapeArch_Specs.pdf

- 2. Compost shall comply with the following parameters:
 - a. pH: 5.5 8.0.
 - b. Soil salt (electrical conductivity): maximum 5 dS/m (mmhos/cm).
 - c. Moisture content %, wet weight basis: 30 60.
 - d. Particle size, dry weight basis: 98% pass through 3/4 inch screen or smear.
 - e. Stability carbon dioxide evolution rate: mg CO2-C/ g OM/ day < 2.
 - f. Solvita maturity test: > 6.
 - g. Physical contaminants (inerts), %, dry weight basis: <1%.

h. Chemical contaminants, mg/kg (ppm): meet or exceed US EPA Class A standard, 40CFR 503.13, Tables 1 and 3 levels.

i. Biological contaminants select pathogens fecal coliform bacteria, or salmonella, meet or exceed US EPA Class A standard, 40 CFR § 503.32(a) level requirements.

- B. Provide a two-gallon sample with manufacturer's literature and material certification that the product meets the requirements.
- 2.03 LIME
 - A. ASTM C 602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent and as follows:

1. Class: Class T, with a minimum 99 percent passing through No. 8 (2.36-mm) sieve and a minimum 75 percent passing through No. 60 (0.25-mm) sieve.

2. Provide lime in form of dolomitic limestone.

B. Provide manufacturer's literature and material certification that the product meets the requirements.

PART 3 - EXECUTION

3.01 SITE EXAMINATION

A. Prior to installation of Planting Soil, examine site to confirm that existing conditions are satisfactory for the work of this section to proceed.

1.Confirm that the subgrade is at the proper elevation and compacted as required. Subgrade elevations shall slope toward the underdrain lines as shown on the drawings.

2. Confirm that the surface of all areas to be filled with Planting Soil are free of construction debris, refuse, compressible or biodegradable materials, stones greater than 2 inches diameter, soil crusting films of silt or clay that reduces or stops drainage from the Planting Soil into the subsoil; and/or standing water. Remove unsuitable material from the site.

3. Confirm that no adverse drainage conditions are present.

4. Confirm that no conditions are present which are detrimental to plant growth.

5. Confirm that utility work has been completed per the drawings.

- B. If unsatisfactory conditions are encountered, notify the Owner's Representative immediately to determine corrective action before proceeding.
- 3.02 COORDINATION WITH PROJECT WORK
 - A. The Contractor shall coordinate with all other work that may impact the completion of the work.
 - B. Prior to the start of work, prepare a detailed schedule of the work for coordination with other trades.
 - C. Notify the Owner's Representative of any conflicts with utility lines.
- 3.03 GRADE AND ELEVATION CONTROL
 - A. Provide grade and elevation control during installation of Planting Soil. Utilize grade stakes, surveying equipment, and other means and methods to assure that grades and contours conform to the grades indicated on the plans.

3.04 SITE PREPARATION

A. Excavate to the proposed subgrade. Maintain all required angles of repose of the adjacent materials as shown on the drawings or as required by this specification. Do not over excavate compacted subgrades of adjacent pavement or structures. Maintain a supporting 1:1 side slope of compacted subgrade material along the edges of all paving and structures where the bottom of the paving or structure is above the bottom elevation of the excavated planting area.

- B. Remove all construction debris and material including any construction materials from the subgrade.
- C. Confirm that the subgrade is at the proper elevation and compacted as required. Subgrade elevations shall slope approximately parallel to the finished grade and/or toward the subsurface drain lines as shown on the drawings.
- D. In areas where Planting Soil is to be spread, confirm subgrade has been scarified.
- E. Protect adjacent walls, walks and utilities from damage or staining by the soil.

1. Any damage to the paving or site features or work shall be repaired at the Contractor's expense.

3.05 PLANTING SOIL INSTALLATION.

- A. Prior to installing any Planting Soil from stockpiles, the Owner's Representative shall approve the condition of the subgrade and the previously installed subgrade preparation and the installation of subsurface drainage.
- B. Phase work such that equipment to deliver or grade soil does not have to operate over previously installed Planting Soil.
- C. Installing soil with soil or mulch blowers or soil slingers shall not be permitted.
- D. The depths and grades shown on the drawings are the final grades after settlement and shrinkage of the compost material. The Contractor shall install the Planting Soil at a higher level to anticipate this reduction of Planting Soil volume. A minimum settlement of approximately 10 -15% of the soil depth is expected.
- 3.06 COMPACTION REQUIREMENTS FOR INSTALLED PLANTING SOIL
 - A. Planting Soil shall be installed in lifts at a density of 75% to 82% of maximum dry density standard proctor in a manner that provides consistent and uniform compaction.
 - B. Maintain moisture conditions within the Planting Soil during installation to allow for satisfactory compaction. Suspend operations if the Planting Soil becomes wet. Apply water if the soil is overly dry.

3.07 OVER COMPACTION REDUCTION

- A. Any soil that becomes compacted to a density greater than the specified density and/or the density in the approved mockup shall be dug up and reinstalled. This requirement includes compaction caused by other sub-contractors after the Planting Soil is installed and approved.
- B. Surface roto tilling shall not be considered adequate to reduce over compaction at levels 6 inches or greater below finished grade.

3.08 INSTALLATION OF CHEMICAL ADDITIVES/COMPOST

A. Following the installation of Planting Soil and prior to fine grading, apply chemical additives/compost as recommended by the soil test and appropriate to the soil and specific plants

to be installed. Compost, if recommended by the soil test, shall be tilled into the top 4" of installed topsoil.

B. Types, application rates and methods of application shall be approved by the Owner's Representative prior to any applications.

3.09 FINE GRADING

- A. The Owner's Representative shall approve all rough grading prior to the installation of Compost, fine grading, planting, and mulching.
- B. Grade the finish surface of all planted areas to meet the grades shown on the drawings, allowing the finished grades to remain higher (10 15% of depth of soil modification) than the grades on the grading plan, as defined in paragraph Planting Soil Installation, to anticipate settlement over the first year.
- C. Provide for positive drainage from all areas toward the existing inlets, drainage structures and or the edges of planting beds. Adjust grades as directed to reflect actual constructed field conditions of paving, wall and inlet elevations. Notify the Owner's Representative in the event that conditions make it impossible to achieve positive drainage.
- D. Provide smooth, rounded transitions between slopes of different gradients and direction. Modify the grade so that the finish grade before adding mulch and after settlement is one or two inches below all paving surfaces or as directed by the drawings.
- E. Fill all dips and remove any bumps in the overall plane of the slope. The tolerance for dips and bumps in shrub and ground cover planting areas shall be a 2-inch deviation from the plane in 10 feet. The tolerance for dips and bumps in lawn areas shall be a 1-inch deviation from the plane in 10 feet.

3.10 CLEAN-UP

A. During installation, keep the site free of trash, pavements reasonably clean and work area in an orderly condition at the end of each day. Remove trash and debris in containers from the site no less than once a week.

1. Immediately clean up any spilled or tracked soil, fuel, oil, trash or debris deposited by the Contractor from all surfaces within the project or on public right of ways and neighboring property.

B. Once installation is complete, wash all soil from pavements and other structures. Ensure that mulch is confined to planting beds and that all tags and flagging tape are removed from the site. The Owner's Representative seals are to remain on the trees and removed at the end of the warranty period.

1. Make all repairs to grades, ruts, and damage to the work or other work at the site.

2. Remove and dispose of all excess Planting Soil, subsoil, mulch, plants, packaging, and other material brought to the site by the Contractor.

3.11 PLANTING SOIL PROTECTION

A. The Contractor shall protect installed and/or modified Planting Soil from damage including contamination and over compaction due to other soil installation, planting operations, and

operations by other Contractors or trespassers. Maintain protection during installation until acceptance. Utilize fencing and matting as required or directed to protect the finished soil work. Treat, repair or replace damaged Planting Soil immediately.

B. Loosen compacted Planting Soil and replace Planting Soil that has become contaminated as determined by the Owner's Representative. Planting Soil shall be loosened or replaced at no expense to the Owner.

1. Till and restore grades to all soil that has been driven over or compacted during the installation of plants.

3.12 SUBSTANTIAL COMPLETION ACCEPTANCE

- A. Upon written notice from the Contractor, the Owners Representative shall review the work and make a determination if the work is substantially complete.
- B. The date of substantial completion of the planting soil shall be the date when the Owner's Representative accepts that all work in Planting and Planting Soil is complete.

3.13 FINAL ACCEPTANCE / SOIL SETTLEMENT

A. At the end of the plant warrantee and maintenance period, (see Specification section - Planting) the Owner's Representative shall observe the soil installation work and establish that all provisions of the contract are complete and the work is satisfactory.

1. Restore any soil settlement and or erosion areas to the grades shown on the drawings. When restoring soil grades remove plants and mulch and add soil before restoring the planting. Do not add soil over the root balls of plants or on top of mulch.

B. Failure to pass acceptance: If the work fails to pass final acceptance, any subsequent observations must be rescheduled as per above. The cost to the Owner for additional observations will be charged to the Contractor at the prevailing hourly rate of the Owner's Representative.

END OF SECTION

SECTION 32 92 00 TURF AND GRASSES

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The work of this Section consists of providing all labor, equipment, materials, incidental work, and construction methods necessary to perform all seeding installation and fine grading work and related items as indicated on the Contract Documents and/or as specified in this Section and includes, but is not necessarily limited to, the following:
 - 1. Lawn Seed Mix
 - 2. Steep Slopes Native Seed Mix
 - 3. Stormwater Native Seed Mix

1.2 RELATED DOCUMENTS

- A. The work of this section shall comply with any and all applicable specifications and drawings in the contract set, as well as any and all applicable conditions as agreed upon by contractor and owner prior to the start of work on this project.
- B. Related Specification Sections:
 - 1. Section 31 23 16: Earthwork.
 - 2. Section 31 25 00: Erosion Control.
 - 3. Section 32 93 00: Trees, Shrubs and Groundcovers.

1.3 SUBMITTALS

- A. At least 30 days prior to intended use, the Contractor shall provide the following samples and submittals for approval in conformance with the requirements of Division 1 Section, SUBMITTALS. Do not order materials until Owner's Representative's approval of samples, certifications or test results has been obtained. Delivered materials shall closely match the approved samples. Acceptance shall not constitute final acceptance. The Owner's Representative reserves the right to reject on or after delivery any material that does not meet these Specifications.
 - 1. Material Sampling and Testing of Topsoil shall be specified and performed under Section 32 91 00, PLANTING SOILS.
 - 2. Fertilizer:
 - a. Submit product literature of seeding fertilizer and certificates showing composition and analysis.
 - 3. Seed: Submit a manufacturer's Certificate of Compliance to the Specifications with each shipment of each type of seed. These certificates shall include the guaranteed

percentages of purity, weed content and germination of the seed, and also the net weight and date of shipment. No seed may be sown until the Contractor has submitted the certificates.

1.4 EXAMINATION OF CONDITIONS

- A. All areas to be improved shall be inspected by the Contractor before starting work and any defects such as incorrect grading, or drainage problems shall be reported to the Owner's Representative prior to beginning this work. The commencement of work by the Contractor shall indicate his acceptance of the areas to be improved, and he shall assume full responsibility for the work of this Section.
- B. The Contractor shall be solely responsible for judging the full extent of work requirements involved.

PART 2 - MATERIALS

- 2.1 PLANTING SOIL
 - A. Planting soil shall be specified, provided, and installed under Section 32 91 00, PLANTING SOILS.

2.2 SOIL ADDITIVES

A. Soil additives shall be specified, provided, and installed under Section 32 91 00, PLANTING SOILS.

2.3 SEED MIXES

- A. Seed mixes are to be the following, as noted on the Landscape Plans;
 - 1. LAWN SEED MIX: 'Fine Fescue Links Blend' from Northeast Nursery, Peabody, MA 01960, or approved other. The mix shall have the following characteristics;
 - 33.82% Chorus Creeping Red Fescue32.77% Conductor Chewing's Fescue32.89% Clarinet Hard Fescue00.52% Inert Matter

'Fine Fescue Links Blend' seed mix to be applied at a rate of is to be 5 lbs. per 1000 square feet.

- 2. STEEP SLOPES MIX: 'Native Steep Slope Mix with Annual Ryegrass' from Ernst Seeds, Meadville, PA 16335, or approved other. The mix shall have the following characteristics;
 - 29% Andropogon gerardii 'Southlow' (Southlow Big Bluestem)
 - 20% Lolium multiflorum (Annual Ryegrass)
 - 15% Sorghastrum nutans (Indiangrass)

- 13.4% *Elymus virginicus* (Viginia Wildrye)
- 6.6% Elymus canadensis (Canada Wildrye)
- 4.8% Panicum virgatum, 'Shawnee' (Shawnee Switchgrass)
- 4% Agrostis perennans (Autumn Bentgrass)
- 2.8% Panicum clandestinum (Deertongue)
- 1% Rudbeckia hirta (Blackeyed Susan)
- 0.7% Coreopsis lanceloata (Laceleaf Coreopsis)
- 0.7% Echinacea purpurea (Purple Coneflower)
- .07% Heliopsis helianthoides (Oxeye Sunflower)
- .06% Chamaecrista fasciculata (Partridge Pea)
- .02% Aster pilosus (Heath Aster)
- .02% Monarda fistulosa (Wild Bergamot)
- .01% Apocynum cannabinum (Indianhemp)
- .01% Asclepias syriaca (common Milkweed)
- .01% Solidago rugosa (Wrinkleleaf Goldenrod)

'Native Steep Slope Mix with Annual Ryegrass' seed mix to be applied at a rate of 60 lbs. per acre.

- 3. STEEP SLOPES MIX: 'Native Detention Area Mix' from Ernst Seeds, Meadville, PA 16335, or approved other. The mix shall have the following characteristics;
 - 26% Panicum clandestinum (Deertongue)
 - 25% Panicum virgatum, 'Shawnee' (Shawnee Switchgrass)
 - 21% Elymus virginicus (Viginia Wildrye)
 - 20% Carex vulpinoidea (Fox Sedge)
 - 4% Agrostis perennans (Autumn Bentgrass)
 - 2% Juncus tenuis (Path Rush)
 - 1% Panicum rigidulum (Redtop Panicgrass)

'Native Detention Area Mix' seed mix to be applied at a rate of 20 lbs. per acre.

- B. Any and all seed suppliers/manufacturer's recommendations shall be followed as part of this specification.
- C. Any substitute for seed mixes shall be approved or provided by Owner's Representatives or Landscape Architect
- D. Any additional fertilizer or pre-emergent herbicide shall be applied at the discretion of the Contractor in response to existing conditions and as necessary to ensure proper grass establishment as outlined elsewhere in these specifications and in response to chemical analysis and field conditions. Any and all such applications shall be with the approval of the Project Landscape Architect.

PART 3 - EXECUTION

3.1 PREPARATION OF SUBGRADE & PLANTING SOIL PLACEMENT AND PREPARATION

A. See Section 32 91 00 PLANTING SOILS for subgrade preparation and planting soil placement and preparation.

3.2 INSTALLATION OF SEED

- A. Contractor shall obtain Owner's Representative's written approval of fine grading and bed preparation before doing any seeding.
- B. Limit of grading and earthwork shall be limit of seeding unless otherwise indicated on the Contract Documents. All lawn areas disturbed outside the limit of seeding shall be prepared and seeded as specified herein at no additional cost.
- C. The season for permanent lawn seeding shall be from April 1 to June 1 and from August 15 to September 30. The actual planting of seed shall be done, however, only during periods within this season that are normal for such work as determined by weather conditions and by accepted practice in this locality.
- D. Seed only when the bed is in a friable condition, not muddy or hard.
- E. Install specified seed or seed mixes where indicated in the Planting Plans.
- F. If broadcast seeding lawn seed or temporary cover crop, cover with clean, weed-free winter wheat straw mulch. For slopes steeper than 3:1, biodegradable erosion control matting should be placed in lieu of straw mulch.
- G. For proposed Steep Slopes Native Seed Mix and Stormwater Native Seed Mix seeding areas, broadcast seed onto the seedbed with a minimum of soil disturbance. To allow for effective distribution of seed, dilute seed by mixing thoroughly with fresh sawdust, and apply mix evenly to the proposed seeding area. Once applied, rake seed lightly into the soil to a depth of approximately ¼" using appropriate equipment. Tamp seed for proper seed-to-soil contact with roller or other appropriate equipment. Apply one inch of clean, weed-free winter wheat straw mulch. Mulch should leave approximately 50% of soil exposed to sunlight. For slopes steeper than 3:1 (with elevation change in excess of 2'), biodegradable erosion control matting should be placed in lieu of straw mulch.
- H. Contractor shall ensure there is no leaf cover (from fallen leaves) over areas seeded with native woodland seed mix prior to germination.
- I. Seeded lawn areas shall be watered and maintained until the completion of the Guarantee Period and Final Acceptance of the Work. Water should not be required for native seeded areas, unless prolonged drought occurs after germination.

3.3 MAINTENANCE

A. Maintenance shall begin immediately after any area is seeded and shall continue for a 60-day active growing period for seeded areas or until Final Acceptance, whichever is longer, following the completion of all lawn construction work, and until final acceptance of the project. In the event that seeding operations are completed too late in the Fall for adequate germination and growth of grass, then maintenance shall continue into the following Spring for the minimum 60 Day period. In addition, install blankets or netting to prevent planting soil degradation and movement over the winter. Submit product literature and samples to the Owner's Representative for review. Blankets and netting shall be placed in a timely manner at no additional cost to the Owner.

3.4 ACCEPTANCE

- A. Following the minimum required maintenance periods for lawn construction, the Contractor shall request the Owner's Representative in writing for a formal inspection of the completed work. Request for inspection shall be received by the Owner's Representative at least 10 Days before anticipated date of inspection.
- B. Acceptance Requirements
 - 1. At the end of the maintenance period, seeded lawn areas shall have a close stand of grass with no weeds present and no bare spots greater than 3 inches in diameter over greater than 5 percent of the overall seeded area. At least 90 percent of the grass established shall be permanent grass species. If seeded areas are deficient, the Contractor's responsibility for maintenance of all seeded lawn areas shall be prepared and reseeded in accordance with the requirements of this Section 32 92 00.
 - 2. Due to longer germination requirements, the areas seeded with Steep Slopes Native Seed Mix and Stormwater Native Seed Mix seed mixes shall be reviewed one year after seeding is completed. Seeded areas shall exhibit a typical coverage of at least 70%. If seeded areas are deficient, the Contractor's responsibility for maintenance of all seeded areas shall be extended until deficiencies are corrected. Seeded areas to be corrected shall be prepared and reseeded in accordance with the requirements of this Section 32 92 00.
- C. At the time of acceptance, the Contractor shall remove temporary barriers used to protect lawn areas.

END OF SECTION

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SECTION 32 93 00

TREES, SHRUBS, AND GROUNDCOVERS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Related Requirements: Review the General Contract Conditions and Division One, General Requirements, which contain information and requirements that apply to this Section.
- B. Work Included: Provide planting of trees, shrubs, groundcover, perennials, and bulbs complete as shown and as specified.
- C. Related Specification Sections:
 - 1. Section 31 23 16: Earthwork
 - 2. Section 32 91 15: Soil Preparation
 - 3. Section 32 92 00: Turf and Grasses

1.02 QUALITY ASSURANCE

- A. Certificates:
 - 1. Submit certificates of inspection as may be required by local law for transportation of each shipment of plants along with invoice.
 - 2. File copies of certificates after acceptance of material. Inspection by Federal or State Governments at place of growth does not preclude rejection of plants at project site.
- B. Applicable Standards: Apply standards for plant materials as described in the following:
 - 1. "American Standard for Nursery Stock", April 14, 2014 Edition, American Association of Nurserymen, Inc. This shall supersede these criteria in the event of contradiction or ambiguity.
 - 2. Hortus III 1976 Edition, Bailey Horatorium, Cornell University.
 - 3. Planting and Transplanting Standards: Comply with ANSI A300, "Trees, Shrubs, and Other Woody Plant Maintenance--Standard Practices," unless more stringent requirements are indicated.

1.03 SUBMITTALS

- A. Samples: Submit prior to delivery to site. Attach product name, address of manufacturer and/or supplier to each sample.
 - 1. Mulch: One (1) pint each type.
 - 2. Nylon Tree Strap: Two (2) each type.

1.04 WORK SCHEDULE

- A. Proceed with the work as rapidly as the site becomes available, consistent with normal seasonal limitations for planting work.
- 1.05 SELECTION, TAGGING AND ORDERING OF PLANT MATERIAL
 - A. Documentation: Submit documentation within 10 days after award of Contract that all plant

materials have been ordered. Arrange procedure for review of plant materials at time of submission.

- B. Review: Request for review of plant materials and quantity at place of growth or from nursery shipment site at least 7 days in advance of shipping to site. Right is reserved to refuse review at this time if, in Landscape Architect's judgment, a sufficient quantity of plants is not available.
- C. Transportation: Contractor shall accompany Landscape Architect to all review(s) of plant materials at the nursery. Landscape Architect will review and tag plants at place of growth and upon delivery for conformity to specifications.
- D. Distant Material: Submit photographs with a person adjacent to plants for preliminary review. Such review shall not impair the right of review and rejection during progress of the work.
- E. Unavailable Material: If proof is submitted that any plant specified is not obtainable, a proposal will be considered for use of the nearest equivalent size or variety with corresponding adjustment of Contract price. Substantiate such proof in writing no later than 20 days after award of contract. Approval of late substitutions is at the sole discretion of the Landscape Architect.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Labeling: Furnish standard products in manufacturer's standard containers bearing original labels legibly showing quantity, analysis, genus/species and name of manufacturer/grower.
- B. Storage: Store products with protection from weather or other conditions that would damage or impair the effectiveness of the product. Protect metal containers from sun during summer months with temperatures above 80 degrees F.
- C. Handling: Do not lift or handle container plants by tops, stems or trunks at any time. Do not bind or handle plants with wire or rope at any time.
- D. Anti-Desiccant: At Contractor's option, spray all evergreen or deciduous plant material in full leaf immediately before transporting with anti-desiccant. Apply an adequate film over trunks, branches, twigs and foliage.
- E. Digging: Dig ball and burlap plants with firm, natural balls of earth of diameter not less than that recommended by American Standard for Nursery Stock," ANSI z60.1-2004 and of sufficient depth to include the fibrous and feeding roots.
- 1.07 ANALYSES OF SAMPLES AND TESTS
 - A. Sampling: Right is reserved to take and analyze samples of materials for conformity to specifications at any time. Furnish samples upon request.
 - B. Rejected Materials: Remove rejected materials immediately from the site at Contractor's expense. Pay cost of testing of materials not meeting specifications.
- 1.08 MAINTENANCE PERIOD AND FINAL ACCEPTANCE: See Section 32 0130 Landscape Maintenance
- 1.09 WARRANTY PERIOD
 - A. Warranties:
 - 1. Correct Species: Warrant that all plant materials are true to species and variety.
 - 2. Vigor: Warrant that all trees and shrubs planted (except those species specifically noted below) under this Contract will be healthy and in flourishing condition of active growth one

year from date of Final Acceptance. Warranty perennial and groundcover for one full growing season from date of Final Acceptance.

- B. Delays: All delays in completion of planting operations that extend the planting into more than one planting season shall extend the Warranty Period correspondingly.
- C. Condition of Plants: Plants shall be free of dead or dying branches and branch tips, with all foliage of a normal density, size and color.
- D. Replacements: As soon as weather conditions permit, replace, without cost to Owner all dead plants and all plants not in a vigorous, thriving condition, as determined by Project Manager during and at the end of Warranty Period. Replacement trees shall have similar warranty for one year from date of replacement planting.
- E. Exclusions: Contractor shall not be held responsible for failures due to neglect by Owner, vandalism, etc., during Warranty Period. Report such conditions in writing to the Landscape Architect.

1.10 REPLACEMENTS

- A. Guarantee: For a period of one (1) year (or as noted in Section 1.10 above) after final acceptance of all work and at no additional cost to the Owner, the Contractor is to replace any new or transplanted plant material that is dead, or that is, in the opinion of the Landscape Architect, in unhealthy or unsightly condition, or that has lost their natural shape due to dead branches or excessive pruning of dead branches, or that has been damaged beyond repair due, in the judgment of the Landscape Architect, to inadequate maintenance and/or protection from animal damage or the natural elements.
- B. Failed Materials:
 - 1. Plant materials exhibiting conditions which are determined as being unacceptable due to workmanship by the Contractor shall be repaired and/or replaced at no additional cost to the Owner as determined by Landscape Architect.
 - 2. Closely match replacements to adjacent specimens of the same species. Apply all requirements of this Specification to all replacements.
 - 3. Contractor shall be held responsible for a maximum of two (2) replacements for each failed tree and shrub after final acceptance during warranty period.
- C. Incorrect Materials:
 - 1. During Warranty Period, replace at no cost to Owner all plants revealed as being untrue to name.
 - 2. Provide replacements of a size and quality to match the planted materials at the time the mistake is discovered.

PART 2 - PRODUCTS

- 2.01 PLANT MATERIALS
 - A. General: Verify that all container stock has been grown in the containers in which delivered for at least two (2) months, but not over two (2) years for shrubs or one (1) year for perennial and groundcovers. Do not install container plants that have cracked or broken balls of earth when taken from container.
 - 1. Growing Conditions: Plants shall be nursery-grown in accordance with good horticultural practices under similar climatic conditions to those of the project for at least two years unless otherwise specifically authorized. Collected material shall be identified for approval by the

Landscape Architect.

- 2. Appearance: All plants shall be exceptionally heavy, symmetrical, tightly knit, and so trained or favored in development and appearance as to be superior in form for their species, with regard to number of branches, compactness and symmetry.
- 3. Vigor: Plants shall be sound, healthy and vigorous, well branched and densely foliated when in leaf. They shall be free of disease, insect pests, eggs, or larvae. They shall have healthy, well-developed root systems. Plants shall be free from physical damage or adverse conditions that would prevent thriving growth.
- B. Condition of Root System: Samples must prove to be completely free of circling, kinked or girdling trunk surface and center roots and show no evidence of a root-bound condition.
- C. Measurements:
 - 1. General: Measure plants when branches are in their normal upright position. Height and spread dimensions specified refer to main body of plant and not branch tip to tip. Take caliper measurement at a point on the trunk 6 in. above natural ground line for trees up to 4 in. in caliper and at a point 12 in. above the natural ground line for trees over 4 in. in caliper. Evergreen trees shall be measured from the base of the tree to the midpoint of the top central leader.
 - 2. Size Range: If a range of size is given, do not use plant materials less than the minimum size. Not less than 40 percent of the plants shall be as large as the maximum size specified. The measurements specified are the minimum size acceptable and are the measurements after pruning, where pruning is required. Plants that meet the measurements specified, but not possess a normal balance between height and spread shall be rejected.
 - 3. Substitutions: Substituted plants shall be true to species and variety and shall conform to measurements specified except that plants larger than specified may be used if accepted. Use of such plants shall not increase Contract price. If larger plants are accepted, increase the ball of earth in proportion to the size of the plant.
- D. Pruning: Do not prune plants before delivery. For pruning after installation, see Section 32 0130 Landscape Maintenance.
- E. Condition: Trees which have multiple leaders, unless specified, or damaged or crooked leaders will be rejected. Trees having a main leader shall not have been headed back. Trees with abrasions of the bark, sunscalds, disfiguring knots, or fresh cuts of limbs over 3/4 in. which have not completely callused, will be rejected.

2.03 COMMERCIAL FERTILIZERS

A. Top-dress Fertilizer: Complete fertilizer, 50 percent of the nitrogen to be derived from natural organic sources or urea-form. Available phosphoric acid shall be from superphosphate, bone or tankage. Potash shall be derived from muriate of potash containing 60 percent potash:

16% Nitrogen 6% Phosphoric Acid 8% Potash

- B. Perennials: Diammonium Phosphate (18-46-0).
- 2.04 STAKING MATERIALS
 - A. Tree Stakes: Rough-sawn, sound, new hardwood, free of knots, holes, cross grain, and other defects, 2 by 2 inches by length indicated, pointed at one end.
 - B. Wire Ties: 11 gauge, single strand, galvanized steel.

- C. Nylon Straps: 2" X 12" wide nylon/cotton weave with ³/₄" grommet at each end as accepted by Landscape Architect.
- 2.05 GUYING MATERIALS
 - A. Anchor and Hardware:
 - 1. Standard Steel 'T' posts, dark green; 2'-6" long. Cut flush to the ground after guying trees.
 - 2. Hardware: 11 gauge, single strand, galvanized steel wire ties with rubber, two-ply, dark-colored, ½"- 5/8" diameter protective hose loops or approved equal.
 - 3. Plastic Guy Covers: 3/8 in. diameter x 3 ft. long white plastic tubing. Provide for all guyed installations as identified in the field by the Landscape Architect.
 - 4. Provide for all guyed installations of evergreen trees.
- 2.06 TREE PROTECTION MATERIALS
 - A. Tree Wrap: Tree wrapping material shall be first quality, 4" wide bituminous, impregnated tape, corrugates or crepe brown paper, specifically manufactured for tree wrapping and having a quality to resist insect infestation.
- 2.07 WATER
 - A. Clean, fresh and potable, furnished and paid for by Owner.

2.08 MULCH

- A. Organic mulch, free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:
 - 1. Type: Ground or shredded hemlock bark, dark brown in color.

2.09 ANTI-DESICCANT

- A. Type: Anti-desiccants for retarding excessive loss of plant moisture and inhibiting wilt shall be sprayable, water insoluble vinyl-vinyledine complex which will produce a moisture retarding barrier not removable by rain or snow.
- B Manufacturer: Wilt-pruf Formula NCF as manufactured by Wilt-Pruf Products,Inc. , Essex, CT 06426-0469.

PART 3 - EXECUTION

- 3.01 PREPLANT REVIEW
 - A. General: Do not commence planting work prior to acceptance of soil preparation.
 - B. Finish Grades: Finish grades for all planting areas shall have been established in accordance with Section 32 91 15, Soil Preparation. Verify that all grades are within 1 in. plus or minus of required finish grade and that all soil amendments have been installed as specified under Section 32 91 15 Soil Preparation. Fine rake planting beds prior to planting shrubs.
 - C. Notification: Submit written notification of all conditions inconsistent with specifications for soil preparation and mixing as described in Section 32 91 15 Soil Preparation.
- 3.02 DRAINAGE OF PLANTING AREAS

A. Surface Drainage: See Section 32 91 15, Soil Preparation

3.03 LAYOUT AND EXCAVATION OF PLANTING AREAS

- A. Layout and Staking: Lay out all trees, shrubs and container locations as shown on Drawings. Owner and Landscape Architect reserves the right to review and adjust plant locations.
- B. Review: Locations of plants will be checked in the field and will be adjusted to exact position before planting begins. Right is reserved to refuse review at this time if, in the Landscape Architect's opinion, an insufficient quantity of plants is available.
- C. Equipment for Digging Plant Pits: Use of an auger or vernier spade to dig plant pits is prohibited. Backhoe is acceptable, with scarification of the tree pit after excavation - see below.
- D. Plant Pits: Excavate tree and shrub to a minimum of three times the diameter of the root ball or container, in accordance with Drawings.

3.04 PLANTING OPERATIONS

- A. General:
 - 1. Protect plants at all times from sun or drying winds.
 - 2. Keep plants that cannot be planted immediately upon delivery in the shade, well-protected and well-watered.
 - 3. Heel in and protect with burlap all B&B plant materials which cannot be planted upon delivery.
- B. Handling and De-potting of Plant Materials:
 - 1. Metal Containers: Cut can on two sides with accepted cutting tool. Do not use spade.
 - 2. Plastic Containers: Tip container to horizontal orientation and carefully remove shrub. Support rootball during installation to prevent cracking or shedding of soil.
 - 3. Balled and Burlap Plants: Avoid all damage to rootballs. If rootball is cracked or broken during handling, plant will be rejected. Lift and carry by bottom of ball only. Do not remove wrapping until plant is set in plant pit. Cut and remove top half of wire cage from around root ball and completely remove burlap from upper 1/2 of rootball prior to backfilling.

C. Installation:

- 1. Scarification:
 - a. Plant Rootball: After removing plant from container, scarify the sides of the rootball to a depth of 1 in. at four to six equally-spaced locations around the perimeter of the ball. Completely sever or remove all circling roots over 3/8 in. diameter.
 - b. Plant Pit: Excavate deep enough to accommodate the ball and bed of prepared plant soil mix. Compact before setting of plants. Scarify sides of plant pit, thoroughly breaking up all surfaces and eliminating all "glazed" areas.
- 2. Positioning: Backfill plant pit as required to allow setting crown of plant 2 in. above new finish grade. Thoroughly foot tamp all backfill. Position plant in planting pit, maintaining plumb condition.
- 3. Backfilling:
 - a. Use backfill mix as specified in Section 32 9300 Soil Preparation, to backfill plant pits. Brace each plant plumb and rigidly in position until planting soil has been tamped solidly around the ball and roots.
 - b. When plant pits have been backfilled approximately 2/3 full, water thoroughly and saturate rootball, before installing remainder of the backfill mix to top of pit, eliminating all air pockets.
- 4. Staking and/or Guying: When required, stake or guy as detailed.
- D. Adjustment: Adjust plants so that after full settlement has occurred, the grade at the base of the plants is 2 in. above the adjacent planting finish grade.
- E. Watering Basin: Form saucer with 3 in. high berm centered around tree and shrub pits 12 in. wider than ball diameter.
- F. Watering: Water all plants immediately after completion of planting operations.
- G. Labels: Remove all nursery-type plant labels, wires and ties from plants.
- 3.05 STAKING AND GUYING
 - A. General:
 - 1. Trees shall be able to stand upright without support, and shall return to the vertical after their tops have been deflected horizontally and released. Stake or guy trees which do not meet this qualification.
 - 2. All plant materials shall remain plumb and straight for all given conditions from installation through the guarantee period.
 - B. Staking (Deciduous Trees):
 - 1. Locate stakes in a line with trunk of tree, perpendicular to prevailing wind and as close to the main trunk as is practical, avoiding root injury. Drive stakes at least 30 in. into firm ground. See Planting Details.
 - 2. Wire support straps shall be placed around the trunk in a single loop. Run wire through grommets on support strap, tighten, and keep taut.
 - C. Guying (Evergreen Trees):
 - 1. Guy Evergreen trees at points of branching height of tree, with three (3) guys spaced equally around and outside perimeter of ball, in accordance with Drawings.
 - 2. Guys: Provide one turnbuckle for each guy. Use 2 cable clamps at each cable connection. Place Plastic Guy Covers on all guys.
- 3.06 PRUNING: See Section 32 0130 Landscape Maintenance
- 3.07 MULCHING
 - A. Install a 2 in. deep layer of specified mulch over all planting areas including tree and shrub watering basins unless otherwise noted on drawings.
- 3.08 GROUNDCOVER AND PERENNIAL PLANTING
 - A. Planting: Plant groundcover plants at optimum depth for proper growth. Avoid air pockets. Equally spaced triangularly, at distances called for in the Drawings. See Planting Details.
 - B. Fertilizers: Apply top-dress fertilizer at the rate of 3 pounds per 1,000 square feet immediately after planting.
 - C. Watering: Water bed thoroughly after fertilizer application. Wash all fertilizer from leaves of plant materials.
- 3.09 BULB

- A. Bulbs: Install per generally accepted standards for specific species. Depths will vary by species.
- B. Location: Locate per direction of Landscape Architect.

3.10 CLEAN-UP

- A. Keep all areas of work clean, neat and orderly at all times.
- B. Clean up and remove all deleterious materials and debris from the entire work area prior to Final Acceptance.

END OF SECTION

SECTION 33 14 00

WATER UTILITY PIPING, VALVES, AND ACCESSORIES

PART 1 – GENERAL

1.1 SCOPE OF WORK

- **A.** Furnish all labor, materials, equipment and incidentals required to install and test pipe, fittings, and accessories complete as shown on Drawings and as specified herein.
- **B.** This Specification includes all exterior water main and service piping and appurtenances to 5 feet outside of a building or vault exterior wall.

1.2 SUBMITTALS

- A. General: Provide submittals in accordance with Specification 01 30 00.
- **B.** Product data for pipe, gaskets, fittings, valves, water meters, and associated components listed herein. Pipe data shall include pipe class, wall thickness, and pressure rating.
- **C.** Shop drawings for pre-cast concrete valve pits and meter pit, including frames and covers.
- **D.** Shop drawings for cast-in-place concrete valve pits and meter pit, including frames and covers.
- **E.** Line layout and marking diagram for all restrained joint areas.
- **F.** Operation and maintenance data for valves.

1.3 **QUALITY ASSURANCE**

- A. Comply with the requirements of utility supplying water to the Project.
- **B.** All pressure water pipe shall be furnished by a single manufacturer. The supplier shall be responsible for the provisions of all specified test requirements as applicable. In addition, all water pipe to be installed under this Contract may be inspected at the plant for compliance with these specifications by an independent testing laboratory provided by the Owner. The Contractor shall require the manufacturer's cooperation in these inspections. The cost of plant inspection of all pipe approved for this Contract will be borne by the Owner.
- **C.** Inspections of pipe may also be made by the Owner after delivery. The pipe shall be subject to rejection at any time on account of failure to meet any of the Specification

requirements, even though sample pipes may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery shall be marked for identification and shall be removed from the job at once.

1.4 DELIVERY, STORAGE, AND HANDLING

- **A.** Deliver, store, and handle water mains, valves, and appurtenances in accordance with the manufacturers' recommendations and in a manner which protects the materials.
- **B.** All items shall be bundled or packaged in such a manner as to provide adequate protection of the ends during transportation to the site. Any pipe damaged in shipment shall be replaced as directed by the Owner.
- **C.** The use of chains, hooks or other equipment that might damage the pipe or pipe coating is not permitted. Stockpiled pipe shall be supported on sand or earth berms free of rock exceeding three inches in diameter.
- **D.** Any pipe or fitting showing a crack or which has received a blow that may have caused an incident fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work.
- E. Gaskets shall be stored in a secure dry place and protected from ultraviolet light.
- **F.** If any defective item is discovered after it has been installed, it shall be removed and replaced with an exact replacement item in a satisfactory manner by the Contractor, at the Contractor's own expense. All pipe and fittings shall be thoroughly cleaned before installation and the interior shall be kept clean until completion of the project.
- **G.** In handling the items, use special devices and methods as required to achieve the results specified herein. No uncushioned devices shall be used in handling the item.

1.5 PROJECT CONDITIONS

- **A.** Site Information: Perform site survey, research public utility records, and verify existing utility locations. Verify that water service piping may be installed in compliance with the original design and referenced standards.
- **B.** Contractor is responsible for compatibility between pipe materials, fittings, and appurtenances.

1.6 SEQUENCING AND SCHEDULING

- **A.** Coordinate connection to public water mains with utility company.
- **B.** Coordinate with interior water distribution piping.

C. Coordinate with other utility work.

PART 2 – PRODUCTS

2.1 WATER MAIN PIPE AND FITTINGS

- A. Ductile Iron Pipe, 3- through 12-inch (DI). Push on joint ductile iron pipe shall conform to ANSI/AWWA C151/A21.51, ANSI/AWWA C111/A21.11, and ANSI/AWWA C104/A21.4 (cement lined). Pipe 12 inches and less shall meet Pressure Class 350, A21.51 standards.
- B. PVC Pipe, 2- through 3-inch. Push-on joint PVC pipe shall be polyvinyl chloride (PVC) conforming to ASTM D2241 with material cell classification 12454 per ASTM D1784. Provide standard pipe having integral bell and spigot with elastomeric gasket and cast iron equivalent outside diameter. Provide pipe in standard 20-foot laying lengths. Random lengths will not be permitted. Provide DR 26 rated for 160 psi or as shown on the Drawings. Fittings shall be as follows unless specified otherwise: one-piece injection molded PVC gasketed, material cell classification 12454 per ASTM D1784, SBR gaskets, meeting ASTM D3139, and DR 21 with a 200 psi pressure rating. Provide fittings with bells and gaskets specifically designed for cast iron equivalent outside diameter PVC or HDPE pipe, as required.
- C. PVC Pipe, 4- through 12-inch. Push-on joint PVC pipe shall be polyvinyl chloride (PVC) conforming to AWWA C900 with material cell classification 12454-B per ASTM D1784. Provide standard pipe having integral bell and spigot with elastomeric gasket and iron pipe size outside diameter. Provide pipe in standard 20-foot laying lengths. Random lengths will not be permitted. Provide DR 18 rated for 235 psi or as shown on the Drawings.
- **D.** High Density Polyethylene (HDPE) Pipe, 1- through 24-inch. High density polyethylene pipe shall be manufactured from PE4710 resin, conform to ASTM D3350 and AWWA C906, and be certified per NSF/ANSI 61. Provide standard pipe having plain ends for heat welded joints and cast iron equivalent outside diameter. Provide DR 13.5 for a 160 psi pressure rating or as shown on the Drawings.
- **E.** Polyethylene (PE) Pipe and Tubing for Gas Service, 1/2- through 2-inch. Pipe and tubing shall be polyethylene grade PE2406 or PE2708, minimum cell classification 234373E per ASTM D2513 and D3350. Fittings shall be socket type per ASTM D2683, butt fusion per ASTM D3261, or electrofusion per ASTM F1055. Connections to metallic piping shall meet ASTM D2513, F1973, or F2509. Install and test piping system in accordance with fuel and plumbing codes and manufacturer's written instructions.
- **F.** Ductile Iron Pipe Fittings, 3- through 48-inch. Mechanical joint fittings shall be ductile iron Class 350, conforming to ANSI/AWWA C153/A21.53 or ANSI/AWWA

C111/A21.11. Joints shall comply with ANSI/AWWA C111/A21.1. Fittings shall be cement lined in accordance with ANSI/AWWA C104/A21.04. Fittings shall have fully restrained joints. Provide ductile iron fittings conforming to AWWA C110 with a minimum rated working pressure of 350 psi. Provide fittings with bells and gaskets specifically designed for cast iron equivalent outside diameter PVC or HDPE pipe, as required.

- **G.** The manufacturer shall furnish all joint materials including rubber gasket and joint lubricant. Gasket shall meet ASTM F477 unless otherwise specified.
- **H.** Where flanges are required as indicated in the Drawings or as specified herein, flanges shall be in accordance with ANSI B16.1 and shall be rated for the piping system's working pressure. Gaskets shall be 1/8 inch ring type full face Garlock 3200 compressed non-asbestos sheet packing or approved equal.
- **I.** Dielectric Insulation. Provide dielectric insulating-flanged joints as required for cathodic protection for dissimilar metals. Provide flange insulation kits to include flange insulating gasket, flange bolt insulating sleeves and flange bolt insulating washers.
 - 1. Pipeline Seal and Insulator, Inc., Advance Products and Systems, Inc, Type E for full protection of both flange faces, or approved equal.
 - 2. Neoprene faced phenolic gaskets.
 - 3. Insulating bolt sleeves shall be the single one-piece type. Separate insulating sleeve and insulating washers are unacceptable.

2.2 WATER SERVICE LINE AND FITTINGS

- A. Copper Tubing (COP)
 - 1. Underground installations Soft annealed, Type K, conforming to ANSI H23.1.
 - 2. Interior and above ground installations Hard drawn domestic Type L, conforming to ANSI H23.1.
- **B.** High Density Polyethylene (HDPE) Tubing. Class 200, copper tube size (CTS), for potable water supply.
- C. Fittings
 - 1. Heavy duty three-part couplings shall be used to join lengths of service line. Compression pack joints shall be used. Provide tubing inserts as needed.
- **D.** All brass that comes in contact with potable water shall conform to AWWA C800 (UNS C89833). These products shall have the letters "NL" cast into the body for proper identification. Brass components that do not come in contact with potable water shall conform to AWWA C800 (ASTM B-62 and ASTM B584, UNS C83600-85-5-5).

- **E.** Corporation stops shall be ball type, heavy duty brass as manufactured by Ford Meter Box Company, Mueller or equal. Only compression pack joints may be used.
- **F.** Service saddles on 4-inch and larger mains shall be double strap, epoxy coated with stainless steel hardware, and used for all taps. Services on 3-inch and smaller mains shall use deep bell ductile iron fittings meeting ASTM A536 with joints meeting AWWA C111 and coating meeting AWWA C153.
- **G.** Curb stops shall be ball type, heavy duty brass as manufactured by Ford Meter Box Company, Mueller, McDonald or equal. Only compression pack joints may be used. The curb stops shall not have a drain. Provide each curb stop with a valve box as specified herein.

2.3 <u>VALVES</u>

- A. Gate Valves 2- to 12-inch: Conform to AWWA C509 latest revision. Gate valves shall be resilient seated with an encapsulated disc with elastomer seat which, in the closed position, creates a seal on the cast iron body resulting in a bubble tight seal across this disc at 200 psi. Buried valves shall operate with a 2" square wrench nut and shall open counter-clockwise. Valves shall have non-rising stem, mechanical joints on both sides (except that tapping valves shall be mechanical joint on one side and flanged on the other side), and shall have fusion bonded epoxy coating on all exterior and interior surfaces. Valve stem shall seal with two "O" rings, each of which shall be designed to allow replacement under full line pressure when the valve is in the open position. Valve bolts shall be Type 18-8 stainless steel.
- **B.** Buried Operators
 - 1. Buried service operators on valves larger than 2-1/2 inches shall have a 2-inch AWWA operating nut. Buried operators on valves 2 inches and smaller shall have cross handle for operation by forked key unless specified otherwise. Enclose moving parts of valve and operator in housing to prevent contact with the soil.
 - 2. Design buried service operators for quarter-turn valves to withstand 450 foot-pounds of input torque at the FULLY OPEN or FULLY CLOSED positions, grease packed and gasketed to withstand a submersion in water to 10 psi.
 - 3. Buried valves shall have extension stems, bonnets, and valve boxes. Where the depth of the valve is such that its centerline is more than 3 feet below grade, furnish an operating extension stem with 2-inch operating nut to bring the operating nut to a point 6 inches below the surface of the ground and/or box cover.

2.4 VALVE BOXES

A. Cast iron valve boxes and covers shall be provided on all buried gate valves. The boxes shall be adjustable and extend from the valve to the ground surface, with an 18-inch

minimum overlap. Minimum diameter of valve boxes shall be six (6) inches. Provide a minimum of one (1) 4-foot long valve key, Mueller A-24610 T-handle operating wrench or approved equal.

B. Cast iron curb stop boxes shall be "Erie" type with 9/16" diameter rod and plug cover, cotter pin at base of rod shall be stainless steel. For any valve larger than 1", a properly sized foot piece shall also be installed. Provide a minimum of two (2) 4-foot long curb stop wrenches, Trumbull 367-4294 or approved equal.

2.5 PRESSURE REDUCING VALVES – 1" AND SMALLER

A. None

2.6 PRESSURE REDUCING VALVES – 1-1/2" AND LARGER

A. None

2.7 <u>RESIDENTIAL WATER METERS</u>

A. None

2.8 METER PITS

A. None

2.9 FIRE HYDRANTS

A. None.

2.10 FLEXIBLE COUPLINGS

A. Not allowed unless the product and application are approved by Engineer.

2.11 TAPPING SLEEVES

A. Tapping sleeves shall be cast iron or ductile iron, mechanical joint, with outlet flange conforming to AWWA C-110.

2.12 ANCHORAGES

- A. Clamps, Straps, and Washers: ASTM A 506, steel.
- **B.** Rods: ASTM A 575, steel.
- C. Rod Couplings: ASTM A 197, malleable iron.

- **D.** Bolts: ASTM A 307, steel.
- E. Cast-Iron Washers: ASTM A 126, gray iron.
- F. Concrete Reaction Backing: Portland cement concrete mix, 3000 psi.
 - 1. Cement: ASTM C 150, Type I.
 - 2. Fine Aggregate: ASTM C 33, sand.
 - 3. Coarse Aggregate: ASTM C 33, crushed gravel.
 - 4. Water: Potable
- **G.** Mechanical joint restraints shall be manufactured of ductile iron in accordance with ASTM A536 with the following additional requirements or exceptions:
 - 1. Mechanical joint restraints shall be incorporated into the design of a follower gland. Dimensions of the gland shall be such that it can be used with the standardized mechanical joint bell and tee-head bolts in accordance with AWWA C111 and C153.
 - 2. The restraint mechanism shall consist of numerous individually activated gripping surfaces to maximize restraint capability. The gripping surfaces shall be wedges that are designed to spread the bearing surfaces on the pipe. Twist-off nuts, sized the same as tee-head bolts, shall be used to ensure the proper actuating of restraining devices. When the nut is sheared off, a standard hex nut shall remain.
 - 3. The mechanical joint restraint device shall be rated for a maximum working pressure of 350 psi, with a factor of safety of 2.
 - 4. Mechanical joint restraint for 2- to 3-inch PVC pipe shall be Ford Meter Box Uni-Flange Series 1350 or approved equal.
 - 5. Mechanical joint restraint for 4-inch and larger PVC and HDPE pipe shall be EBAA Iron, Inc. Megalug 2000 PV, Sigma Corporation One-Lok SLCE, Star Pipe Products StarGrip 4000, or approved equal.
 - 6. Mechanical joint restraint for ductile iron pipe shall be EBAA Iron, Inc. Megalug 1100, Romac Industries RomaGrip, Sigma Corporation One-Lok SLDE, Star Pipe Products StarGrip 3000 Series, or Uni-Flange (Ford) UFR, or approved equal.

2.13 **IDENTIFICATION**

- A. Plastic Underground Warning Tapes: Polyethylene plastic tape, 6 inches wide by 4 mils thick, solid blue in color with continuously printed caption in black letters "CAUTION - WATER LINE BURIED BELOW."
- **B.** Metallic-Lined Plastic Underground Warning Tapes: Polyethylene plastic tape with metallic core, 6 inches wide by 4 mils thick, solid blue in color with continuously printed caption in black letters "CAUTION WATER LINE BURIED BELOW."

C. Nonmetallic Piping Label: Engraved plastic laminate label, for installation on the main electrical meter panel; not less than 1 inch by 3 inches, with caption "CAUTION - THIS STRUCTURE HAS A NONMETALLIC WATER SERVICE."

2.14 TRACER WIRE

- **A.** 10 gauge solid strand copper tracer wire shall be installed with all PVC and/or HDPE pipe. Splicing of tracer wire shall be per manufacturer's recommendation.
- **B.** Wire shall be run along main and service alignments and terminated at the top of valve boxes and curb stop boxes in accordance with manufacturer's recommendations.

PART 3 – EXECUTION

3.1 PREPARATION OF BURIED PIPE FOUNDATION

- A. Excavate to a depth that provides a minimum finished grade pipe cover of 6-feet.
- **B.** Grade trench bottom to provide a smooth, firm, stable, and rock-free foundation throughout the length of the piping.
- **C.** Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid and backfill with clean sand or pea gravel to indicated level.
- **D.** Shape bottom of trench to fit bottom of piping. Fill unevenness with tamped sand backfill. Dig bell holes at each pipe joint to relieve the bells of all loads and to ensure continuous bearing of the pipe barrel on the foundation.

3.2 INSTALLATION OF PIPE AND PIPE FITTINGS

- **A.** As soon as the excavation is complete to normal grade of the bottom to the trench, bedding shall be placed, compacted, and graded to provide firm, uniform, and continuous support for the pipe. Bell holes shall be excavated so that only the barrel of the pipe bears upon the bedding. The pipe shall be laid accurately to the lines and grades indicated on the Drawings. Blocking under the pipe will not be permitted. Bedding and backfill shall be placed in accordance with Specification 31 23 16. Generally the compaction shall be done evenly on each side of the pipe and compaction equipment shall not be operated directly over pipe until sufficient backfill has been placed to ensure that such compaction equipment will not have a damaging effect on the pipe.
- **B.** Ductile-Iron Pipe: Install with cement-mortar-lined, ductile-iron or cast-iron, mechanical joint or push-on joint fittings and rubber gaskets in accordance with AWWA C600.
 - 1. Polyethylene Encasement: Install in accordance with AWWA C105.

- **C.** PVC (Polyvinyl Chloride) Pipe: Install with cement-mortar-lined, ductile-iron or cast-iron, mechanical joint or push-on joint fittings and rubber gaskets in accordance with AWWA M23.
- **D.** HDPE Pipe: Sections of polyethylene pipe should be joined into continuous lengths on the jobsite above ground. The joining method shall be the butt fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. The butt fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements of 400-450 degrees Fahrenheit, alignment, and an interfacial fusion pressure of 75 psi. The butt fusion joining will produce a joint with weld strength equal to or greater than the tensile strength of the pipe itself. All welds will be made using a data logger to record temperature, fusion pressure, with a graphic representation of the fusion cycle shall be part of the quality control records. Mechanical joining will be used where the butt fusion method cannot be used. Mechanical joining will be accomplished by either using a HDPE flange adapter with a ductile iron back-up ring or HDPE mechanical joint adapter with a ductile iron back-up ring. Socket fusion, hot gas fusion, threading, solvents, and epoxies will not be used to join HDPE pipe. Inspect the pipe for defects before installation and fusion. Defective, damaged, or unsound pipe will be rejected.
- E. Copper Tube: Install with compression pack joint fittings.
- **F.** PB (Polybutylene) Pipe: Install with brass or bronze, barbed insert fittings, and 2 strap-type stainless steel clamps over pipe at each insert in accordance with manufacturer's installation instructions.
- **G.** PB (Polybutylene) Tubing: Install with brass or bronze, flared joint or compression joint fittings in accordance with manufacturer's installation instructions.
- **H.** PE (Polyethylene) Pipe and Tubing: Install with copper alloy or nylon, barbed insert fittings, and 2 strap-type stainless steel clamps over pipe at each insert in accordance with manufacturer's installation instructions.
- **I.** Depth of Cover: Provide six (6.0) feet of minimum cover over piping.
- **J.** The Owner may examine each bell and spigot end to determine whether any preformed joint has been damaged prior to installation. Any pipe having defective joint surfaces shall be rejected, marked as such and immediately removed from the job site.
- **K.** Before any joint is made, the pipe shall be checked to assure that a close joint with the next adjoining pipe has been maintained and that the inverts are matched to conform to the required grade. The pipe shall not be driven down to the grade by striking it.

L. Whenever the pipe is left unattended, temporary plugs shall be installed at all openings. Temporary plugs shall be watertight and of such design as to prevent debris, children, and animals from entering the pipe. If water accumulates in the trench, the plugs shall remain in place until the trench has been pumped out and is sufficiently dry to permit the continuance of work.

3.3 INSTALLATION OF VALVES

- **A.** General Application: Use mechanical joint end valves for 3-inch and larger buried installation. Use flanged end valves for installation in pits and inside building. Use bronze corporation stops and valves with ends compatible to piping for 2-inch and smaller installations.
- **B.** Count and record number of turns to open and close each valve; account for any discrepancies with manufacturer's data.
- **C.** AWWA-Type Gate Valves: Comply with AWWA C600. Install buried valves with stem pointing up and with cast-iron valve box.
- **D.** Bronze Corporation Stops and Curb Stops: Comply with manufacturer's installation instructions. Install buried curb stops with head pointed up and with cast-iron curb box.

3.4 INSTALLATION OF ANCHORAGES

A. Anchorages: Provide anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches.

3.5 APPLICATION OF PROTECTIVE COATINGS

A. Apply full coat of asphalt or other acceptable corrosion-retarding material to surfaces of installed ferrous anchorage devices.

3.6 INSTALLATION OF HYDRANTS

A. Install hydrants in locations shown on the plans or as directed by the Engineer. Hydrants shall be installed in accordance with the manufacturer's recommendations. Hydrant drains shall be plugged.

3.7 INSTALLATION OF VALVE PITS AND WATER METER PITS

A. Construct poured-in-place or pre-cast concrete of dimensions indicated, with manhole frame and cover, ladder, and drain. Provide sleeves with waterproof sleeve seals for pipe entry and exit.

B. Water Meter: Install water meter in accordance with AWWA M6, in meter pit, in location and with support as indicated. Provide 3-valve bypass around meter, full size of water service piping.

3.8 INSTALLATION OF IDENTIFICATION

A. Install continuous plastic underground detectable warning tape during back-filling of trench for underground water service piping. Locate approximately 18 inches above pipe, directly over centerline of piping.

3.9 <u>RECORD DRAWINGS</u>

- A. The following record drawings must be prepared by the Contractor:
 - 1. Precisely measured dimensions to all on-line gate valves.
 - 2. Precisely measured dimensions to all blow-offs.
 - 3. Precisely measured dimensions to all house service shut-offs.
 - 4. Precisely measured dimensions to all house service taps to primary mains.
 - 5. Precisely measured dimensions to all distribution piping at approximately 200-foot intervals.
 - 6. Precisely measured dimensions to any principal changes in pipe direction or size.
 - 7. Precisely measured dimensions of vertical depths of pipes and appurtenances, shown on the profiles.

3.10 CLEANING AND DISINFECTION

- A. Mains and appurtenances shall not be put in service until satisfactory disinfection and leakage testing has been performed. Testing shall be completed between main line gate valves, with a maximum length of 2,000 linear feet. Clean and disinfect water distribution piping as follows:
 - 1. Purge all new water distribution piping systems and parts of existing systems that have been altered, extended, or repaired, prior to use.
 - 2. Use the purging and disinfecting procedure prescribed by the authority having jurisdiction or, in case a method is not prescribed by that authority, use the procedure described in AWWA C651-14, or as described below:
 - a. Fill the system or part thereof with a water/chlorine solution containing at least 50 parts per million of chlorine.
 - b. Isolate (valve off) the system or part thereof and allow to stand for 24 hours. At the end of the 24 hour period, the treated water in all portions shall contain a residual of not less than 10 mg/l free chlorine.
 - c. Operate all gate valves within the test section to disinfect.
 - d. Following the allowed standing time, flush the system with clean, potable water from the system in accordance with AWWA C651-14.

- e. Submit water samples to a laboratory approved by the Engineer for bacteriological analysis in accordance with AWWA C651-14.
- **B.** Furnish copies of laboratory test results to the Engineer for review prior to placing the mains in service.
- **C.** Heterotrophic plate count (HPC) testing may be required at the discretion of the Owner.
- **D.** The Contractor is responsible for all costs associated with disinfection and testing, including any and all costs for re-chlorination and re-testing necessary due to failed tests.
- **E.** After a failed disinfection test, the Contractor shall flush, re-chlorinate, and re-test the main until such time as a satisfactory test result is obtained.

3.11 HYDROSTATIC TESTING

- A. The Contractor shall notify the Engineer and the Owner at least 48 hours in advance of beginning testing or disinfection. The Contractor shall utilize the services of a certified subcontractor to perform hydrostatic, conductivity, and other tests on the completed water main in accordance with AWWA C600-17 Specifications. This third-party will provide a certified report to the Owner and Engineer. The Contractor may assist the subcontractor and furnish all necessary equipment.
- **B.** The pipe shall be subjected to hydrostatic pressure of one (1) and one-half (1-1/2) times the design pressure (at least 100 psi) at the lowest elevation of the test section, and this pressure maintained for at least two hours. The test pressure shall not exceed the thrust restraint design pressures or 1.5 times the pressure rating of the pipe or joint, whichever is less (as specified by the manufacturer).
- **C.** The leakage test shall be conducted at a pressure as determined by the Engineer and this pressure shall be maintained for at least 120 minutes during the test. The amount of leakage which will be permitted shall be in accordance with the Specifications for Installation of Water Mains by AWWA C600. For flanged joints, no leakage shall be allowed. The allowable rate of leakage shall be less than the number of gallons per hour determined by the following formula:

$$L= \frac{SD(P)^{1/2}}{133,200}$$

- L= Allowable leakage in gallons per hour
- S= Length of pipe tested, feet
- D= Nominal diameter of the pipe in inches
- P= Average test pressure maintained during the leakage test in pounds per square inch gauge

The testing procedure shall include the continued application of the specified pressure to the test system for the two-hour period by way of a pump taking supply from a container suitable for measuring water loss. The amount of loss shall be determined by measuring the volume displaced from said container. When hydrants are in the test section, the test shall be made against the main valve in the hydrant.

- **C.** Any exposed pipe, fittings, valves, hydrants, and joints shall be examined during the test. Any damaged or defective pipe fittings, valves, or hydrants that are discovered following the pressure test shall be repaired or replaced with sound material, and all tests shall be repeated.
- **D.** The pressure shall not vary by more than ± 5 psi from the required pressure for the duration of the test. If at any point during the test the pressure loss exceeds 5 psi, the test is considered failed. Should the test fail, the Contractor shall accomplish necessary repairs and the test repeated until within the established limits.
- **E.** Tests to be made only after partial or complete backfilling of trenches. Position of valves (fully opened or closed) in section of line to be tested shall be checked in the presence of the Engineer to ensure that:
 - 1. All hydrant branch connections are open to the hydrant (hydrant closed, branch connection valve open).
 - 2. All main line valves are properly positioned for section of line being tested.
- **F.** Tests not to be performed for at least seven (7) days after last concrete block or anchor has been cast.
- **G.** Expel air from pipelines, fittings and appurtenances prior to performing tests. If permanent air vents are not located at all high points, the Contractor shall install corporation stops at his expense at such points so that the air can be expelled as the line is filled with water. These stops shall be protected with a masonry bridge to prevent breakage during backfilling.
- **H.** Examination under pressure: All exposed valves, hydrants and joints shall be examined carefully during the hydrostatic and leakage tests.
- I. Evaluation of Results/Corrective Actions:
 - 1. Examination of leakage: If any leakage test of section of the system discloses a leakage greater than that specified herein, the Contractor shall, at his own expense, locate and repair or replace the defective or damaged materials. He shall then repeat the entire test and make additional repair and test and continue to repeat until the leakage is within specified allowance.

2. All visible leaks are to be repaired by the Contractor, at his own expense, regardless of the amount of leakage.

End of Section

SECTION 33 14 43

PACKAGED PUMPING SYSTEMS FOR WATER UTILITY SERVICE

PART 1 – GENERAL

1.1 SUMMARY

A. Work under this section includes, but is not limited to furnishing and installing a factory built booster pumping system as indicated on the project drawings, as specified herein, and with all ancillary items and equipment necessary to provide a complete functioning system.

1.2 SUBMITTALS

- A. General: Provide submittals in accordance with Specification 01 30 00.
 - 1. Submittals shall provide dimensioned layout of mechanical equipment, anchor bolt locations, pipe penetrations, and maintenance access clearances.
 - 2. Submittals shall provide pump performance or equipment headloss curves and data, marked to indicate the operating limits recommended for stable operation between which the equipment may be operated without surge, cavitation, or vibration. The performance curves shall indicate each specified operation point showing head, power, efficiency, and NPSH required on the ordinate plotted against capacity on the abscissa. The performance curves shall indicate performance over the entire operating range of the pump from shutoff to maximum capacity for full and reduced speeds.
- **B.** Provide operations and maintenance manuals in accordance with Specification 01 78 23.
 - 1. Operation and maintenance instructions must be specific to equipment supplied in accordance with these specifications.
 - 2. Manuals shall be in accordance with written instructions provided by the pump system manufacturer. Comprehensive instructions supplied at time of shipment shall enable personnel to properly operate and maintain all equipment supplied. Content and instructions shall assume operating personnel are familiar with pumps, motors, piping and valves, but lack experience on exact equipment supplied.
 - 3. Documentation shall be specific to the system supplied and collated in functional sections. Each section shall combine to form a complete system manual covering all aspects of equipment supplied by the system manufacturer. Support data for any equipment supplied by others, even if mounted or included in overall system design, shall be provided by those supplying the equipment. Instructions shall include the following as a minimum:
 - a. Functional description of each major component, complete with operating instructions.

- b. Instructions for operating pumps and pump controls in all modes of operation.
- c. Calibration and adjustment of equipment for initial start-up or as required for routine maintenance.
- 3. Support data for commercially available components not produced by the system manufacturer, but supplied in accordance with the specifications, shall be supported by literature from the prime manufacturer and incorporated as appendices.
- 4. Electrical schematic diagram of the pump system circuits. Schematics shall illustrate, to the extent of authorized repair, pump motor branch, control, and alarm system circuits including interconnections. Wire numbers and legend symbols shall be shown. Schematic diagrams for individual components, not normally repairable by the system operator, need not be included. Details for such parts shall not be substituted for an overall system schematic.
- 5. Mechanical layout drawing of the pump system and components, prepared in accordance with good commercial practice, shall provide installation dimensions and location of all pumps, motors, valves, and piping.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications
 - 1. The manufacturer shall be one who has been regularly engaged for at least the past 5 years in the manufacture of equipment of the size and type specified herein and specifically for the specified intended use.
 - 2. Upon request from the Engineer, the pump system manufacturer shall prove financial stability and ability to produce the system within the specified delivery schedules. Evidence of facilities, equipment and expertise shall demonstrate the manufacturer's commitment to long term customer service and product support.
- **B.** Service Conditions
 - 1. The equipment specified herein will be used to pressurize potable water from a storage tank for distribution to a residential community.
 - 2. The equipment will be installed indoors in a new pump station building.
 - 3. The equipment shall be designed for continuous (24-hours per day) service.
- **C.** Manufacturer's Start-up Services: The manufacturer's technical representative shall inspect the completed installation, correct or supervise the correction of any defect or malfunction, and instruct operating personnel in the proper operation and maintenance of the equipment as described in Part 3 of this section.

1.4 MANUFACTURER'S WARRANTY

A. All components of the pump systems shall be manufactured, assembled and tested as a unit by a single supplier. The systems must be a standard catalog item with the manufacturer. The supplier must assume system responsibility. The complete pump

system assembly must be warranted by the manufacturer. Individual component warranties are desirable. However, individual warranties honored solely by the manufacturer of each pump system component will not be acceptable.

B. The pump system manufacturer shall warrant all equipment to be of quality construction, free of defects in material and workmanship.

PART 2 – PRODUCTS

2.1 GENERAL

- A. The booster pumping system has been designed based on two pumps, each with a variable frequency drive, and a hydropneumatic bladder type ASME certified water storage tank minimum 130-gallon capacity to prevent excessive pump cycling at low flows. The hydropneumatic storage tank shall be connected to the discharge piping and shall be separate from the booster system skid. Pump systems that use pump control valves or pressure reducing valves to maintain a constant water pressure shall not be considered equal. The system shall maintain a constant discharge water pressure of 60 psi (138 feet) at 65 gpm using one of the two pumps. The second pump will serve as a backup and alternate to distribute wear between the two pumps. Minimum suction pressure = 0.5 psi.
- **B.** The booster pumping system shall be a standard product factory built by a single manufacturer. Non-standard, "one of a kind" packaged pump systems shall not be considered equal. The manufacturer shall provide all components of the system to enhance compatibility, ease of construction, and efficient maintenance. The manufacturer shall coordinate selection and design of all system components such that all equipment is compatible and operates properly to achieve the specified performance requirements.
- **C.** The complete packaged water booster pump system shall be certified and listed by UL for conformance to U.S. standards. Systems that have only the sub-assemblies certified and listed by UL for conformance to U.S. standards and/or UR recognized components shall not be considered equal.

2.2 MANUFACTURER

- A. The Specifications and project Drawings depict equipment and materials which are deemed most suitable for the service anticipated. They are not intended, however, to eliminate other products of equal quality and performance. The Contractor shall prepare its bid based on the specified equipment for purposes of determining low bid. Award of a contract shall constitute an obligation to furnish the specified equipment and materials.
- **B.** After execution of the contract, the Contractor may offer substitutions to the specified equipment for consideration. The equipment proposed for substitution must be equal in

construction and performance to that specified in the contract, and quality must be demonstrated by a list of current users of the proposed equipment in similar installations.

- **C.** In event the Contractor obtains Engineer's approval for equipment substitution, the Contractor shall, at its own expense, make all resulting changes to the enclosures, buildings, piping or electrical systems as required to accommodate the proposed equipment. Revised detail drawings illustrating the substituted equipment shall be submitted to the Engineer prior to acceptance.
- **D.** It will be assumed that if the cost to the Contractor is less for the proposed substitution, then the contract price shall be reduced by an amount equal to the savings.
- **E.** Reference to a manufacturer's name and model number or catalog number is for the purpose of establishing the standard of quality and general configuration desired. Acceptable manufacturers include Armstrong Fluid Technology Company 6800 Series, QuantumFlo Inc. Genius V3, SyncroFlo Inc. SFIM3-3P140-VMS70, or approved equal.

2.3 <u>PUMP DESIGN</u>

- **A.** The pumps shall be Grunfos Model CR10-5, 5 HP, 230 volt, 3 phase, 60 hertz or approved equal.
- **B.** The pumps shall be vertical multi-stage centrifugal design. The materials of construction shall be as follows:

Pump casing = Cast Iron Impeller = 304 stainless steel, fully enclosed type Pump shaft = Stainless steel Mechanical seal = Carbon rotating face, silicon carbide stationary seat, FPM secondary seal Headers, base, and panel support = 304 stainless steel Nuts and bolts = 304 stainless steel

- **C.** The entire packaged pumping system shall be mounted on a 304 stainless steel fabricated skid.
- **D.** The suction and discharge manifolds shall be designed to attach to the system piping at either end of the manifold. Each manifold shall include a liquid filled pressure gauge. The suction manifold shall have as standard a pressure switch or pressure sensor to detect low suction pressure. The discharge manifold shall include a stainless steel pressure transducer with a 4-20 mA output. The pressure transducer shall be factory installed and wired.
- **E.** Isolation valves shall be installed on the suction and discharge of each pump. A check valve shall be installed on the discharge of each pump.
- **F.** All systems shall be factory tested for performance and hydrostatic tested to 300 psi.

2.4 <u>MOTORS</u>

- A. Motors shall be 5 hp, 3 phase, 230 V, 60 Hz, NEMA premium efficiency, rated for inverter duty. The motors shall operate with a minimum service factor of 1.15. Drive-end motor bearings shall be designed to absorb thrust and shall be adequately sized to ensure long motor life. The motor shall be rated for operation in a 40 degree C ambient temperature.
- **B.** The motor and integrated variable frequency drive shall be designed and built by a single manufacturer. The integrated motor/variable frequency drive combination shall be capable of operating the pump at varying RPMs to maintain the system design pressure with varying flows from 0 gpm to the design flow rate. The variable frequency drive enclosure shall include a PI controller and dry contact fault output relay contacts along with analog and digital inputs. The motor shall detect and protect itself against under voltage, over voltage, excessive temperature, excessive phase shift and set-point signal fault. The motor/drive enclosure shall be rated IP55 and 95% relative humidity. The motor windings shall be class F rated.

2.5 ELECTRICAL CONTROL COMPONENTS

- A. The system controller shall operate the pumps to maintain the design pressure while using minimum energy and alternating between pumps to maintain relatively equal pump operating hours. Pumps will changeover automatically to maintain the system pressure depending on demand, time, and fault. When water demand is zero, the system shall shut off. If the system runs continuously, the lead pump shall alternate every 24 hours. The controller shall accept a low-suction pressure or other suction fault input to shut down the system. The controller shall have a keypad and minimum 7-inch LCD color display screen. System functions will be programmable through the keypad or touchscreen interface. The programmable functions and information shall include, but not be limited to:
 - 1. Pump status
 - 2. Elapsed running hours for each pump
 - 3. Discharge pressure setpoint
 - 4. Actual discharge pressure
 - 5. Pump speed (percent)
 - 6. Pump minimum and maximum speed (percent)
 - 7. System faults
 - 8. On-screen alarms for the following:
 - a. Low and high system pressure shutdown
 - b. Low suction pressure or level shutdown
 - c. Pump failure
 - d. Drive fault
 - e. Suction and discharge pressure sensor failures

- 9. Pressure transducer design settings
- 10. Pump priority
- 11. Current pump rotation order
- 12. High and low discharge pressure shutdown limits
- 13. Low suction pressure shutdown limit
- 14. Analog input for remote setpoint control
- 15. Digital input for remote stop/start
- 16. Clock program (multiple setpoints)
- **B.** The controller shall include non-volatile factory set parameters must be capable of being restored at any time in the field without requiring any programming device or connection to an external source.
- **C.** The controller shall store software in FLASH memory storage which prevents accidental loss of data due to voltage surge or spike.
- **D.** All controls to be factory pre-wired and tested in accordance with provisions of the national electrical code. All control wires shall be individually numbered and each component shall be labelled accordingly. All internal wiring shall be copper stranded A.W.G. with a minimum 90°F rating.
- **E.** The controller shall be mounted in a control cabinet with a NEMA 1 enclosure with the keypad and display screen mounted through the outer door. The control cabinet assembly shall be UL 508 listed. In addition to the electronic pump controller, the control cabinet shall include circuit breakers for each pump and the control circuit and control relays for alarm functions. Control cabinet options shall include, but not be limited to:
 - 1. Dry run protection
 - 2. Lightning protection
 - 3. Sequential startup of the lead and lag booster pumps in the event of a power outage so as to not overload the emergency generator
 - 4. Digital alarm output

PART 3 – EXECUTION

3.1 EXAMINATION

A. Contractor shall deliver and offload equipment at installation site using equipment of sufficient size and design to prevent injury or damage. Immediately after off-loading, Contractor shall inspect the complete pump system and appurtenances for shipping damage or missing parts. Any damage or discrepancy shall be noted in written claim with shipper prior to accepting delivery. Validate all serial numbers and parts lists with shipping documentation. Notify the manufacturer's representative of any unacceptable conditions noted with shipper.

3.2 INSTALLATION

- **A.** Install, level, align, and lubricate pump system as indicated on project drawings. Installation must be in accordance with written instructions supplied by the manufacturer at time of delivery.
- **B.** Check motor and control data plates for compatibility to site voltage. Install and test the system ground prior to connecting line voltage to the system's control panel.
- **C.** Prior to applying electrical power to any motors or control equipment, check all wiring for tight connection. Verify that protective devices (fuses and circuit breakers) conform to project design documents. Manually operate circuit breakers and switches to ensure operation without binding. Open all circuit breakers and disconnects before connecting utility power. Verify line voltage, phase sequence and ground before actual start-up.

3.3 FIELD QUALITY CONTROL

- A. Operational Test
 - 1. Lubricate before operating as per manufacturer's recommendations.
 - 2. Prior to acceptance by Owner, an operational test of all pumps, drives, and control systems shall be conducted to determine if the installed equipment meets the purpose and intent of the specifications. Tests shall demonstrate that all equipment is electrically, mechanically, structurally, and otherwise acceptable; it is safe and in optimum working condition; and conforms to the specified operating characteristics.
 - 3. Observe and record operation of pumps, suction and discharge gage readings, ampere draw, and pump controls. Check calibration of all instrumentation and test manual and automatic control systems. Address any undue noise, vibration, or other operational problems.
- **B.** Manufacturer's Start-up Services. Coordinate equipment start-up with manufacturer's authorized technical representative or factory service technician. The representative or technician will inspect the completed installation, calibrate and adjust instrumentation, correct or supervise correction of defects or malfunctions, and instruct operating personnel in proper operation and maintenance procedures.

3.4 <u>CLEANING</u>

A. Prior to acceptance, inspect the equipment for dirt, splashed material, or damaged paint. Clean or repair accordingly. Remove from the job site all tools, surplus materials, scrap, and debris.

3.5 PROTECTION

A. The pump system should be placed into service immediately. If operation is delayed, drain water from pumps and piping. Open motor circuit breakers and protect system controls and interior equipment from cold and moisture.

End of Section

SECTION 33 31 13

SANITARY SEWERS, MANHOLES, and APPURTENANCES – NH

PART 1 – GENERAL

1.1 SUMMARY

- **A.** This Section includes the following:
 - 1. Furnishing and installing sanitary sewers
 - 2. Furnishing and installing building sewer service laterals
 - 3. Furnishing and installing pre-cast concrete manholes
 - 4. Furnishing and installing manhole frames and covers
 - 5. Miscellaneous sewerage system appurtenances
 - 6. Testing

1.2 SUBMITTALS

- A. General: Provide submittals in accordance with Specification 01 30 00.
 - 1. Name, address and telephone number of suppliers of all manufactured products.
 - 2. Product data containing information and instructions relating to the storage, handling, installation, and inspection of furnished pipe, fittings and appurtenances.
 - 3. Pipe and fitting manufacturers' Certificate of Compliance with specified standards and tests for each lot of pipe and fittings supplied. Immediately turn certificates over to Engineer. Materials delivered to the job site without accompanying certificates will be subject to rejection.
 - 4. Shop drawings and technical data for pre-cast concrete sanitary manholes, including frames and covers, pipe penetration and wall joint sealing systems, and water proof coatings.
 - 5. Certified copy of all leakage tests including all failures and retests.

1.3 **QUALITY ASSURANCE**

A. Pipe and fittings shall be produced in a plant of recognized reputation that is regularly engaged in the production of pipe conforming to the specified standards. Pipe and pipe fittings of the same type shall be the product of a single manufacturer.

- **B.** All pre-cast concrete manhole sections and all castings shall be the product of a single manufacturer who can furnish evidence of satisfactory experience in the production of high quality products of the type indicated and specified.
- **C.** Provide at least one skilled mason who shall be present at all times during the installation of inverts, shelves and chimneys and who shall personally direct the masonry work performed under this Section.
- **D.** Comply with applicable regulations and standards of all local, state, and federal regulatory authorities having jurisdiction.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Carefully handle all pipes and fittings when loading and unloading. Lift pipes by hoists or lower on skid-ways in manner to avoid shock. Lower pipe into trench with suitable equipment as recommended by manufacturer. Do not dump or drop pipe or fittings. Those that are dumped or dropped are subject to rejection by Engineer.
- **B.** Each length of pipe delivered to the job site shall be clearly marked with the name of the manufacturer, class of pipe and pipe diameter. Store in accordance with manufacturer's recommendations.
- **C.** Pre-cast manhole sections shall not be shipped until the concrete has attained a compressive strength of 3,000 psi or until 5 days after fabrication, whichever is longer.
- **D.** All pre-cast manhole sections shall be lifted and moved by use of suitable lifting slings, plugs, and holes so as not to damage ship-lap joints or edges.
- **E.** All materials found at anytime during the work to be defective will be rejected, marked and promptly removed from the job site.

1.5 PROJECT CONDITIONS

- **A.** Verify existing utility and connection locations and elevations. Affirm that sewerage system piping may be installed in compliance with original design and referenced standards. Immediately notify the Engineer of any conflicts which may require design modifications and do not initiate or resume construction until such conflicts have been resolved.
 - 1. Locate existing sanitary sewerage system piping and structures that are to be abandoned and closed.

1.6 SEQUENCING AND SCHEDULING

- **A.** Coordinate construction schedule, service interruptions, traffic control, leakage testing and project start-up with Owner, Engineer and regulatory authorities having jurisdiction.
- **B.** Coordinate building sewer service lateral construction with interior building sanitary sewerage piping.
- **C.** Coordinate with other utility work.

PART 2 – PRODUCTS

2.1 <u>PIPE AND FITTINGS</u>

- A. General: Provide pipe and pipe fitting materials compatible with each other.
- B. Ductile-Iron Pressure Pipe: AWWA C151, Class 52, for push-on joints.
 - 1. Lining: AWWA C104, cement lining.
 - 2. Gaskets: AWWA C 111, rubber.
 - 3. Ductile-Iron Fittings: AWWA C110, ductile-iron, or AWWA C153, ductile-iron compact fittings.
 - a. Lining: AWWA C104, cement lining.
 - b. Gaskets: AWWA C111, rubber.
- C. PVC (Polyvinyl Chloride) Sewer Pipe and Fittings:
 - 1. Gravity Sewer ASTM D3034, SDR 35, elastomeric gasket joints. Gaskets to meet ASTM F477, elastomeric seal.
 - 2. Force Main (Pressure) Sewer ASTM D2241 or ASTM D1785, SDR 26, elastomeric gasket joints.
- **D.** Non-pressure Couplings: Rubber or elastomeric sleeve and stainless steel band assembly fabricated to match outside diameters of pipes to be joined.
 - 1. Sleeves: ASTM C 425, rubber for vitrified clay pipe; ASTM C 443, rubber for concrete pipe; ASTM C 564, rubber for cast-iron soil pipe; and ASTM F 477, elastomeric seal for plastic pipe. Sleeves for dissimilar or other pipe materials shall be compatible with pipe materials being joined.
 - 2. Bands: Stainless steel, one at each pipe insert.

- **E.** Non-pressure Joint Seals: Rubber or elastomeric compression gasket, made to match pipe inside diameter or hub, and adjoining pipe outside diameter.
 - 1. Gaskets: ASTM C 425, rubber for vitrified clay pipe; ASTM C 443, rubber for concrete pipe; ASTM C 564, rubber for cast-iron soil pipe; and ASTM F 477, elastomeric seal for plastic pipe. Gaskets for dissimilar or other pipe materials shall be compatible with pipe materials being joined.

2.2 MANHOLES

- **A.** Precast Concrete Manholes: ASTM C 478, pre-cast reinforced H-20 loading rated concrete, of depth indicated with provision for rubber gasket joints.
 - 1. Base Section: 6-inch minimum floor thickness and 5-inch minimum thickness for walls and base riser section, and having a base section with integral floor.
 - 2. Riser Sections: 5-inch minimum thickness; 48-inch minimum diameter, and barrel heights to provide depth indicated.
 - 3. Top Section: Eccentric cone type, unless concentric cone or flat-slab-top type is indicated.
 - 4. Horizontal Joint Sealant: Double row, Bitumastic.
 - 5. Pipe Connectors: Lock-Joint Flexible Manhole Sleeve or Kor-N-Seal Joint Sleeve, for each pipe connecting to base section.
 - 6. Inverts and Shelves: Brick paved.
 - 7. Mortar and Parging: ASTM C 270, Type S, using ASTM C 150, Type II Portland cement.
 - 8. Bricks: Bricks for shelves, inverts, and grade adjustment shall conform to Env-Wq 704.13 (a) (9), Grade SS hard brick. No more than five (5) brick courses shall be allowed for grade adjustment.
 - 9. Manhole Mortar: Mortar for pointing and sealing manholes shall conform to Env-Wq 704.13 (c).
 - 10. All manholes shall be water proofed, at the factory, with two seal coats applied to the exterior of the manhole in accordance with the seal coating manufacturer's recommendations. Water proofing shall be masonry seal MSP-1 waterproofing material as made by the Masonry Seal Foundation, 7500 West Ridge Road,

Elyria, Ohio, or Foundation Coating 47-461 as made by TNEMEC. Exterior of all joints shall be coated with waterproofing after setting.

- **B.** Reinforcement: Steel conforming to the following:
 - 1. Fabric: ASTM A 185, welded wire fabric, plain.
 - 2. Reinforcement Bars: ASTM A 615, Grade 60, deformed.
- C. Precast Concrete Structure Steps: Manholes shall not be provided with steps. Steps for other structures, if required shall be as follows: Stainless steel or plastic covered steel or plastic shaped so they cannot be pulled out of the concrete wall in which they are secured. All steps shall meet the requirements of ASTM C478 for load carrying capacity and pullout resistance and steps shall not be secured with mortar. The steps shall have a drop section or raised abutments to prevent sideways slippage off the step, the foot contact surface shall have non-skid safety serrations and steps shall be approximately 14" X 10".
- **D.** Manhole Frames and Covers: ASTM A 48, Grade 30, heavy-duty, grey cast iron, H-20 loading rated, 30-inch minimum clear opening, 6-inch minimum riser with 4-inch minimum width flange, and 31-3/4-inch diameter cover, indented top design, with 3-inch lettering "SANITARY SEWER" cast into cover, coal tar epoxy coated.
 - 1. Standard Frame and Cover: Quality Water Products, Style 30, or equivalent.
 - 2. Water-Tight Frame and Cover: Quality Water Products Style C-47 WT.

2.3 **IDENTIFICATION**

A. Metallic-Lined Plastic Underground Warning Tapes: Polyethylene plastic tape with metallic core, 6 inches wide by 4 mils thick, solid green in color with continuously printed caption in black letters "CAUTION - SEWER LINE BURIED BELOW."

PART 3 – EXECUTION

3.1 <u>PREPARATION OF FOUNDATION FOR BURIED SANITARY SEWERAGE</u> <u>SYSTEMS</u>

- **A.** Grade trench subgrade to provide a smooth, firm, stable, and rock-free foundation, throughout the length of the pipe.
- **B.** Remove unstable, soft, and unsuitable materials below subgrade to depth directed by Engineer. Refill to subgrade with course gradation crushed stone or screened gravel.

C. Place stone bedding and shape bottom of trench to fit bottom of pipe. Dig bell holes at each pipe joint to relieve the bells of all loads and to ensure continuous bearing of the pipe barrel on the bedding.

3.2 PIPE APPLICATIONS FOR UNDERGROUND SANITARY SEWERS

- **A.** Gravity Sewers: PVC SDR 35 sewer pipe and fittings or DI Class 52 pressure pipe and fittings, materials and sizes as indicated on plan profile drawings.
- **B.** Building Sewer Service Laterals: PVC SDR 35 sewer pipe and fittings, 4-inch minimum diameter.

3.3 INSTALLATION - GENERAL

- **A.** General Locations and Arrangements: Drawings (plans and details) indicate the general location and arrangement of the underground sanitary sewerage system piping. Location and arrangement of piping layout take into account many design considerations. Install the piping as indicated, to the extent practical.
- **B.** Install piping beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Place stone haunching and chink pipe to grade. Install gaskets, seals, sleeves, and couplings in accordance with manufacturer's recommendations for use of lubricants, cements, and other installation requirements. Place and compact initial backfill and suitable backfill materials as indicated in "Section 31 23 16 Earthwork".
- **C.** Use manholes for changes in direction and at all main intersections. Use wye or tee fittings for branch connections, except where direct tap into existing sewer is indicated.
- **D.** Use proper size increasers, reducers, and couplings, where different size or material of pipes and fittings are connected. Reduction of the size of piping in the direction of flow is prohibited.
- **E.** When installing below pavement sewers at depths less than 6-feet or cross-country sewers less than 4-feet, install 2-inch thick extruded polystyrene insulation 6 inches over piping. Width of insulation shall be a minimum of 24 inches, centered on the centerline of pipe. Joints between sheets shall be covered with a 12-inch long sheet of insulation, centered on the joint. Any variation from the minimum depth requirements (six feet under pavement or four feet under cross country areas) must be granted a waiver prior to construction in accordance with the requirements of Env-Wq 716.02.
- **F.** Install building sewer service laterals, of sizes and in locations indicated or directed. Plug service at street right-of-way, connect to existing building sewer or terminate or connect to

building sanitary drains at a point 5 feet beyond foundation exterior wall, as indicated or directed.

- **G.** When installing building sewer service laterals at depths less than 3 feet, install 1-inch-thick extruded polystyrene over piping. Width of insulation shall extend minimum of 12 inches beyond each side of pipe. Install directly over and center on pipe center line.
- **H.** Tunneling: Install pipe under streets or other obstructions that cannot be disturbed, by tunneling, jacking, or a combination of both.

3.4 PIPE JOINT CONSTRUCTION AND INSTALLATION

- **A.** Join and install ductile-iron pipe with ductile-iron push-on joint fittings and rubber gaskets in accordance with AWWA C600.
- **B.** Join and install PVC pipe as follows:
 - 1. Pipe and gasketed fittings, joining with elastomeric seals in accordance with ASTM D 3212.
 - 2. Installation in accordance with ASTM D 2321.
- **C.** Join different types of pipe with standard manufactured couplings and fittings intended for that purpose.

3.5 MANHOLES

- **A.** General: Install manholes complete with accessories as indicated. Utilize overlapping joint type for pre-cast concrete construction. Construct continuous brick paved inverts and shelves between inlets and outlet. Set tops of frames and covers flush with finish surface where manholes occur in pavements. Elsewhere, set tops 3 inches above finish surface, unless otherwise indicated.
- **B.** Place pre-cast concrete manhole sections as indicated, and install in accordance with ASTM C 891.
- C. Provide a double row of bitumastic joint sealant at horizontal wall section joints.
- **D.** Apply bituminous mastic coating at joints of sections.

3.6 INSTALLATION OF IDENTIFICATION

A. Install continuous plastic metallic lined underground warning tape during back-filling of trench for underground water service piping. Locate 2-feet above pipe crown and centered on pipe.

3.7 FIELD QUALITY CONTROL

- A. Perform testing of sewer system in accordance with local authorities having jurisdiction.
- **B.** Gravity Sewer Testing: All new gravity sewers shall be tested for water tightness by the use of low-pressure air tests. The Engineer shall observe all testing. Low-pressure air testing shall be in conformance with ASTM F 1417-92 (2005) "Standard Test Methods for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air"; or Uni-Bell PVC Pipe Association Uni-B-6, "Low–Pressure Air Testing of Installed Sewer Pipe" (1998). All new gravity sewer pipes shall be cleaned and visually inspected using a lamp and shall be true to line and grade following installation and prior to use. All new gravity sewer pipe shall be deflection tested not less than 30 days nor more than 90 days following installation. The maximum allowable deflection of flexible sewer pipe shall be 5% percent of average inside diameter. A rigid ball or mandrel with a diameter of at least 95% of the average inside pipe diameter shall be used for testing pipe deflection. The deflection test shall be used for testing pipe deflection. The deflection test shall be used for testing pipe deflection. The deflection test shall be used for testing pipe deflection. The deflection test shall be reinstalled to attain satisfactory results.
- **C.** Force Main and Low Pressure Sewer Testing: Force mains shall be tested in accordance with Section 5 of AWWA C600-10 "Installation of Cast Iron Water Mains and Their Appurtenances", at a pressure equal to the greater of 150 percent of the design operating total dynamic head or at least 100 psi. The Engineer shall observe all testing.
- **D.** Manhole Testing

(a) Manholes shall be tested for leakage using a vacuum test in accordance with the ASTM C1244 standard in effect when the testing is performed. A manhole may be backfilled prior to performing a vacuum test, but if the manhole fails the vacuum test, backfill shall be removed so repairs to the manhole can be made from the outside of the manhole prior to retesting.

(b) The manhole vacuum test shall conform to the following:

(1) The initial vacuum gauge test pressure shall be 10 inches Hg; and

(2) The minimum acceptable test hold time for a 1-inch Hg pressure drop to 9 inches Hg shall be:

a. Not less than 2 minutes for manholes less than 10 feet deep in depth;

b. Not less than 2.5 minutes for manholes 10 to 15 feet deep; and

c. Not less than 3 minutes for manholes more than 15 feet deep;

(c) The manhole shall be repaired and retested if the test hold times fail to achieve the acceptance limits specified in (b), above.

(d) Inverts and shelves shall not be installed until after successful testing is completed.

(e) Immediately following completion of the leakage test, the frame and cover shall be placed on the top of the manhole or some other means used to prevent accidental entry by unauthorized persons, children, or animals, until the contractor is ready to make final adjustment to grade.

- 1. Cleaning: Clear interior of piping and structures of dirt and other superfluous material as work progresses. Place plugs in ends of uncompleted pipe at end of day or whenever work stops.
- 2. Flush piping between manholes, if required by local authority, to remove collected debris.
- **E.** Interior Inspection: Inspect piping to determine whether line displacement or other damage has occurred.
 - 1. Make inspections after pipe between manholes and manhole locations has been installed and approximately 2 feet of backfill is in place, and again at completion of project.
 - 2. If inspection indicates poor alignment, debris, displaced pipe, infiltration or other defects correct such defects, and re-inspect.

3.8 **PROTECTION OF WATER SUPPLIES**

- A. There shall be no physical connection between a public or private potable water supply system and a sewer or sewer appurtenance which would permit the passage of sewage or polluted water into the potable supply. No water pipe shall pass through or come in contact with any part of a sewer or sewer manhole.
- **B.** No sewer shall be located within the well protective radii established in Env-Ws 300 for any public water supply wells or within 100 feet of any private water supply well.
- **C.** Sewers shall be located at least 10 feet horizontally from any existing or proposed water main.
- **D.** A deviation from the separation requirements of B or C above shall be allowed where necessary to avoid conflict with subsurface structures, utility chambers and building foundations, provided that the sewer is constructed in accordance with the force main construction requirements specified in Env-Wq 704.06.
- **E.** Whenever sewers must cross water mains, the sewer shall be constructed as follows:
 - 1. Vertical separation of the sewer and water main shall be not less than 18 inches, with the water above sewer; and,
 - 2. Sewer joints shall be located at least 6 feet horizontally from the water main.

END OF SECTION

SECTION 40 05 97

IDENTIFICATION FOR PROCESS EQUIPMENT, PIPING, AND VALVES

PART 1 – GENERAL

1.1 SCOPE OF WORK

A. This section specifies labeling and tagging for the identification of exposed piping and valves.

PART 2 – PRODUCTS

2.1 IDENTIFICATION OF PIPING

- A. All piping shall be identified by the service or fluid inside and with direction of flow indicated by an arrow.
- B. Pipe labels shall be manufactured and applied in one continuous length of plastic with pressure sensitive legends applied to plastic backing. Adhesive applied markers and markers made of individual letters are prohibited. Pipe markers shall meet the following criteria:
 - 1. Strapped or otherwise mechanically attached to pipe conforming to ANSI/ ASME A13.1.
 - 2. Resistant to petroleum, oil, and grease.
 - 3. Resistant to humidity, solar radiation, rain, salt, and fungus per MIL-STD-810C.
 - 4. Continuous operating temperature range of minus 40 to 180 degrees F.
 - 5. Include uni- and bi-directional arrows in the same size as legends.
 - 6. Lettering, colors for lettering and background shall conform to ANSI A13.1 and the following schedule:

Outside Diameter of Pipe (inches)	Pipe Label Length (inches)	Letter Height (inches)
Less than $1-1/2$	8	1/2
1-1/2 through 2	8	3/4
2-1/2 through 6	12	1-1/4
8 through 10	24	2-1/2
Greater than 10	32	3-1/2

Pipe Label Size Schedule

C. Identifying devices for valves and sections of pipe that are too short to be identified by labels and arrows shall be identified with metal or plastic tags attached to the valves or short pipes or to the structure immediately adjacent to a valve or short pipe.

- 1. Metal tags shall be stainless steel with embossed lettering.
- 2. Plastic tags shall be of solid black plastic laminate with white embossed letters.
- 3. Wording on valve tags shall describe the exact function of the valve, e.g., "SHC TANK FILL".
- D. Manufacturer: Brady Corporation, Seton Nameplate Corporation, or approved equal.

PART 3 – EXECUTION

3.1 GENERAL

- A. Install identification labels and tags on all piping exposed or concealed in accessible spaces.
- B. Pipe labels should be positioned so that they are readily visible from all normal working locations and can be easily seen from the normal angle of approach—for instance, below the centerline of the pipe if the pipe is overhead, and above the centerline if the pipe is below eye level.
- C. Each pipe shall be identified at intervals not exceeding 20 feet and at least one time in each room.
- D. Pipe labels should generally be placed:
 - 1. Adjacent to all valves
 - 2. Adjacent to all changes of direction
 - 3. On both sides of wall or floor penetrations
 - 4. At regular intervals on straight runs

3.2 INSTALLATION

- A. Markers and identification tags shall be installed in accordance with the manufacturer's printed instructions and shall be neat and uniform in appearance.
- B. Valve tags shall be permanently attached to the valve or structure by two stainless steel bolts or screws.

End of Section
SECTION 40 23 00

WATER PROCESS PIPING, VALVES, AND ACCESSORIES

PART 1 – GENERAL

1.1 SUMMARY

- **A.** Furnish all labor, materials, equipment and incidentals required to install and test pipe, fittings, and accessories complete as shown on the Drawings and as specified herein.
- **B.** This Specification includes all interior piping, piping under structures, and buried piping within 5 feet of a building or vault exterior wall. Also included are pressure gauges, small valves, hose bibs, and floor drains.
- C. The mechanical details on the Drawings are diagrammatic in character and exact locations of the elements of the system, the measurement or cutting and installing pipe, and dimensions of the equipment, shall be determined based on the structure and equipment installed. Space requirements and locations of connections of equipment the Contractor proposes to furnish shall be investigated by him prior to ordering. The Contractor shall not scale off the Drawings to cut pipe or make connections to equipment selected. Equipment which will not enter the final, finished openings or that will not fit the assigned space will not be acceptable. All Drawings relating to the construction, including architectural, structural, electrical, plumbing, piping, heating, and ventilating, together with the Specifications shall be considered collectively.

1.2 SUBMITTALS

- A. General: Provide submittals in accordance with Specification 01 30 00.
- **B.** Manufacturers' product data and shop drawings on piping, fittings, valves, and accessories with installation details. Shop drawings shall be approved prior to installation of the components.
- C. Pipe support plan, refer to paragraph 3.1.G.
- **D.** Operation and maintenance data for valves, pressure gauges, water meters, and other accessories in accordance with Specification 01 78 23.

1.3 QUALITY ASSURANCE

A. This Specification contains references to industry and trade group standards, including the following. They are a part of this section as specified and modified. The latest version of

the standard references shall apply. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

1. American Water Works Association (AWWA).

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle water mains, valves, and appurtenances in accordance with the manufacturers' recommendations and in a manner which protects the materials.

B. Pipe

- 1. Protect, support, and handle in a manner to prevent damage to the products, especially linings and coatings.
- 2. When necessary, provide shelter to store pipe and apply water to prevent excessive drying.
- 3. During cold weather, store pipe on supports to prevent coating from freezing to the ground.
- 4. Do not store pipe on rock or other hard surface.
- 5. Use implements, tools, facilities, and equipment suitable for proper and safe protection and handling of piping; do not drop or dump pipe into trenches.
- 6. Use heavy canvas or nylon slings, not chains or cables, to lift pipe and fittings.
- 7. Cement-Mortar Lined Pipe: Tightly close ends with polyethylene plastic wrap to protect cement-mortar lining during shipment; leave plastic wrap on pipe until installation.
- 8. Remove pipe that, in the opinion of the Engineer, is damaged beyond repair.

C. Gaskets

- 1. Store in a cool, well-ventilated area.
- 2. Do not expose to the direct rays of the sun.
- 3. Do not allow contact with oils, fuels, or petroleum solvents.

1.5 PROJECT CONDITIONS

- **A.** Site Information: Perform site survey, research public utility records, and verify existing utility locations. Verify that water service piping may be installed in compliance with the original design and referenced standards.
- **B.** Contractor is responsible for compatibility between pipe materials, fittings, and appurtenances.

PART 2 – MATERIALS

2.1 PIPE AND FITTINGS

- A. Ductile Iron Pipe, Below Ground, 3- through 12-inch (DI1). Mechanical joint ductile iron pipe shall conform to ANSI/AWWA C151/A21.51, AWWA C111, and AWWA C104 (cement lined). All ductile-iron pipe shall comply with ANSI A21.1 and shall be pressure class 350. All fittings shall be restrained. Piping below slabs shall be polyethylene wrapped in accordance with AWWA C105.
- **B.** Ductile Iron Pipe, Above Ground, 3- through 12-inch (DI2). Flanged joint ductile iron pipe shall conform to ANSI/AWWA C151/A21.51, AWWA C110, and AWWA C104 (cement lined). All ductile-iron pipe shall comply with ANSI A21.1 and shall be pressure class 350.
- C. Ductile Iron Pipe Fittings, 3- through 12-inch (DI1 and DI2). Provide ductile iron fittings conforming to AWWA C110 with a minimum rated working pressure of 350 psi. Mechanical joint fittings shall be ductile iron Class 350, conforming to ANSI/AWWA C153/A21.53 or ANSI/AWWA C111/A21.11. Fittings shall be cement lined in accordance with AWWA C104. Fittings shall have fully restrained joints. Flanged fittings shall be drilled to a 125 pound template. Provide fittings with bells and gaskets specifically designed for cast iron equivalent outside diameter PVC or HDPE pipe, as required.
- **D.** Cast Iron Pipe Fittings. All cast-iron fittings shall conform to ANSI specification A21.10 or B16.1. All flanges on cast-iron pipe and on cast-iron fittings shall be drilled to a 125 pound template. All push-on or mechanical joints shall conform to ANSI specification A21.11. The exterior surfaces of all fittings shall be foundry-coated with a bituminous coating (except those inside which may be provided without a bituminous coating) and the interior shall be Portland cement lined in accordance with ANSI specification A21.4. Exposed pipe shall be provided with flanges and buried pipe shall be provided with mechanical joints unless indicated otherwise on the Drawings. With the approval of the Engineer, cast-iron fittings as specified above can be substituted for ductile-iron fittings as specified above.
- **E.** Carbon Steel, 2-inch and smaller (CS). Carbon steel pipe shall be Schedule 40 Grade B type ERW or seamless per ASTM A53 or ASTM A106. Carbon steel fittings shall be

2,000 pound forged socket weld or taper threaded per ASTM A105, ANSI B16.1, and ANSI B1.20.1. Carbon steel unions shall be 3,000 pound forged socket welded with steel seats per ASTM A105. No lining for air or gas service.

- **F.** Stainless Steel (SS). Standard weight Schedule 40S type 304 stainless steel conforming to ASTM A312 and ASTM A182. Threaded connections shall be made by wrapping male thread with Teflon tape.
- **G.** Copper (COP). Seamless hard drawn copper tube, Type L, rigid, conforming to ASTM B88 and ANSI H23.1. Use with cast-bronze or wrought copper solder fittings and 95-5 tin antimony solder.
- **H.** Brass (BR). Seamless "regular" red brass conforming to ASTM B43. Use brass threaded fittings.
- I. Cast Iron Soil Pipe (CISP). CISP for floor drains and at locations shown on the Drawings shall conform to Federal Specification WW-P-401 for extra heavy weight. Above slab fittings shall be hubless, below slab fittings shall be hub and spigot per CISPI 301, CISPI 310, ASTM A74, ASTM A1277, ASTM C564, and ASTM C1540. For gaskets use neoprene sealing sleeves series 300 AISI stainless steel shield and clamp for a neoprene gasket compression joint per ASTM C564 and ASTM C1563. All pipe and fittings shall bear the trademark of the Cast Iron Soil Pipe Institute or as approved by the Engineer.
- **J.** Polyvinyl Chloride (PVC). Pipe shall be Schedule 80 conforming to ASTM D1785. Fittings shall be solvent welded per ASTM D2467 with solvent meeting ASTM D2564.
- K. High Density Polyethylene (HDPE). High density polyethylene pipe shall be manufactured from PE4710 resin, conform to ASTM D3350 and AWWA C906, and be certified per NSF/ANSI 61. Provide standard pipe having plain ends for heat welded joints and cast iron equivalent outside diameter. Provide DR 9 class 250 pressure rating or as shown on the Drawings.
- L. Where flanges are required as indicated in the Drawings or as specified herein, flanges shall be in accordance with ANSI B16.1 and shall be rated for the piping system's working pressure. Gaskets shall be 1/8 inch ring type full face Garlock 3200 compressed non-asbestos sheet packing or approved equal. Use rubber compound gaskets that are not affected by the fluid service of the pipeline.
- **M.** Dissimilar Pipe Connections. Supply dielectric coupling EPCO Model HA or EA when connecting pipes of different metals to provide electrical insulation.
- **N.** Insulation. Wrap hot water supply lines with fiberglass insulation using J-M Micro-Lok HP with ASJ-SSL jacket and closure system or approved equal.

2.2 SMALL WATER VALVES, SIZE LESS THAN 3 INCHES

- **A.** GENERAL. Small piping valves shall be suitable for use with liquid being transported. Water valves under 3 inches shall be bronze complying with ASTM B62 with screwed end connections.
- **B.** AIR RELEASE VALVE. Air release valves shall be cast and/or ductile iron bodied, 1" NPT threaded joint, float operated, and designed for the intended service. Furnish valves with stainless steel float and mechanism, all working parts removable through the top of the valve, 200 psi min working pressure. Max temperature of 200°F. Valves shall be as manufactured by GA Industries, Val-Matic, Cla-Val, or approved equal.
- **C.** BACKPRESSURE VALVE. Direct-operated, spring controlled, PVC body, zinc plated spring, PTFE wetted diaphragm, stainless steel lock nut and screw, and a non wetted u-cup TKM seal that isolates the spring. Valve shall have a maximum inlet capacity of 150 psi and a relief setting between 5 and 100 psi. Valve shall come with a fail dry safety vent that indicates a failure of the valve seal. Valve shall have NSF 61 certification for use in a water treatment facility. Valve shall be as manufactured by Plast-o-matic RVDT, or approved equal.
- **D.** BALL VALVES, PVC. Vented ball for sodium hypochlorite solution use. Rated 150 psi at 73 degrees F, with ASTM D1784, Type I, Grade 1 polyvinyl chloride body, ball, and stem, end entry, double union design, ANSI Schedule 80 solvent-weld socket ends, Viton trim. If seal type recommended by manufacturer for the specific chemical or solution varies from those specified, submit recommendation with submittals and highlight for the attention of the Engineer. Spears True Union 2000 Indistrial Vented or approved equal.
- **E.** CHECK VALVES, BRONZE SWING. Bronze check valves shall be swing check disc type with integral disc and hinge, and 125-pound rating, Crane Figure No. 37 or approved equal. Confirm proper application for drain lines and air lines.
- F. CHECK VALVES, PVC BALL. Valve body shall be PVC per ASTM D1784 with dimensions that conform to either ASTM D2467 or F439 for Schedule 80 pressure fittings for socket or threaded end connections. Valve shall have True Union fittings. Valve shall come clearly marked with flow direction, material designation, and NSF-61 certification. Valve shall be rated for a minimum of 150 psi at 73 degrees F. Provide manufacturer's recommendation for seal material compatible with the piped fluid if different from that specified. Nibco Chemtrol Ball Check Valve or approved equal.
- **G.** CORPORATION STOPS. Corporation stops to be all bronze with tapered inlet threads and iron-pipe outlet threads; both inlet and outlet shall be male nipples; stops shall be Mueller Co. H-10003 or approved equal. Saddles will be required in all A-C and PVC

pipe. Saddles will be required on ductile-iron pipe in accordance with the standards established by the Ductile-Iron Pipe Research Association.

- **H.** DOUBLE CHECK VALVE. Threaded end connections, lead free cast copper silicon body, silicone elastomers, stainless steel springs, conforming to AWWA C510, rated to 175 psi working pressure, union ball valves on both ends, NSF 61 certified for drinking water. Valve shall be Febco LF850U or approved equal.
- I. GATE VALVES. Bronze gate valves shall be of rising stem solid wedge disc type. Stuffing box repackable while under pressure, 125-pound rating. Gate valves shall be Crane Figure No. 428 or approved equal.
- **J.** GLOBE VALVES. Bronze globe valves shall be of bronze disc type with 125-pound rating and repackable while under pressure, and shall be Crane Figure No. 1 or approved equal.
- **K.** HOSE BIBB ANTI-SIPHON (HB1). Wall-mounted hose valve with integral vacuum breaker, cast bronze body with NPT screwed ends, union bonnet, rising stem, Buna-N rubber or composition disc, hand-wheel, and ³/₄ inch diameter threaded NPT x NST hose thread outlet connection. Valve shall be rated for 125 psi. Furnish and install an isolation valve immediately upstream of the hose bibb. Woodford model 101 or approved equal.
- L. HOSE BIBB ANTI-SIPHON FREEZEPROOF (HB2). Wall-mounted freezeproof hose valve with integral vacuum breaker, cast bronze body with NPT screwed ends, union bonnet, rising stem, Buna-N rubber or composition disc, hand-wheel, and ³/₄ inch diameter threaded NPT x NST hose thread outlet connection. Valve shall be rated for 125 psi. Install per manufacturer's instructions. Furnish and install an isolation valve immediately upstream of the hose bibb. Woodford model 19 or approved equal.

2.3 LARGE WATER VALVES, SIZE EQUAL TO OR GREATER THAN 3 INCHES

- A. BUTTERFLY VALVE (3" 12"), AWWA. AWWA butterfly valves shall be cast and/or ductile iron bodied, flanged joint and lever actuated, unless otherwise note on the plans, and meet the requirements of AWWA C504. Offset disc design, corrosionresistant shaft, stainless steel disc edge, and self-compensating shaft. Molded-in body seat with disc Class 250B, 250 psi min working pressure, max temperature of 200°F. Valves shall be as manufactured by DeZurik, Pratt, Val-Matic, or approved equal.
- **B.** CHECK VALVE, DOUBLE DOOR, WAFER. The check valve shall be the double door style and designed to fit between ANSI flanges.
 - 1. The check valve doors shall be spring loaded, normally closed, by means of one or more heavy duty stainless steel torsion springs. Flow from the upstream side shall

cause the doors to open and upon flow source shut down, the torsion spring will shut the doors before reverse flow starts and at a point of zero velocity for non-slam closure.

- 2. Seating shall be resilient and water tight. The sealing element shall be Buna-N molded to the body.
- 3. All materials of construction must be certified in writing to ASTM specifications as follows:

Body	Ductile-iron ASTM A536
Doors	Ductile-iron ASTM A536
Sealing Element	Buna-N
Torsion Spring	Stainless Steel T316
Hinge Shaft	Stainless Steel T316
Stop Shaft	Stainless Steel T316
Exterior Paint	Phenolic primer red oxide

- 4. Double door check valves shall be APCO series 9000 or approved equal.
- C. CHECK VALVE, LEVER AND WEIGHT SWING (3" 12"). Flanged end, cast iron body, metal to metal seating, bronze mounted swing type, solid bronze hinges, stainless steel hinge shaft (keyed to disc and lever), adjustable outside lever and weight, rated 125pound SWP, 200-pound WOG. NSF 61 certified for drinking water. Valves shall be as manufactured by Golden Anderson, APCO, or approved equal.
- D. GATE VALVE (3"-12"), AWWA. AWWA gate valves shall be cast and/or ductile iron bodied, flanged joint and hand wheel operated, unless otherwise noted on the plans, and meet the requirements of AWWA C509/515. Furnish valves with resilient wedge and bronze stem, Class 250B, 250 psi min working pressure. Max temperature of 200°F. Valves shall be as manufactured by Kennedy, Mueller, American, or approved equal.
- E. PRESSURE REDUCING VALVE. Pressure reducing valves shall be iron bodied, pilot operated piston or diaphragm valves designed to maintain a constant or minimum downstream pressure under a range of flow and pressure conditions indicated on the Drawings. Pistons shall be bronze or stainless steel with resilient seal rings and diaphragms shall be resilient with stainless steel or bronze removable seats. All valve materials in contact with water shall be non-corrosive in water and be safe for potable water use. Valves shall be flanged, Class 250B, 250 psi min working pressure. Max temperature of 200°F. Valves shall be as manufactured by ClaVal, Ross, GA Industries, Flomatic, or approved equal.
- **F.** PRESSURE SUSTAINING VALVE. Pressure sustaining valve shall be iron bodied, pilot operated piston or diaphragm valves designed to maintain a high downstream

pressure under a range of flow of 50 - 300 gpm, downstream pressure of 40 - 60 psi (set at 50 psi), upstream pressure of 130 psi. Pistons shall be bronze or stainless steel with resilient seal rings and diaphragms shall be resilient with stainless steel or bronze removable seats. All valve materials in contact with water shall be non-corrosive in water and be safe for potable water use. Valves shall be flanged, Class 125B, 200 psi min working pressure. Max temperature of 200°F. Valves shall be as manufactured by ClaVal, Ross, GA Industries, Flomatic, or approved equal.

2.4 PRESSURE GAUGES

- **A.** Each pressure gauge installation shall include the gauge, a piston snubber, and a shut-off valve. Gauges shall be mounted vertically.
- **B.** Pressure gauges shall have aluminum cases, back flanged with screwed ring cover, 4-inch dial, nonreflecting white face, bronze socket and tube, and minimum 1/2 inch male NPT bottom connection. Pressure range for the gauges shall be 0 to 200 psi unless specified otherwise. Pressure gauges shall be Wika 9833434 or approved equal.
- C. Piston snubbers shall be Ray 023S or approved equal.

2.5 TURBINE WATER METER

A. Turbine water meters shall be flanged, Class 125B, 200 psi min working pressure. The measuring chamber shall consist of a measuring element, removable housing, and allelectronic register. The measuring element shall be mounted on a horizontal, stationary stainless steel shaft with sleeve bearings and be essentially weightless in water. The measuring chamber shall be capable of operating within 98% accuracy limits for 2-20% of the flow range and 99% accuracy limits for 20-100% of the flow range. Measuring element shall maintain accuracy without calibration when transferred from one main case to another of the same size. The direct magnetic drive shall occur between the motion of the measuring element blade position and the electronic register. Additional intermediate, magnetic or mechanical, drive couplings are not acceptable. The meter's register shall be all-electronic and does not contain any mechanical gearing to display flow and accurate totalization. The electronic register shall provide Automatic Meter Reading resolution units fully programmable, pulse output frequency fully programmable, integral data logging capability, integral resettable accuracy testing feature, LCD display and 10-year battery life guarantee. Meter pressure castings shall be hydrostatically tested at a minimum of 1.5 times (depending on material) the maximum rated working pressure stated on the meter body manufacturer's badge. Meters shall be as manufacturer by Sensus, Badger, Mueller, or approved equal.

2.6 WALL PENETRATIONS

- A. Where pipes penetrate precast or cast-in-place concrete walls, a positive closure shall be provided that will form a completely water tight seal. The closure shall be comprised of a steel sleeve cast in the wall and a mechanical seal to fill the annulus between the pipe and the wall sleeve.
- **B.** The wall sleeve shall be manufactured from heavy wall steel pipe with a full circle continuously welded water stop plate. The sleeve shall be coated to present corrosion. Sleeves shall be two pipes sizes larger than the nominal pipe size penetrating wall and shall be cast in place at locations as shown on the Drawings.
- **C.** The seal shall be modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall opening. Links shall be loosely assembled with type 316 stainless steel bolts, nuts, and pressure plates to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and nut. After the seal assembly is positioned in the sleeve, tightening of the bolts shall cause the rubber sealing elements to expand and provide an absolutely water-tight seal between the pipe and wall opening. The seal shall be constructed so as to provide electrical insulation between the pipe and wall. The seal shall not leak under water pressure of up to 40 feet.
- **D.** The modular sealing system shall be Link-Seal by GPT Industries or approved equal.

2.7 PIPE SUPPORTS

- **A.** All pipelines shall be supported so that all lines are at a uniform slope or level as required herein or as shown on the Drawings. All pipe shall be supported so that there are no sags in the lines.
- **B.** In absence of details shown on the Drawings, pipes over 4 feet above the floor shall be supported with clevis type hangers from above or brackets from an adjacent wall. Pipes nearer the floor shall be supported by use of a pipe or concrete saddle. Where concrete saddles or thrust blocks are required, there shall be a polyethylene bond breaker between concrete and pipe.
- **C.** The materials used for piping support shall be similar and equal to those manufactured by ITT Grinnell or Eaton B-Line for the appropriate uses.
- **D.** Pipe supports shall be no more than 10 feet apart and each fitting or valve shall have supports on either side. Pipe manufacturers shall approve of the type of support and spacing to prevent local over-stressing of pipes. All pump and equipment piping shall be supported in a manner that prevents any loading or stress on the connections.

- **E.** Slotted standard Unistrut shall be used for pipe that is to be mounted to the wall. All strut system components shall be manufactured by Unistrut Corporation or approved equal as determined by Engineer.
- **F.** All channel members shall be fabricated from structural grade steel conforming to one of the following specifications unless specified otherwise: ASTM A1011 structural steel grade 33, ASTM A653 grade 33. All fittings shall be fabricated from steel conforming one of the following specifications unless specified otherwise: ASTM A575, ASTM A576, ASTM A36, or ASTM A635.
 - 1. Type 304 or 316 stainless steel for following locations: Submerged or less than 1 foot above the liquid surface; below tops of channel walls; under covers or slabs of channels and tanks; in other damp locations.
- **G.** Strut system components shall be finished in accordance with one of the following standards unless specified otherwise:
 - 1. Perma-Green III-Rust inhibiting epoxy enamel when tested in accordance to ASTM B117.
 - 2. Elecro-galvanized-electrolytically zinc coated per ASTM B633 Type III SC 1.
 - 3. Pre-galvanized-zinc coated by hot dipped process prior to roll forming. The zinc weight shall be G90 conforming to ASTM A653.
 - 4. Hot-dipped galvanized-zinc coated after all manufacturing operations are complete. Coating shall conform to ASTM A123 or ASTM A153.

PART 3 – EXECUTION

3.1 GENERAL PIPE INSTALLATION

- **A.** Due to the small scale of the Drawings, it is not possible to indicate all of the piping systems nor to show all offsets, fittings, etc., which may be required.
- **B.** Prior to ordering materials, expose all existing pipes that are to be connected to new pipelines. Verify the size, material, joint types, elevation, horizontal location, and pipe service of existing pipes. Inspect the size and location of structure penetrations to verify the adequacy of wall pipes, sleeves, and other openings before installing connecting pipes.
- **C.** All piping shall be installed as closely as possible to walls, ceilings, columns, beams and equipment (consistent with proper space requirements for maintenance and operational

appurtenances) so as to occupy the minimum of space. All offsets, fittings, etc. required to accomplish this must be furnished.

- **D.** Provisions for maximum flexibility are not always shown and the Contractor may add flexible joints where required, and approved, by the Engineer. All piping shall be installed plumb and square.
- E. Exposed pipe shall be run parallel with or at right angles to the adjacent walls and floors.
- **F.** Piping shall be run in a straight grade between elevations shown on the plans, except when not possible due to conflict with other facilities. Pipelines carrying liquid shall be installed without high points that could trap gases or air and shall be kept below the static water level in the items to which they connect.
- **G.** All pipe shall be properly supported so that all pipes are in a uniform slope or level, as required by the Drawings. All pipe shall be supported so that there are no sags in the line. At the pumps, the pipe shall be supported so that no weight of the pipe will be supported by the pumps. In general, required pipe hangers, supports, bracing, or thrust blocks are not shown on Drawings.
- **H.** The Contractor shall submit to the Engineer his proposed plan of supporting of piping, except for pipe supports specifically detailed on the Drawings. Except where shown otherwise on the Drawings, all supports and hangers shall be a standard manufactured type. Hanger supports that are located and embedded in concrete must be an adjustable type that will allow the piping to be located in straight lines and slopes, where required, at a uniform grade without sagging. Pipe type floor supports are acceptable for piping up to 3 feet above the floor; however, the supports must be properly anchored and coated. Concrete thrust blocks for bracing pressure pipe shall have reinforcement and shall be tied into the concrete floor or wall. Wall brackets and braces shall be sufficiently anchored to the wall in an approved manner.
- **I.** No anchors or attachments will be permitted in precast concrete tee stems except during the casting. Chair or perforated strap hangers for pipes running parallel and vertically adjacent. Supports shall not be spaced over 10 feet and at least two supports are required for individual sections of pipes between joints.
- **J.** All pipes, fittings, and valves delivered to the work site shall be clearly marked to identify the material, class, and thickness. All material shall be new and free of blemishes.
- **K.** Provide the manufacturer's required straight runs of piping upstream and downstream of each flow measuring device.

L. Apply coatings, color coding, directional arrows, and related components as specified in Section 09 91 00.

3.2 PIPES THROUGH CONCRETE WALLS

- A. Unless otherwise specifically detailed on the plans, when a pipe (except copper or wrought steel) passes from concrete to earth or from earth to concrete, provide bell and spigot, ringtite, wedgelock, or other restrained flexible-type joints unless otherwise specifically indicated on the Drawings, or restrained coupling, shall be installed. Particular care shall be taken to secure full support of the pipe in the earth. Unless otherwise specifically indicated on the Drawings, where pipes terminate in or pass through concrete sections below finished grade, they may be set in place or a block out opening may be made in the concrete. Location of the openings shall be accurately determined, and each opening shall be of sufficient size to permit passage of flanges and bells to allow satisfactory closure and sealing of the opening. Block out openings may not be used in tank walls, floors, or areas where liquid is contained or where pipes allow possible groundwater entry.
- **B.** Provide flexible joints at the face of all structures, whether or not shown on the Drawings. Install the first joint flush with structure face or up to one pipe diameter away from face, but not further than 18 inches away from face. Install the second joint within 18 inches of the first joint.
- **C.** After pipe installation, the opening around the pipe shall be closed by pouring with non-shrink grout in accordance with the manufacturer's instructions.
- **D.** Where grout is placed in openings through vertical walls, a "spout" 6-inches above the highest point in the opening shall be provided and filled with grout to assure filling the entire opening. The grout shall be thoroughly mixed and shall be poured in place immediately after mixing.
- **E.** On exposed external surfaces, the finished surface of the grout shall be left not less than 3/4 inch below the adjacent surfaces and a 3/4 inch coat of 3:1 Portland cement plaster applied after the grout has set. The exterior face of the grouted opening and the joint between the grouting and the wall shall be painted with 3 coats of emulsified asphalt.
- **F.** Whenever the pipelines extend through structural walls or through successive walls, or through a roof slab and adjacent wall, the Contractor shall provide a sufficient number of unions, flanges, or similar couplings to permit the dismantling of sections of pipelines within the structure without disturbing adjacent lines or portions within the concrete.

3.3 CHASES, SLEEVES, AND WALL PIPES

- **A.** Galvanized iron or cast-iron pipe sleeves shall be provided for pipes passing through floors, ceilings and partitions at the time are such being constructed. Where the pipes run through footings, iron pipe sleeves shall be in place before the concrete is placed. Where pipes pass under footings, the holes shall be grouted with concrete. Pipe runs encased in concrete shall be properly supported so that they will not be disturbed during concrete placement operations. The Contractor shall supervise the installation of all chases and recesses for the installation of piping, plumbing, ventilation ducts, and heating pipes.
- **B.** Cutting for the installation of the mechanical work shall be done at times most suitable for other crafts and as directed by the Owner. Coordination of this work shall be the responsibility of the Contractor. Where necessary to cut chases in walls, they shall be reinforced as directed. After the work is installed, all holes shall be patched to match the finish of the adjacent surface.

3.4 SMALL PIPE INSTALLATION

- **A.** All threads on steel pipes shall be cut with sharp dies to standard depth, left clean-cut and tapered. All screwed pipe joints shall be properly sealed with a potable water safe approved joint paste or Teflon tape applied on the male threads only. Expansion joints shall be provided as required.
- **B.** All copper piping shall have solder-type fittings. The joints in the copper pipe shall be properly cleaned, flux applied, and then soldered, all applied in accordance with the manufacturer's directions. All parts to be soldered shall be thoroughly cleaned before the flux is applied. All copper piping where the pipe is in direct contact with the pipe hangers or other metal supports shall be protected with a copper saddle soldered to the underside of the pipe. Saddles may be made of split copper pipe.
- **C.** All PVC pipe threads shall be cut with proper tools and connections shall be sealed correctly and completely with Teflon tape.
- **D.** For small size piping in structures not holding water, sleeves shall be provided for pipes passing through floors, ceilings and partitions at the time the structure is being constructed. After installation, all sleeves shall be caulked with approved appropriate material.
- **E.** In all small size piping, unions must be installed at all equipment so that the equipment can be removed without dismantling the piping.
- **F.** At each piece of equipment using water, valves must be installed in each water line connection whether or not shown on the Drawings.

G. All piping shall be reamed and cleaned of all dirt and scale before being installed. All concealed piping shall be tested in the presence of the Engineer before being concealed. Changes in direction shall be made with fittings. Pipe showing kinks or wrinkles will not be accepted. All joints shall be made watertight or airtight depending on their use.

3.5 LARGE PIPE INSTALLATION

A. All pipe and valves shall be carefully aligned and shall be installed in a neat manner. The bolts in the flange joints shall be drawn up uniformly and tightly around the flange without overstraining the flanges. All joints must be made watertight. If any joint, pipe, fittings or valve is found defective upon testing, if shall be immediately repaired or replaced by the Contractor at no additional cost to the Owner. Make-up piping and closure pieces shall be sized and measured after equipment selection has been completed and located, and all permanent parts of the structure are in place. Couplings may be used when locations are approved by the Owner. In general, the location of the piping has been fixed on the Drawings, but variations will be permitted to suit the type or make of approved equipment purchased by the Contractor. However, the general plan of fittings and connections is expected to be followed unless variations are approved by the Owner.

3.6 FLEXIBILITY IN PIPING

- **A.** The Drawings show the location of pipe couplings in piping. All mechanical joints or pipe couplings shall be restrained whether or not shown on the Drawings.
- **B.** Joint restraint rods shall be diametrically opposed. When restraining pipe couplings, the rods shall be bolted between adjacent flanges.
- **C.** The use of restrained mechanical joint connections at interior sides of wall pipes will be considered instead of flanged joint; the Contractor shall submit the proposed configuration to the Engineer for review. Additional pipe couplings with tie rod restraint can be used; however, coupling location must be approved by the Owner. Restraint shall be sufficient for the test pressure of the system.

3.7 <u>CLEANUP</u>

A. After each of the systems has been installed, the Contractor shall thoroughly clean all parts of the installation. All equipment, piping, valves, and fittings shall be cleaned of grease, metal cuttings and other debris. Any stoppage, discoloration or other damage to any of the work due to the Contractor's failure to properly install or to properly clean the systems shall be repaired without additional cost to the Owner.

3.8 TESTING

A. Following the cleaning, each system shall be completely tested in the presence of the Owner. All piping that will be subjected to internal pressures for transporting liquids or gases shall be tested for leaks in accordance with the instructions of the Owner. In general, tests shall comply with the Uniform Plumbing Code. In the absence of a specific code requirement, the lines shall be capable of withstanding and holding without leakage a pressure equal to 150 percent of the working pressure for that particular line, except that no test pressure shall be in excess of 100 psi for raw water lines and 150 psi for potable lines. Air lines will be tested for 175 psi. For hydrostatic tests, maintain test pressure continuously for 120 minutes minimum and for such additional time as necessary to conduct examinations for leakage. In the event the line tested should fail, repairs shall be made and the line retested until it does comply.

3.9 DISINFECTION

A. All potable water lines shall be disinfected in accordance with AWWA C651 and C653.

3.10 PLUMBING FIXTURES INSTALLATION

A. All plumbing fixtures and equipment described in this Specification shall be installed in strict conformance with the manufacturer's written instructions.

3.11 VENTS AND DRAINS

A. Provide hose bibbs or approved system for venting high points and draining low points.

End of Section