

Project Manual For

Replacement Facility for Wrangell Medical Center

Volume 1 (Division 1 Specifications)

Architect's Project No. 10528.00

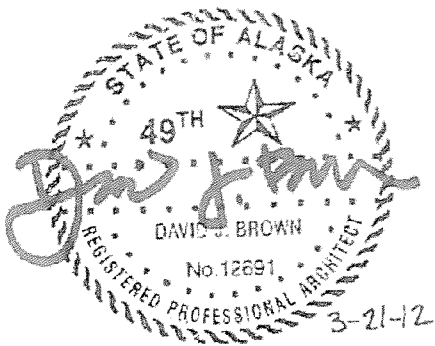
Wrangell, Alaska

March 21, 2012

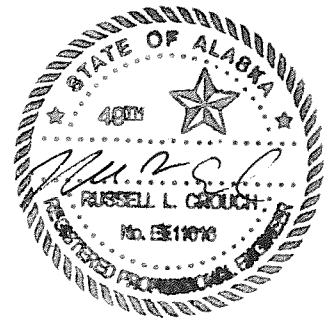
Project Manual For
Replacement Facility for Wrangell Medical Center
Volume 1 (Early Release Site)
Architect's Project No. 10528.00

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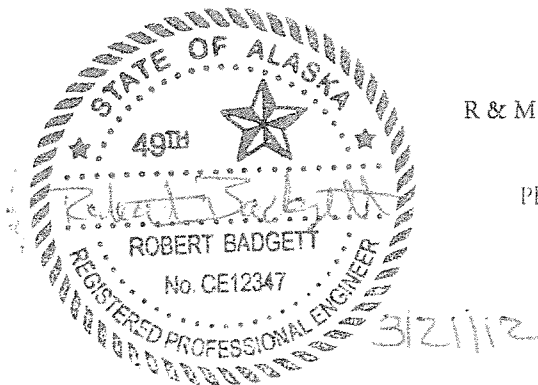
March 21, 2012 (State Fire Marshal Review Set)



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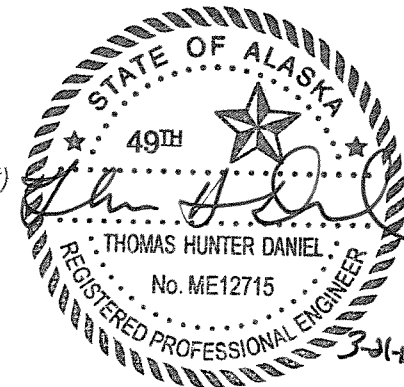
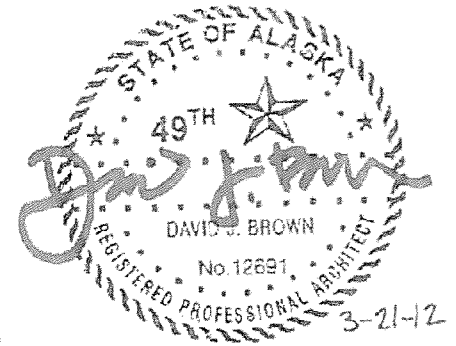
Sections are denoted below by a CM for Construction Manager and/or a CC for Component Contract to distinguish between scope of work. Should a section denote both a CM/CC, refer to specification section and construction drawings for separation of scope.

DIVISION 0 - BIDDING REQUIREMENTS

Refer to Construction Manager and Project Manager's Bid Packages, attached to these documents.

DIVISION 1 - GENERAL REQUIREMENTS

CM/CC	01-1100	Summary of Work (<i>Arch</i>)
CM/CC	01-2000	Price and Payment Procedures (<i>Arch</i>)
CM/CC	01-2100	Allowances (<i>Arch</i>)
CM/CC	01-2513	Product Substitution Procedures (<i>Arch</i>)
CM/CC	01-2513.13	Substitution Request Form (<i>Arch</i>)
CM/CC	01-2527	Weather Delays (<i>Arch</i>)
CM/CC	01-2600	Contract Modification Procedures (<i>Arch</i>)
CM/CC	01-3119	Project Meetings (<i>Arch</i>)
CM/CC	01-3200	Construction Progress Documentation (<i>Arch</i>)
CM/CC	01-3323	Shop Drawings, Product Data, Samples (<i>Arch</i>)
CM/CC	01-4000	Quality Requirements (<i>Arch</i>)
CM/CC	01-4517	Uncovering and Correction of Work (<i>Arch</i>)
CM/CC	01-4529	Testing Laboratory Services (<i>Arch</i>)
CM/CC	01-5000	Temporary Facilities and Controls (<i>Arch</i>)
CM/CC	01-6500	Product Delivery Requirements (<i>Arch</i>)
CM/CC	01-6600	Product Storage and Handling Requirements (<i>Arch</i>)
CM/CC	01-7329	Cutting And Patching (<i>Arch</i>)
CM/CC	01-7400	Cleaning and Waste Management (<i>Arch</i>)
CM/CC	01-7700	Closeout Procedures (<i>Arch</i>)
CM/CC	01-7823	Operation and Maintenance Data (<i>Arch</i>)
CM/CC	01-7833	Product Warranties and Bonds (<i>Arch</i>)
CM/CC	01-7839	Project Record Documents (<i>Arch</i>)
CM/CC	01-7841	Spare Parts and Maintenance Materials (<i>Arch</i>)

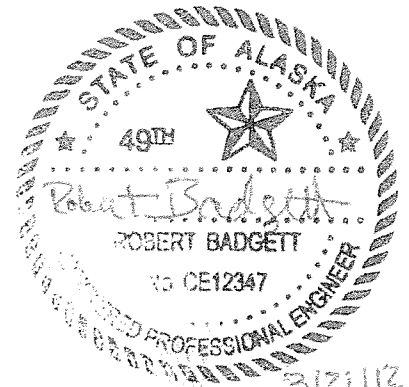


DIVISION 2 - EXISTING CONDITIONS

CM	02-2016	Existing Utilities (<i>Civil</i>)
CM	02-4100	Demolition (<i>Civil</i>)
CM	02-2010	Subsurface Conditions (<i>Civil</i>)

DIVISION 22 - PLUMBING

CM/CC	22-1316	Sanitary Waste & Vent Piping (<i>Plumb</i>)
CM/CC	22-1413	Storm Water Piping (<i>Plumb</i>)



DIVISION 26 - ELECTRICAL

CM	26 0500	Common Work Results from Electrical (<i>Elect</i>)
CM	26 0519	Electrical Power Conductors and Cable (<i>Elect</i>)
CM	26 0526	Grounding and Bonding (<i>Elect</i>)
CM	26 0532	Raceways for Electrical Systems (<i>Elect</i>)
CM	26 5100	Lighting Equipment (<i>Elect</i>)
CM	26 5500	Pad mount transformer Electrical Service Provisions (<i>Elect</i>)



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DIVISION 31 - EARTHWORK

CM	31-2200	Earthwork (<i>Civil</i>)
CM	31-2319	Dewatering (<i>Civil</i>)
CM	31-2333	Trenching, Backfilling, and Compacting for Utilities (<i>Civil</i>)
CM	31-4100	Shoring (<i>Civil</i>)

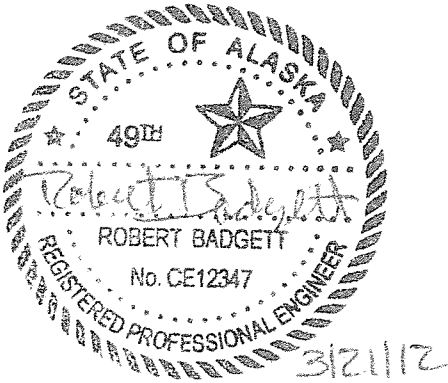
DIVISION 32 - EXTERIOR IMPROVEMENTS

CM	32-1216	Asphalt Concrete Paving (<i>Civil</i>)
CM	32-1217	Pavement Repair and Subsurfacing (<i>Civil</i>)
CM	32-1600	Curbs and Sidewalks (<i>Civil</i>)

DIVISION 33 - COMMON WORK RESULTS FOR UTILITIES

CM	33-1000	Waterlines (<i>Civil</i>)
CM	33-2730	Sanitary Sewers (<i>Civil</i>)
CM	33-2520	Storm Drainage (<i>Civil</i>)

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SECTION 01-1100
SUMMARY OF WORK

PART 1 - GENERAL

1.1 PROJECT DESCRIPTION

- A. The Project consists of two separate contracts for construction.
- B. Layton Construction shall act as the Construction Manager and shall be responsible for the bidding and awarding of the following scope to subcontractors:
 - 1. All site work including underground utilities, rough and final grading, all foundations, a 2 hour independent fire wall, building canopies, asphalt and concrete paving, curbs, landscaping, and signage as shown on Contract Documents prepared by David E. Johnson Architect, dated March 21, 2012. The Construction Manager shall also be responsible for the purchase of the emergency generator.
- C. The Owner shall work with the Construction Manager to bid and award the following scope to a Component Contractor:
 - 1. Construction including delivery and installation of a 55,000 square foot one story hospital built using a component construction method, as shown on the Contract Documents prepared by David E. Johnson Architect, dated March 21, 2012. Scope shall include the tie in of all utilities and structural connections between components and work being performed by the Construction Manager.
- D. This contract is expected to be funded in whole or in part using funds from the American Recovery and Reinvestment Act (ARRA). Section 1605 of the ARRA prohibits the use of these funds unless all iron, steel, and manufactured goods are produced in the United States. All iron and steel manufacturing processes must take place in the United States, except for metallurgical processes involving refinement of steel additives. There is no requirement for the origin of components and subcomponents of manufactured goods. Products listed at 48 CFR 25.104(a) have been determined to be unavailable in the United States and if required for the project may be purchased from foreign sources. No unauthorized use of foreign iron, steel, and/or manufactured goods will be allowed on this project.

1.2 REPORTS AVAILABLE TO THE CONTRACTOR

- A. Geotechnical Report:
 - 1. Sub-surface investigation has been performed at the project site. This investigation was conducted, and a report obtained, solely for design purposes and is not a part of the Contract Documents.
 - 2. The use and interpretation of this information will be entirely the responsibility of the using party. The Owner is not responsible for variations in the sub-surface conditions. Bidders shall decide for themselves the character of the material to be encountered.
 - 3. The report of the subsurface soil investigation by an independent testing laboratory is available upon request from the Owner for use and reference during construction. Reference the geotechnical report by R&M Engineering dated December 15, 2010. Copies are available upon request.

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- B. Shielding Report:
 - 1. A report of the anticipated radiation shielding protection required for the project shall be completed prior to construction to confirm the extent of lead lining shown on the contract documents.

1.3 CONTRACTOR USE OF PREMISES

- A. General: During the construction period the Contractor shall have full use of the premises for construction operations, including use of the site. The Contractor's use of the premises is limited only by the Owner's right to perform construction operations with its own forces or to employ separate contractors on portions of the project.
- B. Work shall be performed in a manner that will not impose avoidable hardship, danger, or inconvenience to public or surrounding neighbors.

1.4 USE OF PREMISES

- A. Use of Site: Confine operations to areas within Contract limits indicated. Portions of the site beyond areas in which construction operations are indicated are not to be disturbed without written approval of Owner.
 - 1. Obtain written approval from Owner at least seven (7) working days in advance when scheduling Work outside limits of construction. Provide Owner an estimate of time needed to perform Work outside limits of construction.
 - 2. Cutting, capping, and reconnecting utility systems outside limits of construction shall be performed by Contractor, unless otherwise noted.
 - 3. Conform to all laws, ordinances, permits and regulations affecting the Work on site.
 - 4. Existing roads, streets, drives, parking lots, entrances and required fire exitways serving the premises shall be kept clear and available at all times for their intended use. These areas shall not be used for parking, staging or storage without the Owner's written approval. Coordinate with Owner, and provide alternate routes for public and Owner access if normal routes are affected. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site.
 - 5. Do not unreasonably encumber site with equipment, materials, or vehicles.
 - 6. Return all improvements on or about site and adjacent property which are not shown to be altered, removed or otherwise changed; to conditions which existed previous to starting performance under the Contract.
 - 7. Construction personnel will not at any time park in any Owner parking lot, on Owner property without Owner's consent, and will not park on adjacent residential streets.

1.5 PARTIAL OWNER OCCUPANCY

- A. General: The Owner reserves the right to occupy and to place and install equipment in completed areas of the building, prior to Substantial Completion provided that such occupancy does not interfere with completion of the Work. Such placing of equipment and partial occupancy shall not constitute acceptance of the total Work.
 - 1. A Certificate of Substantial Completion will be executed for each specific portion of the Work to be occupied prior to Owner occupancy.
 - 2. Obtain a Certificate of Occupancy from local building officials prior to Owner occupancy.

3. Prior to partial Owner occupancy, mechanical and electrical systems shall be fully operational. Required inspections and tests shall have been successfully completed. Upon occupancy the Owner will provide operation and maintenance of mechanical and electrical systems in occupied portions of the building.

1.6 OWNER-FURNISHED ITEMS

- A. The Owner will provide items indicated to be furnished by Owner in the Contract Documents. The Work includes receiving, unloading, handling, storing, protecting, and installing Owner-furnished products.
 1. The Owner will arrange and pay for delivery of Owner-furnished items in accordance with the Contractor's Construction Schedule, and will inspect deliveries for damage.
 2. If Owner-furnished items are damaged, defective or missing, the Owner will arrange for replacement. The Owner will also arrange for manufacturer's field services, and the delivery of manufacturer's warranties and bonds to the Contractor.
 3. The Contractor is responsible for designating the delivery dates of Owner-furnished items in the Contractor's Construction Schedule and for receiving, unloading and handling Owner-furnished items at the site. The Contractor is responsible for protecting Owner-furnished items from damage, including damage from exposure to the elements, and to repair or replace items damaged as a result of his operations.

1.7 MISCELLANEOUS PROVISIONS

- A. By execution of this Contract, Contractor acknowledges review of proposed details and specifications and agrees to provide warranties and bonds for products and systems specified herein, detailed on drawings and as approved as a substituted or equal product or system in Section 01-2513.
- B. No material containing asbestos shall be used in the construction of this project or incorporated into the completed work. Contractor shall provide certification that the building is asbestos free at the completion of construction, as required in Contract Closeout, Section 01-7700.

1.8 COORDINATION

- A. Coordinate work of the various Sections of Specifications to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items installed later.
- B. Verify characteristics of elements of interrelated operating equipment are compatible; coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- C. Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduits, as closely as practicable; make runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

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- D. Execute cutting and patching to integrate elements of Work, uncover ill-timed, defective, and non-conforming Work, and provide samples for testing if required. Seal penetrations through floors, walls, and roofing.

1.9 DEFINITIONS AND EXPLANATIONS

- A. Imperative language is used generally in the specifications. Except as otherwise indicated, requirements expressed imperatively are to be performed by the Contractor as if preceded by the phrase “The Contractor shall”.
- B. The term “provide” means furnish and install, complete, and ready for intended use.
 - 1. Except as otherwise defined in greater detail, the term “furnish” means supply and deliver to the project site, including unloading, unpacking, inspecting, and storing until ready for receipt by Owner, installation, etc., as applicable.
 - 2. Except as otherwise defined in greater detail, the term “install” is used to describe operations at project site including assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations, as applicable.
- C. The term “indicated” is used as cross-reference to graphics, notes or schedules on drawings, to other paragraphs or schedules in the specifications, and to similar means of recording requirements in contract documents. Where terms such as “shows”, “noted”, “schedules”, and “specified” are used in lieu of “indicated”, it is for purpose of helping reader locate cross-reference, and no limitations of location is intended.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION

SECTION 01-2000
PRICE AND PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Procedural requirements for processing the following:
 - 1. Schedule of Values.
 - 2. Cash flow projections for the project.
 - 3. Payment applications.
 - 4. Payments at substantial completion.
 - 5. Payment at final completion.
 - 6. Identification of substitutions and alternatives in payment requests.
 - 7. Accounting of Change Order amounts and allowances, and similar cost and pay-out related requirements.

1.2 SCHEDULE OF VALUES

- A. General:
 - 1. Prepare typed schedule on AIA Form G703-1992, in coordination with the preparation of the progress schedule.
 - 2. Correlate the line items of the Schedule of Values with other administrative schedules and forms required for the work, including the following:
 - a. Progress schedule.
 - b. Payment request form.
 - c. Listing of subcontractors.
 - d. Schedule of allowances.
 - e. Schedule of alternates.
 - f. Listing of products and principal suppliers and fabricators.
 - g. Schedule of submittals.
 - 3. Provide breakdown of Contract Sum in sufficient detail to facilitate continued evaluation of payment requests and progress reports.
 - 4. A breakdown of principal subcontract amounts will be required (several line items).
 - 5. At Contractor's option, values may be rounded off to nearest whole dollar, but total must equal the Contract Sum.
- B. Material/Fabrication Values: For each unit of work where payment requests will be made on account of materials or equipment purchased/fabricated/delivered but not yet installed, show "initial value" for payment request and "value added" for subsequent stage or stages of completion on that unit of work.
- C. Time Coordination: In the coordination of initial submittals and other administrative "start-up" activities, submit the Schedule of Values to the Architect no later than 7 days before the initial payment application is to be submitted.
- D. Listing: Arrange schedule with columns to indicate the generic name of the item, related specification sections, subcontractor, supplier/manufacturer/fabricator, Change Order (numbers) which have affected the value, dollar value of item, and percentage of Contract Sum (to nearest one-hundredth percent and adjusted to total 100 percent).
- E. Schedule Updating:

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1. Update and resubmit Schedule of Values whenever Change Orders affect the listing and whenever the actual performance of the work involves necessary changes of substance to the values previously listed.
2. Coordinate re-submittal times with progress reports and payment application.

1.3 PAYMENT APPLICATIONS

- A. General:
1. Except as otherwise indicated in the Contract Documents, comply with the procedures and requirements of the General Conditions, including the submittal of supporting documentation and waivers or releases of lien.
 2. Refer to General Conditions of the Contract, Supplementary Conditions for requirements concerning "retainage" by Owner on payment.
 3. Except as otherwise indicated, sequence of progress payments shall be made on a regular basis, and each must be consistent with previous applications and payments.
- B. Payment Application Times: The period of construction work covered by each payment request is the period indicated in the General Conditions of the Contract and Supplementary Conditions.
- C. Application Preparation:
1. Payment Application Forms: AIA Document G702-1992 and Continuation Sheets.
 2. Except as otherwise indicated, complete every entry provided for on the form, including the notarization and execution by authorized persons.
 3. Incomplete applications shall be returned by the Architect without action.
 4. Entries must match current data of both the Schedule of Values and progress schedule and report.
 5. Listing must include amounts of Change Orders approved prior to the last day of the "period of construction" of the application.
- D. Stored Materials: Include in Payment Application amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
1. Provide certificate of insurance, evidence of transfer of title to Owner and consent of surety to payment, for stored materials.
 2. Provide supporting data that verifies amount requested, such as invoices.
 3. Provide summary of stored materials indicating:
 - a. Materials previously stored and included in previous Payment Applications
 - b. Work completed for this Payment Application utilizing previously stored materials.
 - c. Additional materials stored with the Payment Application.
 - d. Total materials remaining stored, including materials with the Payment Application.
- E. Initial Payment Application: The following must be received by the Architect prior to submittal of the first payment application.
1. Listing of subcontractors and principal suppliers and fabricators.
 2. Schedule of values.
 3. Progress schedule.
 4. Schedule of principal products.

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5. Schedule of unit prices.
 6. Schedule of submittals.
 7. Listing of Contractor's staff assignments and principal consultants.
 8. Copies of acquired building permits and similar authorizations and licenses from governing authorities for the current performance of the work.
 9. Data needed by Owner to acquire insurance coverage required of the Owner.
 10. Initial settlement survey and damage report, if required.
 11. Initial progress report, including report of preconstruction meeting.
- F. Application at Time of Substantial Completion:
1. Following the issuance of the Architect's "Certificate of Substantial Completion", and also in part as applicable to prior certificates on portions of completed work as designated, a "special" payment application may be prepared and submitted by the Contractor.
 2. The principal administrative actions and submittals which must precede or coincide with such special applications are specified in the General Conditions, and elsewhere in the Contract Documents.
 3. Those specifically related to the application can be summarized as follows, but not limited to these:
 - a. Occupancy permits and similar approvals or certifications by governing authorities and franchised services, assuring Owner's full access and use of the completed work.
 - b. Warranties, guarantees, maintenance agreements and similar provisions of the Contract Documents.
 - c. Test/adjust/balance records, maintenance instructions, meter readings, start-up performance reports, and similar change-over information germane to the Owner's occupancy, use, operation and maintenance of the completed work.
 - d. Final cleaning of the work.
 - e. Application for reduction (if any) of retainage, and Consent of Surety.
 - f. Advice to Owner on coordination of shifting insurance coverage, including proof of extended coverage as required.
 - g. Final progress photographs, if required.
 - h. Listing of incomplete work (Punch List) recognized to be completed by the Contractor, as exceptions to the Architect's Certificate of Substantial Completion.
- G. Final Payment Application:
1. The administrative actions and submittals which must proceed or coincide with submittal of the final payment application can be summarized as follows, but not necessarily limited to these:
 - a. Completion of project closeout requirements.
 - b. Completion of items specified for payment application at time of substantial completion (regardless of whether such application was made).
 - c. Assurance, satisfactory to Owner, that unsettled claims will be settled and that work not actually completed and accepted will be completed without undue delay.
 - d. Transmittal of required project construction record documents and materials to Owner.
 - e. Certified property survey.
 - f. Proof, satisfactory to Owner, that taxes, fees and similar obligations of the Contractor have been paid.
 - g. Removal of temporary facilities, services, surplus materials, rubbish and

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similar provisions.

- h. Change over of door locks and other Contractor access to Owner's property.
- i. Consent of Surety for Final Payment.

H. Application Transmittal:

- 1. Submit number of copies to be verified at first Owner/Architect/Contractor meeting. Include with one copy waivers of lien and similar attachments.
- 2. Transmit each copy with a transmittal form listing those attachments, and recording appropriate information related to the application in a manner acceptable to the Architect.
- 3. Transmit to Architect to ensure receipt within 24 hours.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

SECTION 01-2100
ALLOWANCES

PART 1 - GENERAL

- 1.1 SUMMARY
 - A. Requirements for the following allowances:
 - 1. Lump-sum cash allowances.
 - B. Certain requirements of the Work related to each allowance are shown and specified in the Contract Documents.
 - C. The allowance has been established in lieu of additional requirements for that work; further requirements (if any) will be issued by Change Order.
- 1.2 SELECTING AND PURCHASING
 - A. At the earliest feasible date after the award of Contract, the Architect/Engineer must be advised of the scheduled date when the final selection and purchase of each product or system described by each allowance will be accomplished in order to avoid delays in the performance of the Work.
 - B. Obtain and submit proposals for the work of each allowance, as requested by the Architect/Engineer for use in making final selections. Include whatever recommendations for selection that may be important for proper performance of the Work.
 - C. Purchase the products and systems as specifically selected (in writing) by the Architect/Engineer.
 - D. Submit proposals and recommendations for the purchase of products or systems described by each allowance in accordance with "Change Order Requirements" specified in this Section.
- 1.3 CASH ALLOWANCE
 - A. Comply with the General Conditions for the cash allowances enumerated below.
 - B. Schedule of Lump-Sum Allowances (to be carried by the Construction Manager):
 - 1. Lump-Sum Allowance: Allow the lump-sum of \$25,000 for the purchase and delivery of Landscaping to be specified and detailed at a later date.
 - 2. Lump-Sum Allowance: Allow the lump-sum of \$50,000 for the purchase and delivery of Interior and Exterior Signage to be specified and detailed at a later date.

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PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION

SECTION 01-2513
PRODUCT SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Requirements for requesting approval of proposed substitutions.
- B. The requirements of this section govern the use of "Substitution Request Form - Section 01-2513.13".

1.2 SUBSTITUTION CLAUSE

- A. When a material, article, or piece of equipment is identified on the drawings or in the specifications by reference to manufacturer's or vendor's name, trade name, catalog number, or the like, it is only identified to establish a standard. Within the specifications, two other manufacturers are listed as "approved equals" and are not required to be submitted for additional approval. A substitution request shall be made in the event there is a material, article, or piece of equipment of other manufacturers or vendors that will perform, equally or better, the duties imposed by the general design. The request will then be considered equally acceptable provided the proposed items are, in the opinion of the architect, of equal substance, appearance, and function. These items shall not be purchased or installed by the Contractor without the Architect's written approval. As part of the approval process the proposed brand name products must meet ARRA requirements before concurring that they are otherwise acceptable. Therefore bidders and contractors shall submit a certification that proposed substitutes and equals meet ARRA requirements with any such submittal.

1.3 LIMITATIONS ON SUBSTITUTIONS

- A. Substitutions will not be considered unless the "Substitution Request Form - Section 01-6325" attached in this Project Manual is used and the requirements of this section and Section 01-6325 are fully complied with.
 - 1. Other types of forms are not acceptable.
- B. Substitutions will not be considered when indicated on shop drawings or product data submittals without separate formal request complying with "submittal procedures" specified in this section.
- C. Substitutions will not be considered unless submitted through the General Contractor.
- D. Additional studies, investigations, submittals, redesign and/or analysis by the Architect/Engineer caused by the requested substitutions shall be paid by the Contractor at no expense to the Owner.
- E. Substitute products shall not be ordered or installed without written acceptance.
- F. Only one request for substitution for each product will be considered. When substitution is not accepted by the Architect, provide the specified product.
- G. Architect will determine the acceptability of all substitutions.

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1.4 REQUESTS FOR SUBSTITUTIONS

- A. Contractor's Representation:
 - 1. Request for substitution constitutes a representation that the Contractor:
 - a. Has investigated the proposed product and has determined; that it is equal to or superior in all respects to the specified product.
 - b. Will provide same type of warranty for substitution as for specified product.
 - 1) Contractor's warranty shall be in writing guaranteeing all substituted products have same or superior performance as the product specified.
 - c. Will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.
 - d. Waives all claims for additional costs related to substitutions which consequently become apparent.
 - e. Has thoroughly investigated the proposed substitute to determine if license fees and royalties are pending on the proposed substitute, for compliance with General Conditions of the Contract.
 - f. That the proposed substitute meets ARRA requirements.
 - 2. Request for substitution constitutes a representation that the cost data is complete and includes all related cost under his Contract, but excludes any approved Architect's design fees required by substitution.
- B. Requests for substitutions shall be submitted on "Substitution Request Form - Section 01-2513.13" within one week of the designated bid date. Legible copies of this form shall be made as required for Contractor's submittals. Each submittal request form shall be complete with data substantiating compliance of proposed substitution with requirements of Contract Documents.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION

SUBSTITUTION REQUEST FORM 01- 2513.13-1
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SECTION 01-2513.13
SUBSTITUTION REQUEST FORM

ARCHITECT/ENGINEER WILL NOT REVIEW THIS FORM UNLESS COMPLETELY FILLED OUT INCLUDING SALIENT CHARACTERISTICS COMPARISON.

Project: Replacement Hospital for Wrangell Medical Center, Wrangell, Alaska

Submit to: Julia M. Covington
Johnson Johnson Crabtree Architects P.C.
Nashville, TN 37204
Fax: 615-837-0657
Email: jcovington@jjca.com

Date Submitted: _____

Specification Section No. and Title _____ - _____

Specified Item: _____

Paragraph No. (Example 2.3.A.) _____

Proposed Substitute: _____

Substitute Manuf. website/Direct link to product: _____

1. How will dimensions, gauges, and weights indicated in Contract Documents be changed by proposed substitute? _____

2. How will wiring, piping, and duct work indicated in Contract Documents be changed by proposed substitute? _____

3. How will other trades be effected by proposed substitute? _____

4. How will the construction schedule be effected by the proposed substitute? _____

5. How will the proposed substitute change unit costs? Circle and complete one below: No change. Cost will decrease by _____. Cost will increase by _____.

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Provide breakdown for cost changes on attached sheet.

6. How will the manufacturers warranty of proposed substitute differ from warranty indicated in Construction Documents?

7. Provide a point-by-point comparison of the important salient characteristics of proposed substitute against the specified item. Attach additional pages as needed. Do not leave this section blank or use words like “no difference” or “None”.

Specified Item	Proposed Item
<hr/>	<hr/>
<hr/>	<hr/>
<hr/>	<hr/>
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<hr/>	<hr/>
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8. Subcontractor Company Name: _____
Company Representative: _____
Telephone Number _____ email address _____

9. The undersigned makes the following certifications:
- a. The proposed substitution has been fully investigated and determined to have overall performance and longevity equal or superior to the specified product.
 - b. That cost data is complete and that no claim for additional cost will be made after Substitution Request is accepted.
 - c. That coordination, installation and changes associated with substitution will be complete.

General Contractor Company Name: _____
Company Representative: _____
Address: _____
Telephone Number _____ Fax Number _____
Signature & Date: _____

SUBSTITUTION REQUEST FORM 01- 2513.13-3
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10. Architects Acceptance

Accepted _____ Accepted as noted _____ Rejected (See comment below) _____

Comment _____

Architect' Signature & Date: _____

WEATHER DELAYS 01-02527-1
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SECTION 01-2527
WEATHER DELAYS

PART 1 - GENERAL

1.1 EXTENSIONS OF CONTRACT TIME

- A. If the basis exists for an extension of time in accordance with paragraph 8.3 of the Conditions, an extension of time on the basis of weather may be granted only for the number of Weather Delay Days in excess of the number of days listed as the Standard Baseline for that month.

1.2 STANDARD BASELINE FOR AVERAGE CLIMATIC RANGE

- A. If the Owner has reviewed weather data available from the National Oceanic and Atmospheric Administration (NOAA) and determined a Standard Baseline of average climatic range for the State of Alaska.
- B. Standard Baseline shall be regarded as the normal and anticipated number of calendar days for each month during which construction activity shall be expected to be prevented and suspended because of adverse weather. Suspension of construction activity for the number of days each month as listed in the Standard Baseline is included in the Work and is not eligible for extension of Contract Time.

1.3 ADVERSE WEATHER AND WEATHER DELAY DAYS

- A. Adverse weather is defined as the occurrence of one or more of the following conditions which prevents exterior construction activity or access to the site within twenty-four (24) hours
 1. Precipitation (rain, snow, or ice) in excess of one-tenth inch (0.10") liquid measure.
 2. Temperatures which do not rise above 32 degrees F by 10:00 a.m
 3. Temperatures which do not rise above that specified for the day's construction activity by 10:00 a.m., if any is specified
 4. Sustained wind in excess of twenty-five (25) m.p.h.
 5. Standing snow in excess of one inch (1.00").
- B. Adverse weather may include, if appropriate, "dry-out" or "mud" days:
 1. For rain days above the standard baseline.
 2. Only if there is a hindrance to site access or sitework, such as excavation, backfill, and footings; and
 3. At a rate no greater than 1 make-up day for each day or consecutive days of rain beyond the standard baseline that total 1.0 inch or more, liquid measure, unless specifically recommended otherwise by the Designer.
 4. A weather delay day may be counted if adverse weather prevents work on the project for fifty percent (50%) or more of the Contractor's scheduled work day, including a weekend day or holiday if Contractor has scheduled construction activity that day.

WEATHER DELAYS 01-02527-2
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1.4 DOCUMENTATION AND SUBMITTALS

- A. Submit daily jobsite work logs showing which and to what extent construction activities have been affected by weather on a monthly basis.
- B. Submit actual weather data to support claim for time extension obtained from nearest NOAA weather station or other independently verified source approved by designer at beginning of project.
- C. Use Standard Baseline data provided in this section when documenting actual delays due to weather in excess of the average climatic range.
- D. Organize claim and documentation to facilitate evaluation of a basis of calendar month periods, and submit in accordance with the procedures for claims established in paragraph 4.3 of the Conditions.
- E. Of an extension of the Contract Time is appropriate, it shall be effected in accordance with the provisions of Article 7 of the Conditions, and the applicable General Requirements.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION

SECTION 01-2600
CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Procedural requirements for considering and processing Change Orders.
- B. Related Requirements:
 - 1. Agreement: The amounts of established unit prices.
 - 2. Conditions of the Contract:
 - a. Methods of determining cost or credit to Owner resulting from changes in Work made on a time and material basis.
 - b. Contractor's claims for additional costs.
 - 3. Section 01-2100: Allowances.
 - 4. Section 01-2000: Price And Payment Procedures
 - 5. Section 01-7839: Project Record Documents.
- C. Forms for Changes: See Section 00-5000.

1.2 PROPOSAL PROCEDURES

- A. Owner or Architect may initiate a potential change by submitting a Proposal Request or Supplemental Instructions to Contractor. Request will include the following:
 - 1. Detailed description of the Change, Products, and location of the change in the Project.
 - 2. Supplementary or revised Drawings and Specifications.
 - 3. The projected time span for making the change and a specific statement as to whether overtime work is, or is not, authorized.
 - 4. A specific period of time during which the requested price will be considered valid.
 - 5. Such request is for information only, and is not an instruction to execute the changes, or to stop Work in progress.
- B. Contractor may initiate a request for changes by submitting a written notice to Architect, containing the following:
 - 1. Description of the proposed changes.
 - 2. Statement of the reason for making the changes.
 - 3. Statement of the effect on the Contract Sum and the Contract Time.
 - 4. Statement of the effect on the work of separate contractors.
 - 5. Documentation supporting any change in Contract Sum or Contract Time, as appropriate.
- C. Provide full written data required to evaluate changes.
 - 1. Maintain detailed records of work performed on a time-and-material/force account basis.
 - 2. Provide full documentation to Architect upon request.
- D. Designate in writing the member of Contractor's organization:
 - 1. Who is authorized to accept changes in the Work.
 - 2. Who is responsible for informing others in the Contractor's organization of the authorization of changes in the Work.

CONTRACT MODIFICATION PROCEDURES 01-2600-2
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- E. Owner will designate in writing the person who is authorized to execute Change Orders.

1.3 CONSTRUCTION CHANGE DIRECTIVES

- A. In absence of total agreement on the terms of a Change Order, the Architect may prepare and issue a Construction Change Directive directing a change in the Work, for subsequent inclusion in a Change Order.
 - 1. Construction Change Directive will describe changes in the Work and describe the method of determining any change in the Contract Sum or Contract Time, or both.
 - 2. Construction Change Directive will be signed by Owner and Architect.
- B. Upon receipt of a Construction Change Directive, Contractor shall do the following:
 - 1. Promptly proceed with the change in the Work involved.
 - 2. Promptly advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.
- C. A Construction Change Directive signed by the Contractor indicates the agreement of the Contractor therewith, including adjustment in Contract Sum and Contract Time or the method for determining them.
 - 1. Such agreement shall be effective immediately and shall be recorded as a Change Order.
 - 2. If Contractor does not respond promptly or disagrees with the Construction Change Directive, he shall comply with General Conditions.
- D. A Construction Change Directive shall be processed in compliance with requirements of the General Conditions.

1.4 DOCUMENTATION OF PROPOSALS AND CLAIMS

- A. Support each quotation for a lump-sum proposal, and for each unit price which has not previously been established, with sufficient substantiating data to allow Architect to evaluate the quotation.
- B. On request provide additional data to support time and cost computations:
 - 1. Labor required.
 - 2. Equipment required.
 - 3. Products required:
 - a. Recommended source of purchase and unit cost.
 - b. Quantities required.
 - 4. Taxes, insurance and bonds.
 - 5. Credit for work deleted from Contract, similarly documented.
 - 6. Overhead and profit, for subcontractor and General Contractor separately.
 - 7. Justification for any change in Contract Time.
- C. Support each claim for additional costs, and for work done on a time-and-material/force account basis, with documentation as required for a lump-sum proposal, plus the following additional information:
 - 1. Name of the Owner's authorized agent who ordered the Work, and date of the order.
 - 2. Dates and hours work was performed, and by whom.
 - 3. Time record, summary of hours worked, and hourly rates paid.

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4. Receipts and invoices for:
 - a. Equipment used, listing dates and times of use.
 - b. Products used, listing of quantities.
 - c. Subcontracts.
 - d. Overhead and Profit, Taxes, Insurance.
 - D. Document requests for substitutions for Products as specified elsewhere in Division 1.
- 1.5 PREPARATION OF CHANGE ORDERS
- A. Change Order will describe changes in the Work, both additions and deletions, with attachments of revised Contract Documents to define details of the change.
 - B. Change Order will provide an accounting of the adjustment in the Contract Sum and in the Contract Time.
- 1.6 LUMP-SUM/FIXED PRICE CHANGE ORDER
- A. Content of Change Orders will be based on, either:
 1. Architect's Proposal Request and contractor's responsive Proposal as mutually agreed between Owner and Contractor.
 2. Contractor's Proposal for a change, signed by the Contractor, as recommended by Architect.
 - B. Owner and Architect will sign and date the Change Order as authorization for the Contractor to proceed with the changes, after the Contractor has signed the Change Order.
- 1.7 TIME AND MATERIAL/FORCE ACCOUNT CHANGE ORDER/CONSTRUCTION CHANGE AUTHORIZATION
- A. Architect or Owner will issue a Construction Change Directive directing Contractor to proceed with the changes.
 - B. At completion of the change, Contractor shall submit itemized accounting and supporting data as provided in the Article "Documentation of Proposals and Claims" of this Section.
 - C. Architect will sign and date the Change Order to establish the change in Contract Sum and in Contract Time.
 - D. Owner and Contractor will sign and date the Change Order to indicate their agreement therewith.
- 1.8 CORRELATION WITH CONTRACTOR'S SUBMITTALS
- A. Periodically revise Schedule of Values and Request for Payment forms to record each change as a separate item of Work, and to record the adjusted Contract Sum.
 - B. Periodically revise the Construction Schedule to reflect each change in Contract Time.
 1. Revise sub-schedules to show changes for other items of work affected by the changes.

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- C. Upon completion of Work under a Change Order, enter pertinent changes in Record Documents.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOTE USED.

END OF SECTION

SECTION 01-3119
PROJECT MEETINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Contractor's Responsibilities:
 - 1. Schedule and administer meetings throughout duration of work.
 - 2. Prepare agenda for meetings.
 - 3. Distribute written notice of each meeting seven working days in advance of meeting date.
 - 4. Make physical arrangements for meetings.
 - 5. Preside at meetings.
 - 6. Record the minutes; include all significant proceedings and decisions.
 - 7. Reproduce and distribute copies of minutes within three working days after each meeting.
 - 8. Provide one copy to:
 - a. All participants in the meeting, including the Architect.
 - b. All parties affected by decisions made at the meeting.

- B. Participants:
 - 1. Qualified representative of Contractors, Subcontractors, and Suppliers authorized to act on behalf of the parties they represent.
 - 2. Owner's Representative at their option.

1.2 PRE-CONSTRUCTION MEETING

- A. Schedule meeting within the early stages of Construction as determined by the General Contractor.

- B. Suggested Agenda: Prepare written material, distribute lists, and discuss the following:
 - 1. Identification of major Subcontractors and Suppliers.
 - 2. Projected construction schedules.
 - 3. Critical work sequencing.
 - 4. Major equipment deliveries and priorities.
 - 5. Project coordination, including designation of responsible persons.
 - 6. Procedures for, and processing of:
 - a. Field decisions.
 - b. Proposal requests.
 - c. Submittals.
 - d. Change orders.
 - e. Applications for payments.
 - 7. Adequacy of distribution of Contract Documents.
 - 8. Procedures for Maintaining Record Documents.
 - 9. Use of premises:
 - a. Office, work and storage areas.
 - b. Owner's requirements.
 - c. Construction facilities, construction aids, and controls.
 - d. Procedures for preventing interaction of hazardous roof materials with HVAC intakes.

- e. Temporary utilities.
- f. Safety and first aid procedures.
- g. Security procedures.
- h. Smoking policy.
- i. Housekeeping procedures.
- j. Working days/hours.

1.3 PROGRESS MEETINGS

- A. Schedule regular monthly meetings and as necessary, schedule additional meetings.
- B. Suggested Agenda:
 - 1. Review and approval of minutes of previous meeting.
 - 2. Review of work progress since previous meeting.
 - 3. Field observations, problems, conflicts.
 - 4. Problems which impede construction schedule.
 - 5. Review of off-site fabrication, delivery schedules.
 - 6. Corrective measures and procedure required to regain projected schedule.
 - 7. Revisions to construction schedule.
 - 8. Plan progress and schedule for succeeding work period.
 - 9. Coordination of schedules.
 - 10. Review submittal schedules; expedite as required.
 - 11. Maintenance of quality standards.
 - 12. Review proposed changes for:
 - a. Effect on construction schedule and on completion date.
 - b. Effect on other contracts of the Project.
 - 13. Other business.

1.4 PRE-INSTALLATION MEETINGS

- A. Notify Architect ten working days before meeting date.
- B. Envelope and Roofing Pre-Installation Conference:
 - 1. Prior to starting roofing and exterior envelope work, the Contractor shall set up a job site meeting with the following attendees:
 - a. Contractor's Project Manager and Project Superintendent
 - b. Architect's Representative
 - c. Subcontractors responsible for portions of the Work associated with the building envelope and roof, including the following as applicable to the project: Masonry, fiber cement siding, exterior studs, exterior sheathing and vapor retarder, windows, through-wall flashing, sealants, roofing (insulation, lightweight concrete, roofing material), metal flashing/ fascia, roof drains, mechanical roof equipment, and any other subcontractors the general contractor feels need to be present for the discussion.
 - d. Manufacturers representatives for portions of the Work associated with the building envelope and roof, including the following as applicable to the project: Brick, fiber cement siding, exterior studs, exterior sheathing, flashing, sealants, roofing, and any other subcontractors the General Contractor feels need to be present for the discussion.
 - 2. Agenda: Review submittals, project specifications, pertinent details, testing requirements, and design intent.

3. Recording: The Contractor shall record discussions of conference and decisions reached, and furnish copy of record to each attendee.
- C. Door Hardware Pre-Installation Conference:
1. Prior to starting door hardware installation, the General Contractor shall set up a job site meeting with the following attendees:
 - a. General Contractor's Project Manager and Project Superintendent
 - b. Architect's Representative
 - c. Subcontractors responsible for portions of the Work associated with the door hardware installation, including the following as applicable to the project: Door Hardware, Automatic Operators, Electrical and any other subcontractors the General Contractor feels need to be present for the discussion
 - d. Owner's Representatives responsible for the installation and coordination of the door hardware, including the following as applicable to the project: Low voltage, Security, Keying, etc
 2. Agenda: Review door function and design intent of specialized doors and parties responsible for each component necessary.
 3. Recording: The Contractor shall record discussions of conference and decisions reached, and furnish copy of record to each attendee.
- D. Where elsewhere required in individual Specification Sections, schedule a pre-installation meeting at the job-site prior to starting the work of the Section.
1. Require attendance of entities directly affecting, or affected by, the work of the Section.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION

SECTION 01-3200
CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. This section includes administrative and procedural requirements for documenting the progress of construction during performance of the work, including the following:
 - 1. Contractor's construction schedule.
 - 2. Submittals Schedule
 - 3. Digital photographs of job site conditions.

1.2 SUBMITTALS

- A. Follow Section 01-3323 for making construction submittals.
 - 1. Contractor's Construction Schedule: Submit initial schedule, large enough to show entire schedule for entire construction period.
 - 2. Contractor's Submittal Schedule: Submit intended submittal schedule for entire project.
- B. Follow sections 01-7700, 01-7823 and 01-7833 for making closeout submittals
 - 1. Construction Photographs: Submit digital electronic files as a Project Record Document. Identify electronic media with dates photographs were taken.

1.3 QUALITY ASSURANCE

- A. Scheduling Consultant Qualifications: An experienced specialist in scheduling and reporting.
- B. Prescheduling Conference: Conduct conference at project site to review methods and procedures related to the Contractor's Construction Schedule, including, but not limited to, the following:
 - 1. Review software limitations and content and format for reports.
 - 2. Verify availability of qualified personnel needed to develop and update schedule.
 - 3. Discuss constraints, including phasing, work stages and area separations.
 - 4. Review delivery dates for Owner-furnished products.
 - 5. Review schedule for work of Owner's separate contracts.
 - 6. Review time required for review of submittals and resubmittals.
 - 7. Review requirements for tests and inspections by independent testing and inspecting agencies.
 - 8. Review time required for completion and startup procedures.
 - 9. Review and finalize list of construction activities to be included in schedule.
 - 10. Review submittal requirements and procedures.
 - 11. Review procedures for updating schedule.

1.4 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

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

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

- A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
 - 1. Coordinate Submittals Schedule with list of subcontractors, the Schedule of Values, and Contractor's Construction Schedule.
 - 2. Initial Submittal: Submit concurrently with preliminary construction schedule. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the work and those required early because of long lead time for manufacture or fabrication.
 - a. At Contractor's option, show submittals on the Preliminary Construction Schedule, instead of tabulating them separately.
 - 3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Procedures: Comply with procedures contained in AGC's "Construction Planning and Scheduling."
- B. Time Frame: Extend schedule from date established for commencement of the work to date of Final Completion.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- C. Activities: Treat each separate area as a separate numbered activity for each principal element of the work. Comply with the following:
 - 1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
 - 2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 - 3. Submittal Review Time: Include review and resubmittal times indicated in Division 1 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
 - 4. Startup and Testing Time: Include not less than seven days for startup and testing.
 - 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's and Construction Manager's administrative procedures necessary for certification of Substantial Completion.

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6. Punch List and Final Completion: Include not more than 30 days for punch list and final completion.
- D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the work is affected.
1. Phasing: Arrange list of activities on schedule by phase.
 2. Work Under More Than One Contract: Include a separate activity for each contract.
 3. Work by Owner: Include a separate activity for each portion of the work performed by Owner.
 4. Owner-Furnished Products: Include a separate activity for each product with delivery date. Delivery dates indicated stipulate the earliest possible delivery date.
 5. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Partial occupancy before Substantial Completion.
 - b. Use of premises restrictions.
 - c. Seasonal variations.
 - d. Environmental control.
 6. Work Stages: Indicate important stages of construction for each major portion of the work, including, but not limited to, the following:
 - a. Subcontract awards.
 - b. Submittals.
 - c. Purchases.
 - d. Mockups.
 - e. Fabrication.
 - f. Sample testing.
 - g. Deliveries.
 - h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.
 - k. Curing.
 - l. Startup and placement into final use and operation.
 7. Area Separations: Identify each major area of construction for each major portion of the work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a. Structural completion.
 - b. Permanent space enclosure.
 - c. Completion of mechanical installation.
 - d. Completion of electrical installation.
 - e. Substantial Completion.
- E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.
- F. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis to demonstrate the effect of the proposed change on the overall project schedule.
- G. Computer Software: Prepare schedules using a program that has been developed specifically to manage construction schedules.

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2.3 PRELIMINARY CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule within seven days of date established for commencement of the work.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 60 days of construction. Include skeleton diagram for the remainder of the work and a cash requirement prediction based on indicated activities.

2.4 CONTRACTOR'S CONSTRUCTION SCHEDULE- CRITICAL PATH METHOD (CPM)

- A. CPM Schedule: Prepare Contractor's Construction Schedule using a CPM network analysis diagram.
 - 1. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 - 2. Use "one workday" as the unit of time.
- B. CPM Schedule Preparation: Prepare a list of all activities required to complete the work.
 - 1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Purchase of materials.
 - c. Delivery.
 - d. Fabrication.
 - e. Installation.
 - f. Principal events of activity
 - g. Immediate preceding and succeeding activities.
 - h. Early and late start dates
 - i. Early and late finish date
 - j. Activity duration in workday
 - k. Total float or slack time
 - 2. Format: Mark the critical path.
- C. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
 - 1. Identification of activities that have changed.
 - 2. Changes in early and late start dates.
 - 3. Changes in early and late finish dates.
 - 4. Changes in activity durations in workdays.
 - 5. Changes in the critical path.
 - 6. Changes in total float or slack time.
 - 7. Changes in the Contract Time.

2.5 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at project site.
 - 1. List of subcontractors at project site.
 - 2. List of separate contractors to project site.

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3. Approximately count of personnel at project site.
 4. High and low temperatures and general weather conditions.
 5. Accidents.
 6. Meetings and significant decisions.
 7. Unusual events (refer to special reports).
 8. Stoppages, delays, shortages, and losses.
 9. Meter readings and similar recordings.
 10. Emergency procedures.
 11. Orders and requests of authorities having jurisdiction.
 12. Change Orders received and implemented.
 13. Construction Change Directives received.
 14. Services connected and disconnected.
 15. Equipment or system tests and startups.
 16. Partial Completions and occupancies.
 17. Substantial Completions authorized.
- B. Material Location Reports: At monthly intervals, prepare a comprehensive list of materials delivered to and stored at project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from project site.
- C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit with a request for information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.6 SPECIAL REPORTS

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

2.7 PHOTOGRAPHIC MEDIA

- A. Digital Images: Provide images in PDF format.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor to provide planning, evaluation, and reporting using CPM scheduling.
1. Scheduling to be performed by skilled personnel with experience in CPM scheduling and reporting techniques.
 2. The individual with scheduling responsibility shall attend all meetings related to project progress, alleged delays, and time impact.

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- B. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
 - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As the work progresses, indicate Actual Completion percentage for each activity.

- C. Distribution: Distribute copies of approved schedule to Architect, Construction Manager, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 - 1. Post copies in project meeting rooms and temporary field offices.
 - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the work and are no longer involved in performance of construction activities.

3.2 CONSTRUCTION PHOTOGRAPHS

- A. Preconstruction Photographs: Before starting construction, take four color photographs of project site and surrounding properties from different vantage points, plus interior photographs as directed by Architect. Show existing conditions adjacent to property and existing interior conditions.

END OF SECTION

SECTION 01-3323
SHOP DRAWINGS, PRODUCT DATA, SAMPLES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Procedures for processing:
 - 1. Shop Drawings
 - 2. Product Data
 - 3. Office Samples
 - 4. Mock-up Samples
 - 5. Certificate of Compliance
- B. See Section 01-3200 for Submittal Schedule procedures.
- C. See sections 01-7700, 01-7823 and 01-7833 for making closeout submittals.

1.2 GENERAL PROCEDURES

- A. The approval of submittals does not constitute a Change Order.
- B. All products shall be submitted with certification that the items meet ARRA Requirements.
- C. All items shall be submitted under Construction Manager's or Component Contractor's transmittal letter. The transmittal letter shall include the following information. If the following information is not included, the submittal will be returned un-reviewed for clarification.
 - 1. Project by title and Architect's project number.
 - 2. Contractor's contract number.
 - 3. Work and products by Specification Section, Article number and type (Product data, shop drawings, certification, etc.).
 - 4. All requirements for submittals specified in this section and individual sections of the Project Manual shall be complied with; partial submittals are not acceptable and will be returned by the Architect.
- D. Resubmittals: When Architect requires that a submittal be "resubmitted", comply with requirements of this section.
 - 1. Identify changes made since the previous submittal.
- E. Notify Architect in writing at time of submittal, of any deviations from the requirements of Contract Documents.
- F. Make all submittals far enough in advance of scheduled dates for installation to provide sufficient time for reviews, for securing necessary approvals, for possible revisions and resubmittals, and for placing orders and securing delivery.
 - 1. Architect's Review Time: In scheduling, allow at least 10 working days for Architect's review. (This review time shall apply to Architect's initial review, and allow at least 10 working days to review any subsequent required revision or resubmittal.)

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2. Delays caused by the tardiness of the Contractor in preparing and forwarding of submittals (including failure to include time for possible revisions and resubmittals) will not be an acceptable basis for extension of the Contract completion date or for consideration of alternate products which do not meet the specified requirements of this Project Manual.
- G. Fabricating products which require submittals to be approved by Architect before Architect approves and returns the submittals to Contractor shall be at Contractor's risk.
- H. Starting work which requires submittals to be approved by Architect before Architect approves and returns the submittals to Contractor shall be at Contractor's risk.
- I. Where used in the Contract Documents, the words "or equal" shall be defined as "refer to substitution requirements" specified in Section 01-2513.

1.3 SHOP DRAWINGS

- A. Reproduction of any portion of the Architect's Construction Documents for use as submittals for shop drawings is not acceptable, such submittals will be returned unreviewed.
- B. Submit shop drawings in a clear and thorough manner.
 1. Title each drawing with Project name and Architect's project number.
 2. Identify each element of drawings by reference to sheet number and detail, schedule, or room number of Contract Documents.
- C. Identify the following:
 1. Requirements of the individual section of Project Manual.
 2. Field measurements.
 3. Field construction criteria.
 4. Relation to adjacent or critical features of the Work or products.
 5. Conformance of submittal with requirements of Contract Documents.
- D. Shop drawings shall be stamped and signed by Contractor before submitting to Architect. Certify compliance with requirements of Contract Documents. If submittals from the Contractor are marked anything except "approved" or "approved as noted," the submittal will be returned and not checked by the Architect.
 1. The contractor's stamp shall contain a line to be filled in to indicate the applicable specification section(s) of the particular submittal. Submittals received without this information included will be returned without action.
- E. Seismic Information: Include calculations showing the adequacy of the item, represented by the Shop Drawing, to resist the expected vertical and lateral forces as indicated.
- F. Fabricating products or beginning the work before shop drawings are approved by Architect and returned to Contractor shall be at Contractor's risk.
- G. Number of Copies Required: Submit the number which are required to be returned plus two copies which will be retained by the Architect.

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1.4 PRODUCT DATA

- A. Submit only pages which are pertinent.
 - 1. Mark each copy of standard printed data to identify pertinent products, referenced to Specification Section and Article number.
 - 2. Show reference standards, performance characteristics, and capacities; wiring and piping diagrams and controls; component parts; finishes; dimensions; and required clearances.
 - 3. Provide current safety data sheets for products and materials which are hazardous or potentially hazardous to handle and install in the project. A copy of the data sheets shall be on file in job office for use by employees on the job site.
- B. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the Work. Delete information not applicable.
- C. Each set of manufacturer's product data shall be stamped and signed by Contractor before submitting to Architect to certify compliance with requirements of contract Documents.
- D. Number of Copies Required: Submit the number which are required to be returned plus two copies which will be retained by the Architect.

1.5 OFFICE SAMPLES

- A. Submit full range of manufacturer's standard finishes except when more restrictive requirements are specified, indicating colors, textures, and patterns, for Architect's selection.
- B. Submit samples to illustrate functional characteristics of products, including parts and attachments.
- C. Approved samples which may be used in the Work are indicated in the Specification section.
- D. Label each sample with identification required for transmittal letter.
- E. Number Required: Submit the number which are required to be returned plus two copies which will be retained by the Architect.

1.6 MOCK-UP SAMPLES

- A. Where mock-up samples and similar samples are indicated in the individual specifications section, comply with requirements for "Office Samples", and process transmittal forms for mock-ups to provide a record of activity.

1.7 MOCK-UPS

- A. Exterior Building Mock-up: Before exterior finishes are started and Pre-installation Conference for Envelope and Roofing is held, provide an exterior mock-up for Owner and Architect review and approval of all exterior finish elements, materials and

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construction manner. Size mock-up to be approximately 6' x 10', of layout provided by Architect. Construct mock-up as detailed in the Contract Documents.

1. Mock-up to incorporate all finish materials and specific details, such as bond, control joints, reveals, etc.
2. Mock-up to incorporate a typical opening with all waterproofing provisions shown in contract documents, such as the subsill pan. Flashing, etc.
3. Owner will test the mock-up panel assembly for moisture infiltration with hose test prior to construction of the entire envelope. Any failures will be discussed and resolved prior to incorporation into the building.
4. Contractor to schedule building of mock-up to allow for review and testing and not impact schedule.
5. Mock-up to be maintained on-site until building exterior is complete. Keep mock-up clean until removed from site, coordinate time of removal with Architect.

1.8 CERTIFICATIONS OF COMPLIANCE

- A. Contractor shall submit "Certificates of Compliance" certifying that all materials used in the Work comply with all specified provisions thereof.
 1. Submit in the form of a letter or company standard forms.
 2. Include data or dates of testing and results of testing.

1.9 TEST REPORTS

- A. Test reports certified by an independent testing laboratory must be made available upon request by Architect.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

SECTION 01-4000
QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. 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. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 2. Requirements for Contractor to provide quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- B. See Section 01-4529 and the Drawings for specific test and inspection requirements.

1.2 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Architect.
- C. Mockups: Full-size, physical example assemblies to illustrate finishes and materials. Mockups are used to verify selections made under Sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Mockups establish the standard by which the Work will be judged.
 - 1. See Section 01-3323 for additional requirements.
- D. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

1.3 DELEGATED DESIGN

- 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 Submittals: In addition to Shop Drawings, Product Data, and other required submittals, submit 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, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.4 REPORTS AND DOCUMENTS

- A. Reports: Prepare and submit certified written reports that include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, and telephone number of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.
 - 8. Complete test or inspection data.
 - 9. Test and inspection results and an interpretation of test results.
 - 10. Ambient conditions at time of sample taking and testing and inspecting.
 - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 - 12. Name and signature of laboratory inspector.
 - 13. Recommendations on retesting and reinspecting.

- B. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.5 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

- B. 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.

- C. 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.

- D. 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.

- A. 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 installations of the system, assembly, or products that are similar to those indicated for this Project in material, design, and extent.

- B. **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.
- C. **Testing Agency Qualifications:** An agency with the experience and capability to conduct testing and inspecting indicated, as documented by ASTM E 548, and that specializes in types of tests and inspections to be performed.

1.6 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 the types of testing and inspecting they are engaged to perform.
 - 2. Costs for retesting and reinspecting 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:** Unless otherwise indicated, provide quality-control services specified and required by authorities having jurisdiction.
 - 1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ the same entity engaged by Owner, unless agreed to in writing by Owner.
 - 2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 - 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 - 4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 - 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. **Special Tests and Inspections:** Owner will engage a testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner.
 - 1. See Section 01-4529 for code compliance testing requirements.
 - 2. Testing agency will notify Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 - 3. Testing agency will submit 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. Testing agency will submit a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
 - 5. Testing agency will interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 - 6. Testing agency will retest and reinspect corrected work.

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- D. **Manufacturer's Field Services:** Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.
- E. **Retesting/Reinspecting:** Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.
- F. **Testing Agency Responsibilities:** Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
 - 1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 - 2. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 - 3. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 - 4. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
 - 5. Do not perform any duties of Contractor.
- G. **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 inspections.
 - 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 - 4. Facilities for storage and field-curing of test samples.
 - 5. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 - 6. Security and protection for samples and for testing and inspecting equipment at Project site.
- H. **Coordination:** Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
 - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

- A. **General:** On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Sections of these Specifications. Restore patched areas and extend restoration into adjoining areas in a manner that eliminates evidence of patching.

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2. Comply with the Contract Document requirements for Division 1 Section "Cutting and Patching."
- 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 SECTION

SECTION 01-4517
UNCOVERING AND CORRECTION OF WORK

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. The requirements of Section 01-7329 Cutting and Patching form a part of this section and must be complied with.

1.2 UNCOVERING OF WORK

- A. If the Contract Documents, laws, ordinances, rules, regulations or orders of any Public Authority having jurisdiction require any portion of the Work to be inspected, the Contractor shall give the Architect timely notice of its readiness so that the Architect may observe such inspections.
- B. If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if required in writing by the Architect, be uncovered for the Architect's observation and be replaced at the Contractor's expense without change in the Contract Time.
- C. If a portion of the Work has been covered which the Architect has not specifically requested to observe prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor.
 - 1. If such Work is in accordance with Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be charged to the Owner.
 - 2. If such Work is not in accordance with Contract Documents, the Contractor shall pay such costs unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

1.3 CORRECTION OF WORK

- A. The Contractor shall promptly correct the Work rejected by the Architect and/or the Public Authority, whether observed before or after Substantial Completion and whether or not fabricated, installed or completed.
- B. The quality of materials and workmanship used in restoring this work shall be in full compliance with the requirements of the Contract Documents.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION

SECTION 01-4529
TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Laboratory services required to perform the specified testing shall be performed by an independent testing laboratory employed by the Owner.
- B. Contractors shall cooperate with the laboratory to facilitate the execution of its required services.
- C. Employment of the laboratory shall in no way relieve Contractors of obligations to perform the Work of the Contract.
- D. See Section 01-4000 for quality requirements.

1.2 QUALIFICATION OF LABORATORY

- A. Laboratory shall meet "Recommended Requirements for Independent Laboratory Qualification", published by American Council of Independent Laboratories.
- B. Laboratory shall be authorized to operate in the State in which the Project is located.

1.3 LABORATORY REPORTS

- A. After each inspection and test, Laboratory shall promptly submit the laboratory report to the Architect, Construction Manager, Owner, Structural Engineer, and Civil Engineer.
- B. Each report shall include:
 - 1. Date issued.
 - 2. Project Title and number.
 - 3. Testing laboratory name, address and telephone number.
 - 4. Name of laboratory inspector and job number.
 - 5. Date and time of sampling or inspection.
 - 6. Record of temperature and weather conditions.
 - 7. Date of test.
 - 8. Identification of specification section.
 - 9. Location of sample or test in the Project.
 - 10. Type of inspection or test and Identification of Testing Standard Specified and Used
 - 11. Results of tests and compliance with Contract Documents.
 - 12. Interpretation of test results.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 LABORATORY RESPONSIBILITIES

- A. Laboratory shall provide qualified personnel at site after due notice and cooperate with Architect and Contractor in performance of services.
- B. Laboratory shall perform specified inspection, sampling, and testing of products in accordance with specified standards.
- C. Laboratory shall ascertain compliance of materials and mixes with requirements of Contract Documents.
- D. Laboratory shall promptly notify Architect and Contractor of observed irregularities or non-conformance of Work or products.
- E. Laboratory shall perform additional inspections and tests required by Architect.
- F. Laboratory shall attend preconstruction conferences.

3.2 LIMITS ON TESTING LABORATORY AUTHORITY

- A. Laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
- B. Laboratory may not approve or accept any portion of the Work.
- C. Laboratory may not assume any duties of Contractor.
- D. Laboratory has no authority to stop Work.

3.3 CONTRACTOR RESPONSIBILITIES

- A. Cooperate with laboratory personnel, and provide access to Work.
- B. Provide incidental labor and facilities to provide access to work to be tested, to obtain and handle samples at the site or at source of products to be tested, to facilitate tests and inspections, and for storage and curing of test samples.
- C. Notify Architect and laboratory 24 hours prior to expected time for operations requiring inspection and testing services.
 - 1. When tests or inspections cannot be performed after such notice, Contractor shall notify the laboratory.
 - 2. If Contractor does not notify laboratory before laboratory personnel are scheduled for this work, Contractor shall reimburse the Owner for laboratory personnel and travel expenses.

3.4 CODE COMPLIANCE TESTING * SECTION TO BE EDITED*****

- A. The following construction components are to be tested or otherwise approved per 2006 International Building Code, Chapter 17

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1. Structural Components: See Structural Drawings for details on the testing of the following components.
 - a. Structural Load-bearing Member Fabrication
 - b. Steel Construction
 - c. Concrete Construction
 - d. Soils
 - e. Special Foundations
2. Architectural Components: See Specification Sections and Architectural Drawings for additional details on the testing of the following components.
 - a. Sprayed Fire-resistant Materials
 - 1) Prepared surface complies with manufacturer's instructions.
 - 2) Thickness, density and bond strength of material.
 - 3) Verification of application per manufacturer's instructions.
3. Mechanical Components: See Mechanical Drawings for details on the testing of the following components.
 - a. Smoke Control Systems
4. Seismic Resistance: See Structural Drawings for details on the testing of the following components.
 - a. Structural Steel
 - b. Cold-formed Steel Framing
 - c. Pier Foundations
 - d. Architectural Components: Bearing and Non-bearing walls and veneers may need to be tested if in Category D,E or F, over 30' tall, veneer over 5psf, non-bearing walls over 15 psf
 - e. Mechanical Components

3.5 ADDITIONAL CODE COMPLIANCE TESTING

- A. Additional inspections and tests required by local codes or ordinances, or by a plan approval authority having jurisdiction over the project site, and which are made by a legally constituted authority, shall be the responsibility of and shall be paid for by the Contractor, unless noted above or otherwise provided in the Contract Documents.

3.6 PAYMENT FOR TESTING

- A. Initial Services:
 1. When initial tests indicate non-compliance with the Contract Documents, the costs of initial tests associated with that non-compliance will be deducted by the Owner from the Contract Sum.
- B. Retesting:
 1. When initial tests indicate non-compliance with the Contract Documents, all subsequent retesting occasioned by the non-compliance shall be performed by the same testing agency and the costs thereof will be deducted by the Owner from the Contract Sum.
- C. Contractor's Convenience Testing:
 1. Inspecting and testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.

END OF SECTION

SECTION 01-5000
TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Temporary facilities and controls including:
 - 1. Temporary utilities
 - 2. Construction aids
 - 3. Security and protection facilities.
 - 4. Access roads and parking
 - 5. Project identification and signs
 - 6. Field office and storage trailers

1.2 SUBMITTALS

- A. Follow Section 01-3323 for making construction submittals.
 - 1. Affidavit: Contractor shall submit affidavit verifying that polyethylene and similar covering materials comply with requirements.

1.3 QUALITY ASSURANCE

- A. Regulations: Comply with Federal, state and local codes/regulations.
- B. Standards: Comply with applicable NFPA, ANSI, and NECA requirements.

1.4 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow to use temporary services and facilities without cost, including, but not limited to Owner, Architect, testing agencies, and authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Site Enclosure Fence: Provide commercial grade minimum 2", 0.148" thick, galvanized steel chain link fabric fencing equipped with vehicular (and pedestrian) gates and locks.
- B. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10 mils minimum thickness, with flame-spread rating of 15 or less per ASTM E84.
- C. Materials for temporary facilities and utilities may be new or used, but must be adequate in capacity for the required use. Materials used must not create unsafe conditions, and must not violate the requirements of applicable codes and standards.

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2.2 FIELD OFFICE AND STORAGE TRAILERS

- A. Provide a prefabricated, mobile unit or job built constructed weathertight field office with:
 - 1. Lighting, electrical outlets, heating, cooling and ventilating equipment, and equipped with furniture.
 - 2. Job telephone and fax machine.
 - 3. Computer, Internet service and email capability.
 - 4. Space for Project meetings, with table and chairs to accommodate a minimum of 12 persons.
 - 5. Work table large enough to accommodate working drawings.
 - 6. Hand carried, portable, UL rated fire extinguishers. Comply with NFFA 10 and NFFA 241 for classification, extinguishing agent and size required by location and class of fire exposure.
 - 7. Files, drawings, racks, and shelves to maintain order and neatness.
- B. Provide janitor service for the office.
- C. Provide lighted, weathertight storage trailer, for tools, materials and equipment with adequate space for organized storage and access. Provide heat and ventilation for products requiring controlled conditions.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated. Comply with NFPA 10 "Standard for Portable Fire Extinguishers" and NFPA 241 "Standard for Safeguarding Construction, Alterations and Demolition Operations".
- B. Heating Units: Provide as required by CFR 29, 1926 OSHA Construction Industry Regulations, Section 1926.154, Temporary Heating Devices.

PART 3 - EXECUTION

3.1 GENERAL

- A. Location: Locate temporary facilities to preclude interference with work and as directed.
- B. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- C. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage caused by freezing temperatures and similar elements.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
 - 2. Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or not later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary

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facility. Repair damaged work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are the property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements in 01-7400.

3.2 TEMPORARY ELECTRICITY AND LIGHTING

- A. Temporary Electric Service: Arrange with utility company, provide service required for power and lighting, and pay all costs for service and for power used.
- B. Provide adequate artificial lighting for all areas of work when natural light is not adequate for work, and for areas accessible to the public.
- C. Lamps and Light Fixtures: Provide general service type incandescent lamps of wattage required for adequate illumination. Where exposed to breakage by construction operations, protect lamps with guard cages or tempered glass enclosures. Provide exterior type fixtures where exposed to weather or moisture.
- D. Electrical Power Cords: Use only grounded extension cords: "hard-service" type where exposed to abrasion and traffic. Use single lengths or tape intermediate connections with waterproof electrical tape, or use waterproof connectors.

3.3 TEMPORARY HEAT AND VENTILATION

- A. Provide temporary heat and ventilation as required to maintain adequate environmental conditions to facilitate process of the work, to meet specified minimum conditions for the installation of materials, and to protect materials and finishes from damage due to temperature or humidity.
- B. Provide adequate forced ventilation of enclosed areas for curing of installed materials, to disperse humidity, and to prevent hazardous accumulations of dust, fumes, vapors or gasses.
- C. Pay all costs of installation, maintenance, operation and removal, and for fuel consumed.

3.4 TEMPORARY TELEPHONE/ INTERNET SERVICE/ DIGITAL CAMERA

- A. Arrange with local telephone service company, provide direct line telephone service at the construction site for the use of personnel and employees. Service required:
 1. One direct line instrument in Field Office.
 - a. At each telephone post and answering machine list of important telephone numbers

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- 1) Police and fire departments
 - 2) Ambulance service
 - 3) Contractor's home office
 - 4) Architect's office
 - 5) Engineer's office
 - 6) Owner's office
 - 7) Principal subcontractors' field and home offices
2. Other instruments at the option of the Contractor, or as required by regulations.
 3. Computer, internet service, email capability and digital camera.

- B. Pay all costs for installation, maintenance and removal, and service charges for local calls. Toll charges shall be paid by the party who places the call.

3.5 TEMPORARY WATER

- A. Arrange with utility service company, provide water for construction purposes; pay all costs for installation, maintenance and removal, and service charges for water used.
- B. Install branch piping with taps located so that water is available throughout the construction by the use of hoses. Protect piping and fittings against freezing.

3.6 TEMPORARY SANITARY FACILITIES

- A. Provide sanitary facilities in compliance with laws and regulations.
- B. Service, clean and maintain facilities and enclosures.

3.7 DRINKING WATER FACILITIES

- A. Provide containerized tap-dispenser bottled-water type drinking water units, including an adequate supply of paper cups. Use of Owner's drinking fountains is prohibited.

3.8 CONSTRUCTION AIDS

- A. Furnish, install and maintain required construction aids, remove on completion of Work.
- B. Comply with Federal, State and local codes and regulations.
- C. Materials may be new or used, suitable for the intended purpose, but must not violate requirements of applicable codes and standards.
- D. Provide construction aids and equipment required by personnel and to facilitate the execution of the Work; scaffolds, staging, ladders, stairs, ramps, runways, platforms, railings, hoists, cranes, chutes and other such facilities and equipment.
- E. Provide and operate drainage and pumping equipment. Maintain excavations and site free of standing water.
- F. Maintain all facilities and equipment in a first class condition.

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3.9 TEMPORARY ROADS AND PAVED AREAS

- A. Contractor shall construct temporary roads and paved areas adequate to support loads and to withstand exposure to traffic during construction period. If practical, locate temporary roads and paved areas in same location as permanent roads and paved areas.
- B. Access to site for delivery of construction materials and equipment shall be made only from locations as established by the Owner, Architect and Contractor at the pre-construction conference.

3.10 PROJECT IDENTIFICATION AND SIGNS

- A. General: Refer to the page following this section for requirements in regards to a Construction Sign. Specifics on wording shall be established prior to construction.

3.11 TEMPORARY CONSTRUCTION

- A. Provide temporary weather-tight enclosure of exterior walls for successive areas of the building as work progresses, as necessary to provide acceptable working conditions, provide weather protection for interior materials, allow for effective temporary heating, and to prevent entry of unauthorized persons.
 - 1. Provide temporary exterior doors with self-closing hardware and padlocks.
 - 2. Other enclosures shall be removable as necessary for work and for handling of materials.
- B. Temporary roof, partition and ceiling enclosure framing and sheet materials shall comply with structural and fire rating requirements of applicable codes and standards.
 - 1. Polyethylene type coverings to be used for interior and exterior protection of stored materials or products, temporary dust walls, or as weather protection at openings in exterior walls or ceilings to meet requirements in this section.
 - 2. Close joints between sheet materials, and seal edges and intersections with existing surfaces with fire retardant tape to prevent penetration of dust or moisture.
 - 3. Construct gypsum board enclosures in occupied areas, if required, to provide STC rating of 50, determined in accordance with ASTM E-90.
 - 4. Paint surfaces of gypsum board enclosures exposed to public view and in Owner occupied areas.
 - 5. See section 01-3533 for additional requirements

3.12 SECURITY AND PROTECTION FACILITIES

- A. General: Provide as required to prevent public entry to construction areas and adjacent properties from damage from construction operations.
- B. Site Enclosure Fence: Before construction begins, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering the site except by entrance gates.
- C. Barricades, Warning Signs and Lights: Comply with standard and code requirements and authorities having jurisdiction. Provide barricades and temporary lighting at streets and open ditches where construction work may present hazards to vehicles and personnel. Where appropriate provide flashing red or amber lights.

TEMPORARY FACILITIES AND CONTROLS 01-5000-6
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- D. Tree and Plant Protection: Provide barriers around trees and plants designated to remain and those adjacent to the site. Protect against vehicular traffic, stored materials, dumping, chemically injurious materials, and puddling or continuous running water.
 - 1. Replace, or suitably repair, trees and plants designated to remain which are damaged or destroyed due to construction operations.

3.13 TEMPORARY FIRE PROTECTION

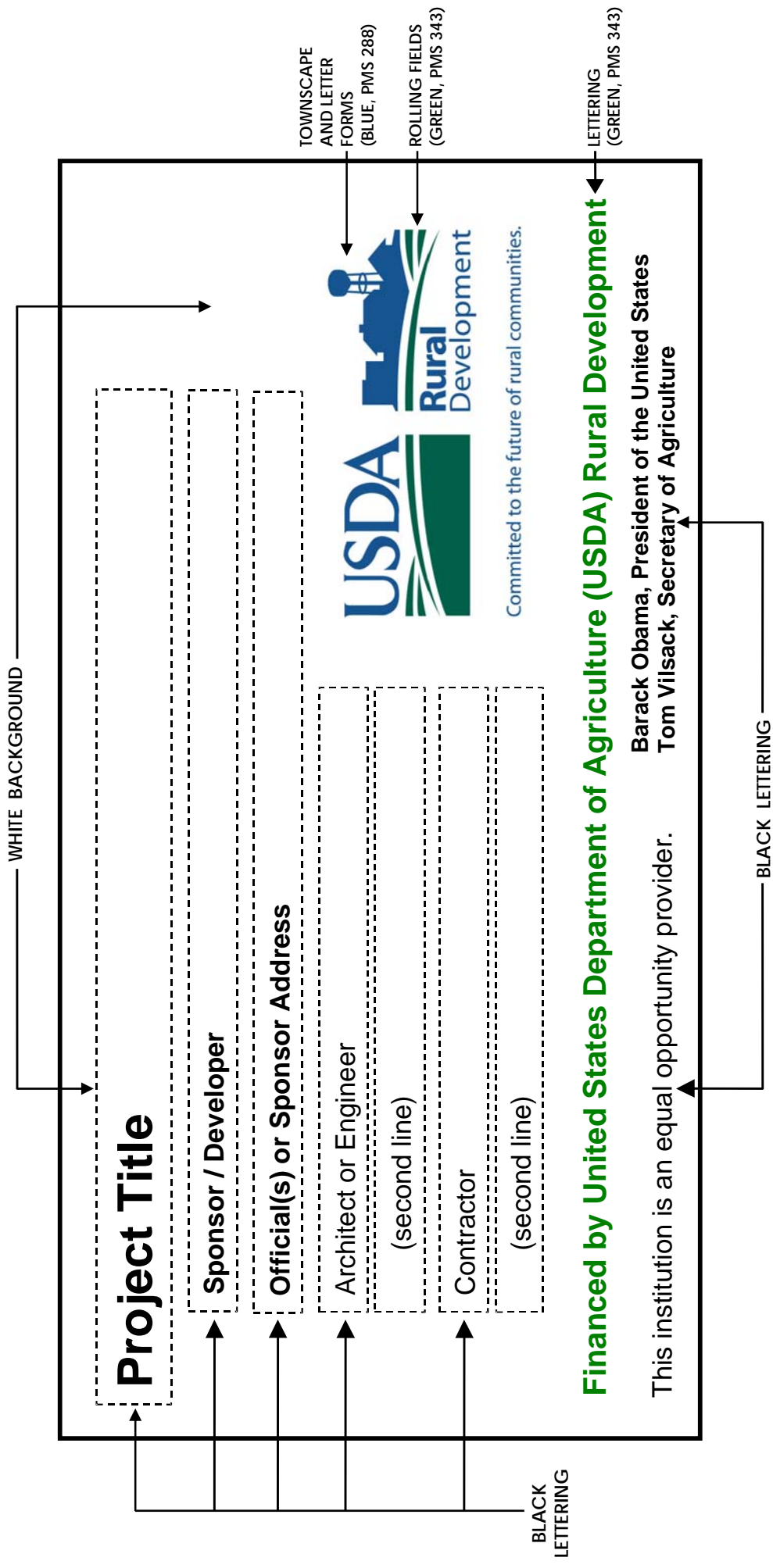
- A. Until fire protection needs are supplied by permanent facilities, install and maintain temporary fire protection facilities of the types needed to protect against reasonably predictable and controllable fire losses.
- B. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one (1) extinguisher on each floor at or near each exit.
- C. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, exits and other access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.
- D. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of fire ignition.
- E. Permanent Fire Protection: At the earliest feasible date in each area of the Project, complete installation of the permanent fire protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.

3.14 REMOVAL

- A. Remove temporary materials, equipment, services and construction prior to Substantial Completion.
- B. Clean and repair damage caused by installation or use of temporary facilities. Remove underground installations to a depth of two feet and grade as indicated or directed by the Architect.

END OF SECTION

TEMPORARY CONSTRUCTION SIGN FOR RURAL DEVELOPMENT PROJECTS



SIGN DIMENSIONS: 1200 mm x 2400 mm x 19 mm (approx. 4' x 8' x 3/4")
PLYWOOD PANEL (APA RATED A-B GRADE-EXTERIOR)

SECTION 01-6500
PRODUCT DELIVERY REQUIREMENTS

PART 1 - GENERAL

1.1 PACKAGING AND TRANSPORTATION

- A. Require supplier to package products in boxes or crates for protection during shipment. Protect sensitive products against exposure to elements and moisture.
- B. Protect sensitive equipment and finishes against impact, abrasion and other damage.

1.2 DELIVERY

- A. Arrange deliveries of products, including products furnished by the Owner, in accordance with construction schedules and in ample time to facilitate inspection prior to installation.
- B. Coordinate to avoid conflict with work and conditions at the site. Specifically coordinate to determine:
 - 1. Work of the Owner.
 - 2. Products furnished by the Owner.
 - 3. Work of other contractors.
 - 4. Availability of equipment and personnel for handling products.
 - 5. Owner's use of premises.
- C. Deliver products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.
- D. Clearly mark partial deliveries of component parts of equipment to permit easy accumulation of parts and to facilitate assembly.
- E. Immediately on delivery, inspect shipments to assure:
 - 1. Compliance with requirements of Contract Documents and approved submittals.
 - 2. Quantities are correct.
 - 3. Containers and packages are intact and that labels are legible.
 - 4. Products are properly protected and undamaged.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION

PRODUCT STORAGE AND HANDLING REQUIREMENTS 01-6600-1
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SECTION 01-6600
PRODUCT STORAGE AND HANDLING REQUIREMENTS

PART 1 - GENERAL

1.1 GENERAL STORAGE

- A. Store and handle products immediately on delivery in accordance with the manufacturer's printed instructions, with seals and labels intact and legible, and protect until installed in the work.
- B. Arrange storage in a manner to provide easy access for inspection.

1.2 ENCLOSED STORAGE

- A. Store products subject to damage by the elements in substantial weathertight enclosures.
- B. Maintain temperature and humidity within the ranges required by manufacturer's instructions.
- C. Store unpacked products on shelves, in bins or in neat piles, accessible for inspection.

1.3 EXTERIOR STORAGE

- A. Provide substantial platforms, blocking or skids to support fabricated products above the ground to prevent soiling or staining.
- B. Cover products which are subject to discoloration or deterioration from exposure to the elements with impervious sheet coverings. Provide adequate ventilation to avoid condensation.
- C. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.
- D. Provide surface drainage to prevent flow or ponding of rainwater.
- E. Prevent mixing of refuse or chemically injurious materials or liquids.

1.4 MAINTENANCE OF STORAGE

- A. Maintain a periodic system of inspections of stored products on a scheduled basis to assure that:
 - 1. Condition of storage facilities is adequate to provide required conditions.
 - 2. Required environmental conditions are maintained on a continuing basis.
 - 3. Surfaces of products exposed to elements are not adversely affected.
 - 4. Note: Any weathering of products, coatings and finishes is NOT acceptable under requirements of the Contract Documents.
- B. Have complete manufacturer's instructions for servicing accompanying each item, with notice of enclosed instructions shown on the exterior of the package, for mechanical and electrical equipment which requires servicing during long term storage.

PRODUCT STORAGE AND HANDLING REQUIREMENTS 01-6600-2

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1. Comply with the manufacturer's instructions on a scheduled basis.
2. Connect space heaters which are part of the electrical equipment and operate continuously until equipment is placed in service.

1.5 PROTECTION AFTER INSTALLATION

- A. Provide substantial coverings to protect installed products from damage from subsequent operations. Remove when no longer needed, prior to completion of work.
- B. Control traffic to prevent damage to equipment and surfaces.
- C. Provide coverings to protect finished surfaces from damage.
- D. Cover projections, wall corners, jambs, sills and soffits of openings, in areas used for traffic and passage of products in subsequent work.
- E. Protect finished floors and stairs from dirt and damage.
- F. In other areas subject to foot traffic, secure heavy paper, sheet goods on the materials in place.
- G. For movement of heavy products, lay planking or similar materials in place
- H. Waterproofed and roofing surfaces:
 1. Prohibit use of surfaces for traffic of any kind, and for storage of any products.
 2. When some activity must take place in order to carry out the Contract, obtain recommendations of the installer for protection of surface.
 3. Install recommended protection and remove on completion of that activity.
 4. Restrict the use of adjacent unprotected areas.
- I. Prohibit traffic of any kind across planted lawn and landscaped areas.

1.6 PRODUCT HANDLING

- A. Provide equipment and personnel to handle products by methods to prevent soiling or damage to products or packaging.
- B. Provide additional protection during handling as necessary to prevent scraping, marring, or otherwise damaging products or surrounding spaces.
- C. Handle products by using methods that will prevent bending or over stressing.
- D. Lift heavy components only at designated lifting points.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION

SECTION 01-7329
CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. This section modifies the General Conditions to include incidental requirements and limitations for cutting, fitting and patching that may be required within the new construction to complete the Work, or make its several parts fit together. Incidental cutting and patching is performed for coordination of the Work, to uncover for access or inspection, to obtain samples for testing, and to permit alterations to be performed or for similar purposes.

1.2 ADVANCED WRITTEN REQUESTS

- A. Submit written request in advance of cutting or alteration work which affects the following:
 - 1. Structural integrity of any element of the Project.
 - 2. Integrity of weather-exposed or moisture-resistant element.
 - 3. Efficiency, maintenance or safety of any operational element.
 - 4. Visual qualities of sight-exposed elements.
 - 5. Work of Owner or separate contractor.
- B. Include the following in each written request:
 - 1. Identification of Project.
 - 2. Location and description of affected work.
 - 3. Necessity for cutting or alterations.
 - 4. Description of proposed work, and materials and products to be used.
 - 5. Alternative to cutting and patching.
 - 6. Effect on work of Owner or separate contractor.
 - 7. Written permission of the affected separate contractor.
 - 8. Date and time the work will be executed.

1.3 QUALITY ASSURANCE

- A. General: Employ skilled workmen or firms qualified to perform cutting and patching specified in this section. Proceed with cutting and patching at the earliest feasible time and complete without delay.
- B. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would change their load-carrying capacity or load-deflection ratio.
- C. Operational Limitations: Do not cut and patch operating elements or related components in a manner that would result in reducing their capacity to perform as intended. Do not cut and patch operating elements or related components in a manner that would result in increased maintenance or decreased operational life or safety.
- D. Visual Requirements: Do not cut and patch construction exposed on exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic or visual qualities. Do not cut and patch construction in a manner that would

result in visual evidence of cutting and patching. Remove and replace construction which was cut and patched in a visually unsatisfactory manner.

- E. Warranty: Replace, patch, and repair material and surfaces cut or damaged by methods and with materials in such a manner as not to void required warranties.

1.4 DESCRIPTION

- A. Install Work in such a manner and sequence as to preclude or minimize cutting and patching of new Work.
- B. Execute cutting, fitting or patching of Work, required to:
 - 1. Make several parts fit properly.
 - 2. Uncover Work to provide for installation of ill timed Work.
 - 3. Remove and replace defective Work.
 - 4. Remove and replace non-conforming Work.
 - 5. Remove samples of installed Work for testing.
 - 6. Install specified Work in existing construction.
 - 7. Provide rerouting penetrations of non-structural surfaces for installation of piping and electrical conduit.
 - 8. Patch and repair fireproofing damaged after installation of other Work or demolition activities.
 - 9. Remove and finish construction at connections to other structures.
- C. Do not cut building framing members or modify the foundation without written approval or consent of Architect.
- D. Be responsible for damage resulting from violation of these provisions.
- E. Use only firms or individual trades qualified to perform Work required under this Section.

1.5 JOB CONDITIONS

- A. Before start of Work, obtain and pay for all permits required by all authorities having jurisdiction and notify all interested utilities companies.
- B. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- C. Items to be salvaged and delivered to Owner shall be carefully removed and properly stored in an area easily accessible for removal by Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Types: New materials and products of types and quality identical to existing materials.
- B. For exposed surfaces, use materials that visually match existing adjacent surfaces.
- C. Use materials whose installed performance will equal or surpass that of existing materials.

- D. Comply with specifications for type of Work to be performed.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Perform preliminary investigations as required to ascertain extent of Work.
 - 1. Conditions which would be apparent by such investigation will not be allowed as cause for claims for extra costs.
- B. If unsafe or unsatisfactory conditions are encountered, take corrective action before proceeding.
- C. Before proceeding, meet at Project Site with parties involved in cutting and patching, including mechanical and electrical trades.
 - 1. Review areas of potential interference and conflict.
 - 2. Coordinate procedures and resolve potential conflicts before proceeding.

3.2 PREPARATION

- A. Provide adequate shoring, bracing and support as required to maintain structural integrity of Project.
- B. Provide protection from elements for other portions of Project which may be affected.
- C. Erect and maintain dustproof partitions as required to prevent spreading of dust, fumes and smoke to other parts of the building.

3.3 CUTTING AND REMOVAL - GENERAL

- A. Execute fitting and adjustment to provide finished installation to comply with specified tolerances and finishes.
- B. Execute cutting by methods which will prevent damage to existing or other Work and will provide proper surfaces to receive installation of new Work.
- C. Neatly cut and remove materials, and prepare all openings to receive new Work.
- D. Concrete or masonry shall be removed in small sections.
- E. Provide shoring, bracing, and other supports to prevent movement, settlement, or collapse of remaining or adjacent wall areas, structure, or facilities.
- F. Arrange shoring, bracing, and supports to prevent overloading of structure.
- G. Take all precautions necessary to prevent damage to existing remaining work or to adjacent facilities.
- H. Use methods which will prevent interference with use of remaining and adjacent facilities by Owner.
- I. Provide for cutting, fitting, repairing, patching and finishing of Work disturbed by installation of new Work.

3.4 MATCHING AND PATCHING

- A. At penetrations of fire-rated walls, ceilings, or floor construction, completely seal voids with fire-rated material, full thickness of the construction element.
- B. Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- C. Use methods and materials similar in appearance, and equal in quality to areas or surfaces being repaired.
- D. Restore Work which has been cut or removed; install new products to provide completed Work in accord with requirements of Contract Documents.
- E. Patch Work must in every way possible match adjacent surfaces.
- F. Re-finish entire surfaces as necessary to provide an even finish to match adjacent finishes.
 - 1. Continuous surfaces; to nearest intersections.
 - 2. Assembly - entire refinishing.

END OF SECTION

SECTION 01-7400
CLEANING AND WASTE MANAGEMENT

PART 1 - GENERAL

1.1 SITE MAINTENANCE

- A. Maintain premises and public properties free from accumulations of waste, debris, and rubbish caused by operations.
- B. Keep streets clean from mud, dirt, debris, and other materials removed from the job site.
- C. At completion of work, remove waste materials, rubbish, tools, equipment, machinery, and surplus materials. Clean all sight-exposed surfaces.
- D. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
 - 1. Do not burn or bury rubbish and waste materials on project site.
 - 2. Do not dispose of volatile waste such as mineral spirits, oil, and paint thinner in storm drains or sanitary sewers.
- E. Hazard Control:
 - 1. Store volatile wastes in covered metal containers, and remove from premises daily.
 - 2. Prevent accumulation of waste which might cause hazardous conditions.
 - 3. Provide adequate ventilation during use of volatile and noxious substances.

1.2 PROGRESS CLEANING

- A. Keep building, grounds, and public properties free from accumulations of waste materials and rubbish.
- B. Wet down dry materials and rubbish to prevent dust.
- C. During progress of Work, clean site and public properties and dispose of waste materials, debris and rubbish.
- D. Provide on-site containers for collection of waste materials, debris, and rubbish.
- E. Vacuum interior building areas, where work is performed prior to painting and other finish work.
- F. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, new painted surfaces.

1.3 FINAL CLEANING

- A. Employ experienced workmen or professional cleaners for final cleaning.
- B. In addition to removal of debris and cleaning specified in other sections, clean interior and exterior exposed-to-view surfaces.

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- C. Remove temporary protection and labels not required to remain.
- D. Clean finishes free of dust, stains, films and other foreign substances.
- E. Clean transparent and glossy materials to a polished condition; remove foreign substances. Polish reflective surfaces to a clear shine.
- F. Vacuum clean carpeted and similar soft surfaces.
- G. Clean resilient and floor finishes as specified.
- H. Clean surfaces of equipment; remove excess lubrication.
- I. Clean plumbing fixtures to a sanitary condition.
- J. Clean permanent filters of ventilating equipment and replace disposable filters when units have been operated during construction; in addition, clean ducts, blowers, and coils when units have been operated without filters during construction.
- K. Clean light fixtures and lamps.
- L. Remove debris, rubbish, dirt, etc. from open concealed spaces, chases and above ceilings.
- M. Repair, patch, and touch-up marred surfaces to specified finish and to match adjacent surfaces.
- N. Remove waste, foreign matter, and debris from roofs and drainage systems.
- O. Remove waste, debris, and surplus materials from site. Clean grounds; remove stains, spills, and foreign substances from paved areas and sweep clean. Rake clean other exterior surfaces.
- P. Maintain cleaning until Final Completion.
- Q. Prior to Final Completion, or Owner occupancy, Contractor shall conduct an inspection of sight exposed interior and exterior surfaces, and all work areas, to verify that the entire work is clean.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Use only cleaning materials recommended by manufacturer of surface to be cleaned.
- B. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 - EXECUTION – NOT USED

END OF SECTION

SECTION 01-7700
CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUBSTANTIAL COMPLETION

- A. When Work is considered to be substantially complete, submit the following to Architect:
 - 1. Written notice that the Work, or designated portion, is substantially complete.
 - 2. List of items to be completed or corrected (contractor's punch list).
- B. Within a reasonable time, Architect will inspect to determine status of completion, and compile a punch list of items to be completed and corrected. If Architect determines that Work is not substantially complete, he will immediately notify Contractor in writing. Architect will generally point out his reasons, but he will not be obligated to give an exhaustive list of discrepancies.
- C. Contractor's Duties: Remedy deficiencies and send Architect another written Notice of Substantial Completion.
- D. Architect's Actions:
 - 1. Reinspect the Work.
 - 2. When Architect considers Work substantially complete, he will issue the Certificate of Substantial Completion.

1.2 AGENCY INSPECTIONS

- A. When Work is considered to be substantially complete, the Contractor shall schedule inspections by all applicable authorities having jurisdiction. The Contractor shall notify the Owner and Architect of the anticipated date of these inspections, and further advise of any action needed by Owner and Architect to facilitate these inspections.
- B. An inspection by the state and local authorities having jurisdiction will be required following Substantial Completion and prior to Owner Occupancy. The Contractor shall notify the Architect approximately 30 days prior to the desired State Health Department inspection date so that the Architect may schedule this inspection. The Contractor shall have the documentation complete and in good order to review during the inspection, including, but not limited to:
 - 1. Certificate of Compliance or Occupancy issued by the local building official.
 - 2. Certification of Compliance issued by the state fire marshal.
 - 3. Medical Gas Certification.
 - 4. Sprinkler Certification.
 - 5. Fire Alarm Installation Certification. (Applicable State form, completed by Fire Alarm Installer.)
 - 6. Documentation of flame spread ratings of vinyl wall coverings.
 - 7. Elevator Certification.
 - 8. Mechanical, Electrical Systems Certification.
 - 9. Nurse Call/Code Blue Certification.
 - 10. Final Test & Balance Report.
 - 11. Emergency Generator Start-up Sheets & most recent Test Run.
 - 12. Certification that hot water temperatures are properly adjusted.

13. Certification that kitchen equipment is installed and fully operational.

1.3 OWNER OCCUPANCY

- A. Owner's Action: Occupy the Project, or designated portion of the Project, in accordance with provisions of the Certificate of Substantial Completion.
- B. Contractor's Duties:
 - 1. Obtain Certificate of Occupancy if required by local building codes authority.
 - 2. Obtain consent of insurance company or companies to keep insurance in force during partial occupancy by Owner.
 - 3. Make corrections listed on punch list attached to Certificate of Substantial Completion.
 - 4. Perform final clean-up.

1.4 FINAL COMPLETION

- A. When Work is considered to be complete, Contractor shall submit certification indicating the following:
 - 1. Contract Documents have been reviewed and Work has been inspected for compliance with those Documents.
 - 2. Work has been completed in accordance with Contract Documents.
 - 3. All punch list items have been corrected.
 - 4. Equipment and systems have been tested in presence of Owner's Representative and are operational.
 - 5. Work is complete and ready for final inspection.
- B. Architect's Actions During Final Inspection:
 - 1. Inspect to verify the status of completion with reasonable promptness.
 - 2. If he considers Work incomplete or defective, he will promptly notify Contractor in writing, listing deficiencies.
- C. Contractor's Duties: Take immediate action to correct deficiencies, and send certification to Architect that Work is complete.
- D. When Architect determines that Work is acceptable, he will request Contractor to make closeout submittals.

1.5 REINSPECTION FEES

- A. Should status of completion of work require reinspection by Architect due to failure of work to comply with Contractor's claims on initial inspection, Owner will deduct the amount of Architect compensation for reinspection services from final payment to Contractor.

1.6 CONTRACTOR'S CLOSEOUT SUBMITTALS REQUIRED

- A. Documents required by State Licensure inspectors and other authorities having jurisdiction.
- B. Certification that new work in building is asbestos free as required in Section 01-1100.
- C. Project Record Documents: Comply with Section 01-7839.

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- D. Operation and Maintenance Data: Comply with Section 01-7823.
- E. Product Warranties and Bonds: Comply with Section 01-7833.
- F. Keys and Keying Schedule: Comply with Section 08-7100.
- G. Evidence of Payment and Release of Liens: Comply with requirements and Conditions of the Contract.
- H. Consent of Surety to Final Payment.
- I. Certificates of Insurance for Products and Completed Operations: Comply with Supplementary Conditions.
- J. Test Results: Complete, dated test results of various systems signed by person authorized to sign for a qualified testing agency which conducted tests.
- K. Provide products, spare parts and maintenance materials in quantities specified in each section, in addition to that used for construction of the work.
 - 1. Coordinate with Owner; deliver to Project Site and obtain receipt to include with final payment.

1.7 STATEMENT OF ADJUSTMENT OF ACCOUNTS

- A. Submit a final statement to Architect indicating all adjustments to the Contract Sum. Include the following:
 - 1. Original Contract Sum.
 - 2. Previous change orders.
 - 3. Changes under allowances.
 - 4. Changes under unit prices.
 - 5. Deductions for uncorrected work.
 - 6. Penalties and bonuses.
 - 7. Deductions for liquidated damages.
 - 8. Deductions for reinspection fees.
 - 9. Other adjustments to Contract Sum.
 - 10. Total Contract Sum, as adjusted.
 - 11. Previous payments.
 - 12. Sum remaining due.
- B. If required, a final Change Order will be prepared reflecting approved adjustments to Contract Sum which were not previously made on Change Orders.

1.8 FINAL APPLICATION FOR PAYMENT

- A. Submit final Application for Payment in accordance with procedures and requirements of the Conditions of the Contract.

1.9 FINAL PAYMENT

- A. Owner will make final payment.
- B. If the final payment is materially delayed through no fault of the Contractor, the Owner may issue a semi-final payment.

1.10 POST-CONSTRUCTION INSPECTION

- A. Prior to expiration of one year from the Date of Substantial Completion, the Architect will make a visual inspection of the Project to determine whether correction of Work is required, in accordance with the Conditions of the Contract.
- B. The Architect will promptly notify the Contractors, in writing, of any observed deficiencies. Contractors shall then correct deficiencies promptly.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION

SECTION 01-7823
OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Compile product data and related information appropriate for Owner's maintenance and operation of products furnished under the Contract.
- B. Prepare operating and maintenance data as specified in this Section and as referenced in other pertinent sections of Specifications.
- C. Instruct Owner's personnel in the maintenance of products and in the operation of equipment and systems.

1.2 QUALITY ASSURANCE

- A. Have data prepared by personnel:
 - 1. Trained and experienced in maintenance and operation of the described products.
 - 2. Completely familiar with requirements of this Section.
 - 3. Skilled as a technical writer to the extent required to communicate essential data.
 - 4. Skilled as a draftsman competent to prepare required drawings.

1.3 SUBMITTALS

- A. Submit a copy of preliminary draft of proposed format and outline of contents of the operating and maintenance instructions manuals prior to Substantial Completion.
- B. Submit one copy of completed manuals in final form prior to final inspection or acceptance.
- C. Submit two (2) copies of approved manuals in final form after final inspection or acceptance.

PART 2 - PRODUCTS

2.1 OPERATING AND MAINTENANCE INSTRUCTION MANUALS

- A. Prepare a neatly typewritten table of contents for each volume, arranged in a systematic order, to include:
 - 1. Contractor, name of responsible principal, address, and telephone number.
 - 2. A list of each product required to be included, indexed to the content of the volume.
 - 3. List, with each product, the name, address, and telephone number of:
 - a. Subcontractor or installer.
 - b. Maintenance contractor, as appropriate.
 - c. Identify the area of responsibility of each.
 - d. Local source of supply for parts and replacement.
 - 4. Identify each product by product name and other identifying symbols as set forth in Contract Documents.
- B. Product Data:

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1. Include only those sheets which are pertinent to the specific product.
 2. Annotate each sheet to:
 - a. Clearly identify the specific product or part installed.
 - b. Clearly identify the data applicable to the installation.
 - c. Delete references to inapplicable information.
- C. Drawings:
1. Supplement product data with drawings as necessary to clearly illustrate:
 - a. Relations of component parts of equipment and systems.
 - b. Control and flow diagrams.
 2. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation.
 3. Do not use Project Record Documents as maintenance drawings.
- D. Written text, as required to supplement product data for the particular installation:
1. Organize in a consistent format under separate headings for different procedures.
 2. Provide a logical sequence of instructions for each procedure.
- E. Provide information sheet for Owner's personnel noting:
1. Proper procedures in the event of failure.
 2. Instances which might affect the validity of warranties or bonds.

2.2 MATERIAL INFORMATION

- A. Content for architectural products:
1. Manufacturer's data, giving full information on products.
 2. Information required for reordering specially manufactured products.
 3. Instructions for care and maintenance.
 4. Manufacturer's recommendation for types of cleaning agents and methods.
 5. Cautions against cleaning agents and methods which are detrimental to the product.
 6. Recommended schedule for cleaning and maintenance.
- B. Content for moisture protection and weather exposed products:
1. Manufacturer's data, giving full information on products.
 2. Applicable standards.
 3. Chemical composition.
 4. Details of installation.
- C. Instructions for inspection, maintenance and repair.
- D. Additional requirements for maintenance data: The respective section of Specifications.
- E. Provide complete information for products of sections of the Project Manual.

2.3 EQUIPMENT AND SYSTEMS INFORMATION

- A. Content for each unit of equipment and system, as appropriate:
1. Description of unit and component parts.
 2. Function, normal operating characteristics, and limiting conditions.
 3. Performance curves, engineering data, and tests.
 4. Complete nomenclature and commercial number of all replaceable parts.

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- B. Operating Procedures:
 - 1. Start-up, break-in, routine and normal operating instructions.
 - 2. Regulation, control, stopping, shutdown, and emergency instructions.
 - 3. Summer and winter operating instructions.
 - 4. Special operating instructions.
- C. Maintenance Procedures:
 - 1. Routine operations.
 - 2. Guide to "troubleshooting."
 - 3. Disassembly, repair, and reassembly.
 - 4. Alignment, adjusting, and checking.
- D. Servicing and lubrication schedule.
 - 1. List of lubricants required.
- E. Manufacturer's printed operating and maintenance instructions.
- F. Description of sequence of operation by control manufacturer.
- G. Original manufacturer's parts list, illustrations, assembly drawings, and diagrams, required for maintenance.
 - 1. Predicted life of parts subject to wear.
 - 2. Items recommended to be stocked as spare parts.
- H. As-installed control diagrams by controls manufacturer.
- I. Each contractor's coordination drawings.
 - 1. As-installed color coded piping diagrams.
- J. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
- K. Other data as required under pertinent sections of Specifications.
- L. Content for each electrical and electronic system, as appropriate:
 - 1. Description of system and component parts.
 - 2. Function, normal operating characteristics and limiting conditions.
 - 3. Performance curves, engineering data, and tests.
 - 4. Complete nomenclature and commercial number of replaceable parts.
 - 5. Circuit directories of panelboards.
 - 6. Electrical service.
 - 7. Controls.
 - 8. Communications.
 - 9. As-installed color-coded wiring diagrams.
 - 10. Operating schedules:
 - a. Routine and normal operating instructions.
 - b. Sequences required.
 - c. Special operating instructions.
 - 11. Maintenance procedures:
 - a. Routine operations.
 - b. Guide to "troubleshooting."
 - c. Disassembly, repair, and reassembly.
 - d. Adjustment and checking.

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- 12. Manufacturer's printed operating and maintenance instructions.
- 13. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
- 14. Other data as required under pertinent section of Specifications.

- M. Prepare and include additional data when the need for such data becomes apparent during the instruction of Owner's personnel.

- N. Additional requirements for operating and maintenance data: The respective sections of Specifications.

- O. Provide complete information for products of sections of the Project Manual.

2.4 INSTRUCTION OF OWNER'S PERSONNEL

- A. Prior to final inspection or acceptance, fully instruct Owner's designated operating and maintenance personnel in the operation, adjustment and maintenance of all products, equipment, and systems.

- B. Record all instructions and provide on DVD with manuals.

- C. For each item, record the following information:
 - 1. Time and date of instruction.
 - 2. Name(s) of personnel providing instruction.
 - 3. Name(s) of personnel receiving instruction.
 - 4. Items covered during instructions.

- D. Use operating and maintenance manual to constitute the basis of instruction.
 - 1. Review contents of manual with personnel in full detail to explain all aspects of operations and maintenance.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Prepare data in the form of an instructional manual for use by Owner's personnel. Organize information by sections of the Project Manual.

- B. Format:
 - 1. Paper: 8-1/2" x 11", white.
 - 2. Text: Manufacturer's printed data, or neatly typewritten.

- C. Drawings:
 - 1. Provide reinforced punched binder tab; bind in with text.
 - 2. Fold larger drawings to the size of the text pages.

- D. Product Literature:
 - 1. Provide fly-leaf for each separate product, or each piece of operating equipment.
 - 2. Provide typed description of product, and major component parts of equipment.
 - 3. Provide indexed tabs.

- E. Cover: Identify each volume with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS", etc.

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- F. List:
 - 1. Title of Project.
 - 2. Identity of separate structure as applicable.
 - 3. Identity of general subject matter covered in manual.

- G. Binders:
 - 1. Commercial quality three-ring binders with durable and cleanable plastic covers.
 - 2. When multiple binders are used, correlate the data into related consistent groupings.

END OF SECTION

SECTION 01-7833
PRODUCT WARRANTIES AND BONDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Provide warranties and bonds required for specific products in individual Specifications Sections. See Section 01-1100.

1.2 SUBMITTALS

- A. Submit a copy of preliminary draft of proposed format and outline of contents of the warranties and bonds manuals prior to Substantial Completion.
- B. Submit one copy of completed manuals in final form prior to final inspection or acceptance.
- C. Submit two (2) copies of approved manuals in final form after final inspection or acceptance.
- D. For items of work when acceptance is delayed beyond date of Substantial Completion, submit documents to Architect after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 - PRODUCTS

2.1 WARRANTIES AND BONDS MANUALS

- A. Obtain warranties and bonds, executed in duplicate by responsible subcontractors, suppliers and manufacturers, after completion of the applicable item of work.
 - 1. Except for items put into use with Owner's permission, leave date of beginning of time of warranty blank until the Date of Substantial completion is determined.
- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Bind in commercial quality 8-1/2 x 11 three-ring side binders, with plastic covers.
- B. Label cover of each binder with typed or printed title, "WARRANTIES AND BONDS," with title of Project; name, address, and telephone number of Contractor; and name of responsible principal.
- C. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified and the name of product or work item.

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- D. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing.
 - 1. Provide full information, using separate typed sheets as necessary.
 - 2. List subcontractor, supplier, and manufacturer, with name, address and telephone number of responsible principal.

END OF SECTION

SECTION 01-7839
PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Procedural requirements for maintaining documents and samples at the site as required in the General Conditions.
 - 1. Coordinate with Divisions 23 and 26 through 28 for Mechanical and Electrical requirements.

- B. The General Conditions require the Construction Manager and Component Contractor to maintain a record copy of the following for Architect's review:
 - 1. Drawings showing architectural and engineering systems and components.
 - 2. Specifications and Schedule (Project Manual).
 - 3. Addenda.
 - 4. Change Orders and other documents which modify original document.
 - 5. Approved shop drawings, product data and samples.
 - 6. Records of all changes made during construction.

- C. In addition to the above, Contractor shall maintain at the site a record copy of the following:
 - 1. Field test records.
 - 2. Manufacturer's certificates.
 - 3. Fixed equipment manuals.
 - 4. Inspection certificates.

1.2 SUBMITTALS

- A. At Contract Closeout Submit:
 - 1. Record Documents and samples, including Record Drawings.
 - 2. Surveyor's certificate for building location, first floor elevation, handicap ramps, to Architect.

- B. Submit Record Documents and Surveyor's Certificate under cover of a transmittal letter containing:
 - 1. Date.
 - 2. Project title and number.
 - 3. Contractor's and subcontractor's names and addresses.
 - 4. Title and number of each Record Document.
 - 5. Certification that each document submitted is complete and accurate.
 - 6. Signature of Contractor or his authorized representative.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Drawings which are required for Owner's records, shall be recorded by the both the Construction Manager and Component Contractor.

- B. Construction Manager and Component Contractor shall transfer all changes recorded on construction drawings on the Record Drawings.
 - 1. All information shall be recorded neatly and legible.
 - 2. Use separate colors for recording information about each major system.
 - 3. Establish a code to denote the color for each trade and indicate by a schedule placed on the front sheet of the Record Drawings.
- C. Construction Manager shall include with Record Document Submittal a certificate and drawing, from a surveyor licensed in the state in which the project is located, verification of the building location and first floor elevation.
- D. Construction Manager shall include with Record Document Submittal a certificate and drawing, from a surveyor licensed in the state in which the project is located, verification that handicap ramp slopes are not greater than slopes indicated on project documents, and that the widths and lengths of the ramps indicated are considered minimums per governing codes.

PART 3 - EXECUTION

3.1 MAINTENANCE OF DOCUMENTS AND SAMPLES

- A. Store Record Documents and samples in a file in the Field Office, apart from the documents used for construction.
 - 1. Provide files, racks and secure storage for Record Documents and samples.
- B. Label and file Record Documents in sequence with section number listings in Table of Contents of this Project Manual.
 - 1. Label each document "PROJECT RECORD" in the lower right hand corner in neat, large printed letters.
- C. Maintain Record Documents in clean, dry, legible condition.
 - 1. Do not use Record Documents for construction purposes.
- D. Keep Record Documents and samples available for inspection by Architect and Engineer.

3.2 RECORDING

- A. Record information concurrently with construction progress.
 - 1. Do not conceal work until required information has been recorded.
- B. Contract Drawings and Shop Drawings: Legibly mark each item to record actual construction, including the following:
 - 1. Depth of footings in relation to finish first floor level.
 - 2. Measure horizontal and vertical locations of underground utilities, valves, etc. referenced to building exterior lines. Show direction of flow of pipe and depth of piping underground.
 - 3. Field changes of dimensions and details.
 - 4. Changes made by Contract Modifications.
 - 5. Details not on original Contract Drawings.
 - 6. Fixed equipment.

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- C. Project Manual: Legibly mark to record actual construction, including the following:
 - 1. On appropriate pages, record changes made by Addenda, Change Orders and other modifications.
 - 2. On appropriate pages, enter trade name, manufacturer, catalog number, and name of supplier of each product and item actually installed, if different from that specified.
 - 3. Other items installed but not originally specified.

END OF SECTION

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SECTION 01-7841
SPARE PARTS AND MAINTENANCE MATERIALS

PART 1 - GENERAL

1.1 SPARE PARTS AND TOOLS

- A. Package in clearly identified boxes.
 - 1. Indicate manufacturer's name, part name and stock number.
 - 2. Indicate piece of equipment part or tool is for.
 - 3. Indicate name, address and phone number of closest supplier.

1.2 MAINTENANCE MATERIALS

- A. Package in clearly identified boxes.
 - 1. Indicate trade name and stock number.
 - 2. Indicate which item material is to be used with.
 - 3. Indicate name, address and phone number of closest supplier.

1.3 EXTRA MATERIALS

- A. Package in clearly identified containers, or install where indicated.
 - 1. Indicate trade name, stock number, size, color, etc.
 - 2. Indicate where product is to be used.
 - 3. Indicate name, address and phone number of closest supplier.
- B. See individual specification sections for quantity required.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 DELIVERY

- A. Deliver to Owner prior to substantial completion unless Owner requests earlier delivery.
- B. Deliver to location directed by Owner.
- C. Use transmittal form acceptable to Architect.
 - 1. Transmittal to indicate Owner's acceptance.

END OF SECTION

SECTION 02-2016

EXISTING UTILITIES

1. GENERAL

1.1 PUBLIC AND PRIVATE UTILITIES

- A. Existing above-ground utilities, including but not limited to power transmission and distribution, telegraph, telephone and traffic control systems, whether shown on the drawings or not, shall be maintained, relocated, rerouted, removed and restored as may be necessary by the Contractor in a manner satisfactory to owners and operators of the utilities.
- B. Existing major underground utilities and appurtenant structures, whether shown on the drawings or not, shall be maintained, relocated, rerouted, removed and restored by the Contractor. In the following special cases, the Contractor will be reimbursed in accordance with the General Conditions for all costs of modifying, rerouting, relaying or maintaining service of major underground utilities.
 - 1. An existing utility is found during construction to cross the ditch line at an elevation between the top and bottom of the proposed pipeline or structure to be constructed under this contract together with the required pipe zone.
 - 2. An existing underground utility is found during construction to cross or project within the utility conflict limits for the proposed work at an angle of 30° or less at any elevation.
 - 3. For the purposes of these special cases, utility conflict limit shall be two (2) feet either side of the edge of the pipe.
 - 4. The existing water line is excluded from this special case and no reimbursement will be made for conflicts.
 - 5. In no case shall the Contractor be reimbursed if the conflict is clearly shown on the drawings.
- C. Minor underground utility service lines, including but not limited to sanitary sewer services, gas services, water services, house or yard drains, and electricity or telephone services and driveway culverts shall be maintained, relocated, rerouted, removed and restored by the Contractor with the least possible interference with such services and in no case shall the interference of such service lines be considered for extra compensation under any of the special cases listed above, except sanitary sewer service occurring at an elevation between the top and bottom of the proposed pipeline or structure together with the pipe zone.
- D. The right is reserved by owners of public utilities and franchises to enter upon any street, road, right-of-way, or easement for the purpose of maintaining their property and for making necessary repairs or adjustments caused by the Contractor's operations. The Contractor shall save the Owner harmless of any costs so incurred.
- E. For purpose of this section, "pipe zone" is defined as extending from the bottom of the required excavation to six (6) inches over the top of the pipe.

1.2 QUALITY ASSURANCE

- A. In addition to the General Conditions, the Contractor will be required to have available a pipe finder and a man capable in its use and to utilize same to satisfy himself as to exact location of such underground facilities in the interest of avoiding unnecessary damage, maintenance costs, and to insure continuity of customer

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service. It is recommended that the Contractor make arrangements with the applicable utility company or department to aid in the location and maintenance of existing utilities.

1.3 RESTORATION OF DRAINAGE FACILITIES

- A. Where it is necessary for drainage facilities to be removed and replaced, existing pipe and catch basins may be reinstalled when approved by the agency having jurisdiction.
- B. The materials shall be cleaned.
- C. When it is necessary to replace existing pipe or catch basins, the new materials shall be of equal strength and similar design to existing materials.
- D. Installation shall be in accordance with the applicable provisions of these specifications.
- E. All costs, whether new or existing facilities are installed, shall be considered to be included in the unit prices bid for the various items and no additional payment shall be allowed.

END OF SECTION

SECTION 02-4100

DEMOLITION

1. GENERAL

1.1 PROTECTION

- 1 A. Streets, roads, adjacent property and other work to remain shall be protected throughout the work.
- 2 B. Pavement may be cut only where authorized and only to the extent specified.
- 3 C. Any material damaged by Contractor's operations shall be replaced with new material by the Contractor.

2. EXECUTION

2.1 CUTTING PAVEMENT

- 4 A. Unless specified otherwise by the authority having control over the pavement, cutting of pavement shall be as specified herein.
- 5 B. All pavement shall be neatly cut by machine before excavation therein begins.
- 6 C. Pavement shall be removed to a width that is at least 6 inches back of the anticipated width of the trench, except that strips of concrete remaining between the trench opening and expansion of contraction joints shall not be less than 6 feet in width.
- 7 D. Pavement cuts shall be straight and parallel, and for concrete shall provide beveled edges such that the pavement cut is approximately 1-1/2 inch wider at the top of the slab than at the bottom.
- 8 E. No undercutting shall be permitted, and where trenching operations result in undercutting of pavement beyond the cutting limits herein set forth, the Contractor shall at his own expense, make whatever repairs that may be required by the right-of-way owner.

2.2 CUTTING WALKS

- 9 A. Concrete sidewalk(s) shall be cut as specified above for concrete pavement, except that where such cutting would leave strips of walk less than 3 feet wide, or where in the opinion of the Engineer, the strips remaining would be damaged by the cutting, the entire walk shall be removed.

2.3 PRIVATE DRIVEWAYS, CULVERTS AND MISCELLANEOUS

- 10 A. General:

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- 11 1. Pipe laying operations in the project area may necessitate temporary removal of mail boxes, newspaper tubes, landscaping logs, fences, private driveways, drains, service lines, conduits, etc., to facilitate construction.
- 12 2. In the event that the Contractor finds it necessary to remove the above mentioned items, it is to be particularly understood that it will be his responsibility to restore these items in a manner equal to their original condition.
- 13 3. The Contractor shall maintain adequate temporary provisions for domestic deliveries and utilities service and access for fire fighting equipment.
- 14 B. The preceding requirement will be the same for any temporary removal of road culverts, whether under state, local, or private jurisdiction.
- 15 C. The cost of the above described work shall be incidental to the pipe work and no additional compensation shall be made to the Contractor.
- 16 D. The Contractor shall make every effort to prevent blocking private driveways for more than a reasonable time; and shall make such driveways immediately accessible on order of the Engineer.

END OF SECTION

SECTION 02 2010

SUBSURFACE CONDITIONS

1. GENERAL

1.2 SOIL REPORTS

- A. Any data on soil and/or subsurface conditions shown in the Plans or Specifications is not to be taken as a representation, but is based on limited information and is at best only an opinion; consequently, such data cannot be considered precise or complete and there is no guarantee as to its completeness, accuracy, or precision.
- B. A limited soils investigation was performed for this project to determine general characteristics of the existing subsurface. Due to limited project budget, the scope was limited and may not have adequately addressed the subsurface conditions in all areas.
- C. Additional Investigation:
 - 1. Contractor should visit the site and acquaint himself with site conditions before submitting a bid, and the submission of a bid will be prima facie evidence that he has done so.
 - 2. Prior to bidding, Contractor may make his own subsurface investigations to satisfy himself with site and subsurface conditions.

1.3 QUALITY ASSURANCE

- A. The Contractor shall readjust work performed that does not meet technical or design requirements.
- B. The Contractor shall make no deviations from the Contract Documents without specific and written approval of the Owner.
- C. The Contractor shall be responsible for obtaining approval from responsible agency or property owner before performing any exploratory excavations.

END OF SECTION

SECTION 22-1316
SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following for soil, waste, and vent piping inside the building:
 - 1. Pipe, tube, and fittings.
 - 2. Special pipe fittings.
 - 3. Encasement for underground metal piping.
 - 4. **Construction Manager shall be responsible for underground piping with sanitary tees for connection by component contractor as shown on drawings**
 - 5. **Component contractor is responsible for all piping above ground and connections to underground piping.**

1.3 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. EPDM: Ethylene-propylene-diene terpolymer rubber.
- C. LLDPE: Linear, low-density polyethylene plastic.
- D. NBR: Acrylonitrile-butadiene rubber.
- E. PE: Polyethylene plastic.
- F. PVC: Polyvinyl chloride plastic.
- G. TPE: Thermoplastic elastomer.

1.4 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:
 - 1. Soil, Waste, and Vent Piping: 10-foot head of water].

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- B. Seismic Performance: Soil, waste, and vent piping and support and installation shall be capable of withstanding the effects of seismic events determined according to [ASCE 7, "Minimum Design Loads for Buildings and Other Structures."

1.5 SUBMITTALS

- A. Product Data: For pipe, tube, fittings, and couplings.
- B. Shop Drawings:
 - 1. Design Calculations: Signed and sealed by a qualified professional engineer for selecting seismic restraints.
- C. Field quality-control inspection and test reports.

1.6 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; "NSF-drain" for plastic drain piping; "NSF-tubular" for plastic continuous waste piping; and "NSF-sewer" for plastic sewer piping.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.2 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
- B. Shielded Couplings: CISPI 310 and ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.
 - 1. Standard Shielded, Type 301 Stainless-Steel Couplings: With Type 301 AISI stainless-steel shield, stainless-steel bands and tightening devices, and ASTM C 564 rubber gasket.

2.3 STEEL PIPE AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade A or B, Standard Weight or Schedule 40, galvanized. Include ends matching joining method.
- B. Drainage Fittings: ASME B16.12, threaded, cast-iron drainage pattern.

C. Pressure Fittings:

1. Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, galvanized, seamless steel pipe. Include ends matching joining method.
2. Malleable-Iron Unions: ASME B16.39; Class 150; hexagonal-stock body with ball-and-socket, metal-to-metal, bronze seating surface; and female threaded ends.
3. Gray-Iron, Threaded Fittings: ASME B16.4, Class 125 standard pattern.
4. Cast-Iron Flanges: ASME B16.1, Class 125.
5. Cast-Iron, Flanged Fittings: ASME B16.1, Class 125.

2.4 STAINLESS-STEEL PIPE AND FITTINGS

- A. Pipe and Fittings: ASME A112.3.1, drainage pattern with socket and spigot ends.
- B. Gaskets: Lip seals shaped to fit socket groove, with plastic backup ring.
 1. Material: EPDM, unless NBR is indicated.

2.5 DUCTILE-IRON PIPE AND FITTINGS

- A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end, unless grooved or flanged ends are indicated.
 1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
 2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.
- B. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end, unless grooved or flanged ends are indicated.
 1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
 2. Gaskets: AWWA C111, rubber.
- C. Flanges: ASME 16.1, Class 125, cast iron.

2.6 COPPER TUBE AND FITTINGS

- A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.
 1. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.

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- B. Hard Copper Tube: ASTM B 88, Types L and M, water tube, drawn temper.
 - 1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
 - 2. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.
 - 3. Copper Unions: MSS SP-123, copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
- C. Soft Copper Tube: ASTM B 88, Type L, water tube, annealed temper.
 - 1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.

2.7 ABS PIPE AND FITTINGS

- A. Solid-Wall ABS Pipe: ASTM D 2661, Schedule 40.
- B. ABS Socket Fittings: ASTM D 2661, made to ASTM D 3311, drain, waste, and vent patterns.

2.8 PVC PIPE AND FITTINGS

- A. Solid-Wall Schedule 40 PVC Pipe: ASTM D 2665, drain, waste, and vent.
 - 1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns.

2.9 POLYPROPYLENE PIPE

- A. Schedule 40 single wall polypropylene pipe ASTM D4101 with fusion fittings.
 - 1. Underground – Orion Brownline, with fusion joints
 - 2. Aboveground – Orion Blueline fire retardant

2.10 SPECIAL PIPE FITTINGS

- A. Flexible, Nonpressure Pipe Couplings: Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition pattern. Include shear ring, ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - 1. Sleeve Materials:
 - a. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
 - b. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.

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- c. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
 - B. Shielded Nonpressure Pipe Couplings: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - C. Rigid, Unshielded, Nonpressure Pipe Couplings: ASTM C 1461, sleeve-type reducing- or transition-type mechanical coupling molded from ASTM C 1440, TPE material with corrosion-resistant-metal tension band and tightening mechanism on each end.
 - D. Pressure Pipe Couplings: AWWA C219 metal, sleeve-type same size as, with pressure rating at least equal to, and ends compatible with, pipes to be joined.
 - 1. Center-Sleeve Material: Manufacturer's standard].
 - 2. Gasket Material: Natural or synthetic rubber.
 - 3. Metal Component Finish: Corrosion-resistant coating or material.
 - E. Flexible Ball Joints: Ductile-iron fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include gasketed ball-joint section and ductile-iron gland, rubber gasket, and steel bolts.
 - F. Expansion Joints: Two or three-piece, ductile-iron assembly consisting of telescoping sleeve(s) with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Select and assemble components for expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
 - G. Wall-Penetration Fittings: Compound, ductile-iron coupling fitting with sleeve and flexing sections for up to 20-degree deflection, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
 - H. Tubular Fittings: ASTM F 409, ABS and PVC drainage-pattern tube and tubular fittings with ends as required for application.
- 2.11 ENCASEMENT FOR UNDERGROUND METAL PIPING
- A. Description: ASTM A 674 or AWWA C105, high-density, cross laminated PE film of 0.004-inch] or LLDPE film of 0.008-inch minimum thickness.
 - B. Form: Sheet or tube.
 - C. Color: Black or natural.

PART 3 - EXECUTION

3.1 EXCAVATION

- A. Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

- A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.
- B. Aboveground, soil and waste piping NPS 4 and smaller shall be any of the following:
 - 1. Hubless cast-iron soil pipe and fittings; heavy-duty shielded, stainless-steel couplings; and hubless-coupling joints.
 - 2. Steel pipe, drainage fittings, and threaded joints.
 - 3. Stainless-steel pipe and fittings, gaskets, and gasketed joints.
 - 4. Copper DWV tube, copper drainage fittings, and soldered joints
 - 5. Solid Wall PVC.
- C. Aboveground, soil and waste piping NPS 5 and larger shall be any of the following:
 - 1. Service class, cast-iron soil pipe and fittings; gaskets; and compression joints.
 - 2. Hubless cast-iron soil pipe and fittings; standard, and heavy-duty shielded, stainless-steel couplings; and hubless-coupling joints.
 - 3. Steel pipe, drainage fittings, and threaded joints.
 - 4. Solid Wall PVC.
- D. Aboveground, vent piping NPS 4 and smaller shall be any of the following:
 - 1. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.
 - 2. Steel pipe, drainage fittings, and threaded joints.
 - 3. Stainless-steel pipe and fittings gaskets, and gasketed joints.
 - 4. Copper DWV tube, copper drainage fittings, and soldered joints.
 - a. Option for Vent Piping, NPS 2-1/2 and NPS 3-1/2: Hard copper tube, Type M; copper pressure fittings; and soldered joints.
 - 5. Solid Wall PVC.

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- E. Aboveground, vent piping NPS 5 and larger shall be any of the following:
 - 1. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.
 - 2. Steel pipe, drainage fittings, and threaded joints.
 - 3. Solid Wall PVC.
- F. Underground, soil, waste, and vent piping NPS 4 and smaller shall be any of the following:
 - 1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 - 2. Solid-wall, Schedule 40, PVC pipe; PVC socket fittings; and solvent-cemented joints.
- G. Underground, soil and waste piping NPS 5 and larger shall be any of the following:
 - 1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 - 2. Solid-wall, Schedule 40, PVC pipe; PVC socket fittings; and solvent-cemented joints.
- H. Underground, acid resistant waste piping shall be the following:
 - 1. Polypropylene – Orion Browline
- I. Aboveground, acid resistant waste piping shall be the following:
 - 1. Polypropylene – Orion Blueline

3.3 PIPING INSTALLATION

- A. Sanitary sewer piping outside the building is specified in Division 2 Section "Sanitary Sewerage."
- B. Basic piping installation requirements are specified in Division 22 Section "Basic Mechanical Materials and Methods."
- C. Install seismic restraints on piping. Seismic-restraint devices are specified in Division 22 Section "Mechanical Vibration and Seismic Controls."
- D. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.
- E. Install cleanout fitting with closure plug inside the building in sanitary force-main piping.
- F. Install underground, ductile-iron, special pipe fittings according to AWWA C600.
 - 1. Install encasement on piping according to ASTM A 674 or AWWA C105.

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- G. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 22 Section "Basic Mechanical Materials and Methods."
- H. Install wall-penetration fitting at each service pipe penetration through foundation wall. Make installation watertight.
- I. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
 - 1. Install encasement on underground piping according to ASTM A 674 or AWWA C105.
- J. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- K. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- L. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:
 - 1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 2 1/2 and smaller; 1 percent downward in direction of flow for piping NPS 3 and larger.
 - 2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
 - 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- M. Install engineered soil and waste drainage and vent piping systems as follows:
 - 1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
 - 2. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.
- N. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

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- O. Install underground ABS and PVC soil and waste drainage piping according to ASTM D 2321.
- P. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.4 JOINT CONSTRUCTION

- A. Basic piping joint construction requirements are specified in Division 22 Section "Basic Mechanical Materials and Methods."
- B. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
- C. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.
- D. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.
- E. PVC Nonpressure Piping Joints: Join piping according to ASTM D 2665.

3.5 HANGER AND SUPPORT INSTALLATION

- A. Seismic-restraint devices are specified in Division 22 Section "Mechanical Vibration Controls and Seismic Restraints."
- B. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports." Install the following:
 - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 2. Install individual, straight, horizontal piping runs according to the following:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.
 - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Install supports according to Division 22 Section "Hangers and Supports."
- D. Support vertical piping and tubing at base and at each floor.
- E. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.

- F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
 - 2. NPS 3: 60 inches with 1/2-inch rod.
 - 3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
- G. Install supports for vertical cast-iron soil piping every 15 feet.
- H. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/4: 84 inches with 3/8-inch rod.
 - 2. NPS 1-1/2: 108 inches with 3/8-inch rod.
 - 3. NPS 2: 10 feet with 3/8-inch rod.
 - 4. NPS 2-1/2: 11 feet with 1/2-inch rod.
- I. Install supports for vertical steel piping every 15 feet.
- J. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/4: 72 inches with 3/8-inch rod.
 - 2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
 - 3. NPS 2-1/2: 108 inches with 1/2-inch rod.
 - 4. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
 - 5. NPS 6: 10 feet with 5/8-inch rod.
 - 6. NPS 8: 10 feet with 3/4-inch rod.
- K. Install supports for vertical copper tubing every 10 feet.
- L. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

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- C. Connect drainage and vent piping to the following:
1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
 4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

3.7 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Re-inspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for re-inspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.

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4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.8 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.9 PROTECTION

- A. Exposed ABS and PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

END OF SECTION

SECTION 22-1413
STORM DRAINAGE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following storm drainage piping inside the building:
 - 1. Pipe, tube, and fittings.
 - 2. Special pipe fittings.
 - 3. Encasement for underground metal piping.
 - 4. **Construction Manager shall be responsible for underground piping with sanitary tees for connection by component contractor as shown on drawings**
 - 5. **Component contractor is responsible for all piping above ground and connections to underground piping.**

1.3 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. LLDPE: Linear, low-density polyethylene plastic.
- C. PE: Polyethylene plastic.
- D. PVC: Polyvinyl chloride plastic.
- E. TPE: Thermoplastic elastomer.

1.4 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working-pressure, unless otherwise indicated:
 - 1. Storm Drainage Piping: 10-foot head of water.
 - 2. Storm Drainage, Force-Main Piping: 150 psig.

- B. Seismic Performance: Soil, waste, and vent piping and support and installation shall be capable of withstanding the effects of seismic events determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures."

1.5 SUBMITTALS

- A. Product Data: For pipe, tube, fittings, and couplings.
- B. Shop Drawings:
 - 1. Design Calculations: Signed and sealed by a qualified professional engineer for selecting seismic restraints.
 - 2. Controlled-Flow Storm Drainage System: Include calculations, plans, and details.
- C. Field quality-control inspection and test reports.

1.6 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-drain" for plastic drain piping and "NSF-sewer" for plastic sewer piping.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 74, Service class(es).
- B. Gaskets: ASTM C 564, rubber.
- C. Lead and Oakum: ASTM B 29, pure lead and oakum or hemp fiber.

2.4 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
- B. Shielded Couplings: CISPI 310 and ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.
 - 1. Standard Shielded, Type 301 Stainless-Steel Couplings: With Type 301 AISI stainless-steel shield, stainless-steel bands and tightening devices, and ASTM C 564 rubber gasket.
- C. Rigid, Unshielded Couplings: ASTM C 1461, sleeve-type, reducing- or transition-type mechanical coupling molded from ASTM C 1440, TPE material with corrosion-resistant-metal tension band and tightening mechanism on each end.
 - 1. Manufacturers:
 - a. ANACO.

2.5 STEEL PIPE AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade A or B, Standard Weight or Schedule 40, galvanized. Include ends matching joining method.
- B. Drainage Fittings: ASME B16.12, galvanized, threaded, cast-iron drainage pattern.
- C. Pressure Fittings:
 - 1. Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, galvanized, seamless steel pipe. Include ends matching joining method.
 - 2. Malleable-Iron Unions: ASME B16.39; Class 150; hexagonal-stock body with ball-and-socket, metal-to-metal, bronze seating surface; and female threaded ends.
 - 3. Gray-Iron, Threaded Fittings: ASME B16.4, Class 125, galvanized, standard pattern.
 - 4. Cast-Iron Flanges: ASME B16.1, Class 125.
 - 5. Cast-Iron, Flanged Fittings: ASME B16.1, Class 125, galvanized.
- D. Grooved-Joint Systems:
 - 1. Manufacturers:
 - a. Anvil International.
 - b. Star Pipe Products; Star Fittings Div.

- c. Victaulic Co. of America.
 - d. Ward Manufacturing, Inc.
2. Grooved-End, Steel-Piping Fittings: ASTM A 47/A 47M, galvanized, malleable-iron casting; ASTM A 106, galvanized-steel pipe; or ASTM A 536, galvanized, ductile-iron casting; with dimensions matching steel pipe.
 3. Grooved-End, Steel-Piping Couplings: AWWA C606, for steel-pipe dimensions. Include ferrous housing sections, gasket suitable for water, and bolts and nuts.

2.6 DUCTILE-IRON PIPE AND FITTINGS

- A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end, unless grooved or flanged ends are indicated.
 1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
 2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.
- B. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end, unless grooved or flanged ends are indicated.
 1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
 2. Gaskets: AWWA C111, rubber.
- C. Grooved-Joint Systems:
 1. Manufacturers:
 - a. Victaulic Co. of America.
 - b. Insert manufacturer's name.
 2. Grooved-End, Ductile-Iron Fittings: ASTM A 47/A 47M, malleable-iron castings or ASTM A 536, ductile-iron castings with dimensions matching pipe.
 3. Grooved-End, Ductile-Iron-Piping Couplings: AWWA C606, for ductile-iron-pipe dimensions. Include ferrous housing sections, gasket suitable for water, and bolts and nuts.
- D. Flanges: ASME 16.1, Class 125, cast iron.

2.7 COPPER TUBE AND FITTINGS

- A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.

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1. Copper Drainage Fittings: ASME B16.23, cast-copper or ASME B16.29, wrought-copper, solder-joint fittings.
- B. Hard Copper Tube: ASTM B 88, Types L and M, water tube, drawn temper.
1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
 2. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.
 3. Copper Unions: MSS SP-123, copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
- C. Soft Copper Tube: ASTM B 88, Type L, water tube, annealed temper.
1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.

2.8 PVC PIPE AND FITTINGS

- A. Solid-Wall Schedule 40 PVC Pipe: ASTM D 2665, drain, waste, and vent.

2.9 SPECIAL PIPE FITTINGS

- A. Flexible, Nonpressure Pipe Couplings: Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition pattern. Include shear ring, ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.
1. Manufacturers:
 - a. Dallas Specialty & Mfg. Co.
 - b. Fernco, Inc.
 - c. Logan Clay Products Company (The).
 - d. Mission Rubber Co.
 - e. NDS, Inc.
 - f. Plastic Oddities, Inc.
 2. Sleeve Materials:
 - a. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
 - b. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
 - c. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
- B. Shielded Nonpressure Pipe Couplings: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
1. Manufacturers:

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- a. Cascade Waterworks Mfg. Co.
 - b. Mission Rubber Co.
- C. Rigid, Unshielded, Nonpressure Pipe Couplings: ASTM C 1461, sleeve-type reducing- or transition-type mechanical coupling molded from ASTM C 1440, TPE material with corrosion-resistant-metal tension band and tightening mechanism on each end.
 1. Manufacturers:
 - a. ANACO.
- D. Pressure Pipe Couplings: AWWA C219 metal, sleeve-type same size as, with pressure rating at least equal to, and ends compatible with, pipes to be joined.
 1. Manufacturers:
 - a. Cascade Waterworks Mfg. Co.
 - b. Dresser, Inc.; DMD Div.
 - c. EBAA Iron Sales, Inc.
 - d. Ford Meter Box Company, Inc. (The); Pipe Products Div.
 - e. JCM Industries, Inc.
 - f. Romac Industries, Inc.
 - g. Smith-Blair, Inc.
 - h. Viking Johnson.
 2. Center-Sleeve Material: Manufacturer's standard.
 3. Gasket Material: Natural or synthetic rubber.
 4. Metal Component Finish: Corrosion-resistant coating or material.
- E. Expansion Joints: Two or three-piece, ductile-iron assembly consisting of telescoping sleeve(s) with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Select and assemble components for expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
 1. Manufacturers:
 - a. EBAA Iron Sales, Inc.
 - b. Romac Industries, Inc.
 - c. Star Pipe Products; Star Fittings Div.
- F. Wall-Penetration Fittings: Compound, ductile-iron coupling fitting with sleeve and flexing sections for up to 20-degree deflection, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
 1. Manufacturers:

a. SIGMA Corp.

2.10 ENCASEMENT FOR UNDERGROUND METAL PIPING

- A. Description: ASTM A 674 or AWWA C105, high-density, crosslaminated PE film of 0.004-inch or LLDPE film of 0.008-inch minimum thickness.
- B. Form: Sheet or tube.
- C. Color: Black or natural.

PART 3 - EXECUTION

3.1 EXCAVATION

- A. Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

- A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.
- B. Aboveground storm drainage piping NPS 2 to NPS 6 and smaller shall be any of the following:
 - 1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 - 2. Hubless cast-iron soil pipe and fittings; heavy-duty shielded, stainless-steel couplings; and coupled joints.
 - 3. Steel pipe, drainage fittings, and threaded joints.
 - 4. Copper DWV tube, copper drainage fittings, and soldered joints.
- C. Aboveground, storm drainage piping NPS 8 and larger shall be any of the following:
 - 1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 - 2. Hubless cast-iron soil pipe and fittings; heavy-duty shielded, stainless-steel couplings; and coupled joints.
- D. Underground storm drainage piping NPS 3 and smaller shall be any of the following:
 - 1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 - 2. Solid-wall Schedule 40 PVC pipe, PVC socket fittings, and solvent-cemented joints.
- E. Underground, storm drainage piping NPS 8 and larger shall be any of the following:

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1. Service class, cast-iron soil piping and fittings; gaskets; and gasketed joints.
 2. Solid-wall Schedule 40 PVC pipe, PVC socket fittings, and solvent-cemented joints.
- F. Aboveground storm drainage force mains NPS 2 and larger shall be any of the following:
1. Hard copper tube, Type L; copper pressure fittings; and soldered joints.
 2. Steel pipe, pressure fittings, and threaded joints.
- G. Aboveground storm drainage force mains NPS 6 and larger shall be any of the following:
1. Hard copper tube, Type L; copper pressure fittings; and soldered joints.
 2. Steel pipe, pressure fittings, and threaded joints.
 3. Grooved-end steel pipe, grooved-joint system fittings and couplings, and grooved joints.
- H. Underground storm drainage force mains NPS 4 and smaller shall be any of the following:
1. Hard copper tube, Type L; wrought-copper pressure fittings; and soldered joints.
 2. Steel pipe, pressure fittings, and threaded joints.
 - a. Include grooved-joint system fittings and couplings and grooved joints where indicated.
 3. Mechanical-joint, ductile-iron pipe; mechanical-joint, ductile-iron fittings; glands, gaskets, and bolts; and mechanical joints.
 - a. Include grooved-joint system fittings and couplings and grooved joints where indicated.
 4. Push-on-joint, ductile-iron pipe; push-on-joint, ductile-iron fittings; gaskets; and gasketed joints.
 - a. Include grooved-joint system fittings and couplings and grooved joints where indicated.
- I. Underground storm drainage force mains NPS 5 and larger shall be any of the following:
1. Steel pipe, pressure fittings, and threaded joints.
 2. Mechanical-joint, ductile-iron pipe; mechanical-joint, ductile-iron fittings; glands, gaskets, and bolts; and mechanical-joint joints.

3. Push-on-joint, ductile-iron pipe; push-on-joint, ductile-iron fittings; gaskets; and gasketed joints.

3.3 PIPING INSTALLATION

- A. Storm sewer and drainage piping outside the building are specified in Division 2 Section "Storm Drainage."
- B. Basic piping installation requirements are specified in Division 22 Section "Basic Mechanical Materials and Methods."
- C. Install seismic restraints on piping. Seismic-restraint devices are specified in Division 22 Section "Mechanical Vibration and Seismic Controls."
- D. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers. Cleanouts are specified in Division 22 Section "Plumbing Specialties."
- E. Install cleanout fitting with closure plug inside the building in storm drainage force-main piping.
- F. Install underground, steel, force-main piping. Install encasement on piping according to ASTM A 674 or AWWA C105.
- G. Install underground, ductile-iron, force-main piping according to AWWA C600. Install buried piping inside building between wall and floor penetrations and connection to storm sewer piping outside building with restrained joints. Anchor pipe to wall or floor. Install thrust-block supports at vertical and horizontal offsets.
 1. Install encasement on piping according to ASTM A 674 or AWWA C105.
- H. Install underground, copper, force-main tubing according to CDA's "Copper Tube Handbook."
 1. Install encasement on piping according to ASTM A 674 or AWWA C105.
- I. Install underground, ductile-iron, special pipe fittings according to AWWA C600.
 1. Install encasement on piping according to ASTM A 674 or AWWA C105.
- J. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 22 Section "Basic Mechanical Materials and Methods."
- K. Install wall-penetration fitting system at each service pipe penetration through foundation wall. Make installation watertight.
- L. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

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1. Install encasement on underground piping according to ASTM A 674 or AWWA C105.
 - M. Make changes in direction for storm piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
 - N. Lay buried building drain piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
 - O. Install storm drainage piping at the following minimum slopes, unless otherwise indicated:
 1. Building Storm Drain: 1 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
 2. Horizontal Storm-Drainage Piping: 2 percent downward in direction of flow.
 - P. Install force mains at elevations indicated.
 - Q. Install engineered controlled-flow storm drainage piping in locations indicated.
 - R. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.
 - S. Install PVC storm drainage piping according to ASTM D 2665.
 - T. Install underground PVC storm drainage piping according to ASTM D 2321.
 - U. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- 3.4 JOINT CONSTRUCTION
- A. Basic piping joint construction requirements are specified in Division 22 Section "Basic Mechanical Materials and Methods."
 - B. Hub-and-Spigot, Cast-Iron Soil Piping Gasketed Joints: Join according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
 - C. Hub-and-Spigot, Cast-Iron Soil Piping Calked Joints: Join according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum calked joints.
 - D. Hubless Cast-Iron Soil Piping Coupled Joints: Join according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

- E. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.
- F. Grooved Joints: Cut groove ends of pipe and assemble grooved ends of pipes, grooved-end fittings, and grooved-end-piping couplings according to AWWA C606.
- G. PVC Nonpressure Piping Joints: Join piping according to ASTM D 2665.

3.5 HANGER AND SUPPORT INSTALLATION

- A. Seismic-restraint devices are specified in Division 22 Section "Mechanical Vibration Controls and Seismic Restraints."
- B. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports." Install the following:
 - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 2. Individual, Straight, Horizontal Piping Runs: According to the following:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.
 - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Install supports according to Division 22 Section "Hangers and Supports."
- D. Support vertical piping and tubing at base and at each floor.
- E. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.
- F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
 - 2. NPS 3: 60 inches with 1/2-inch rod.
 - 3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
 - 4. NPS 6: 60 inches with 3/4-inch rod.
 - 5. NPS 8 to NPS 12: 60 inches with 7/8-inch rod.
 - 6. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.
- G. Install supports for vertical cast-iron soil piping every 15 feet.

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- H. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/4: 84 inches with 3/8-inch rod.
 - 2. NPS 1-1/2: 108 inches with 3/8-inch rod.
 - 3. NPS 2: 10 feet with 3/8-inch rod.
 - 4. NPS 2-1/2: 11 feet with 1/2-inch rod.
 - 5. NPS 3: 12 feet with 1/2-inch rod.
 - 6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.
 - 7. NPS 6: 12 feet with 3/4-inch rod.
 - 8. NPS 8 to NPS 12: 12 feet with 7/8-inch rod.
- I. Install supports for vertical steel piping every 15 feet.
- J. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/4: 72 inches with 3/8-inch rod.
 - 2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
 - 3. NPS 2-1/2: 108 inches with 1/2-inch rod.
 - 4. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
 - 5. NPS 6: 10 feet with 5/8-inch rod.
 - 6. NPS 8: 10 feet with 3/4-inch rod.
- K. Install supports for vertical copper tubing every 10 feet.
- L. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
 - 2. NPS 3: 48 inches with 1/2-inch rod.
 - 3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
 - 4. NPS 6: 48 inches with 3/4-inch rod.
 - 5. NPS 8 to NPS 12: 48 inches with 7/8-inch rod.
- M. Install supports for vertical PVC piping every 48 inches.
- N. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect storm drainage piping to roof drains and storm drainage specialties.
- D. Connect force-main piping to the following:

1. Storm Sewer: To exterior force main or storm manhole.
2. Sump Pumps: To sump pump discharge.

3.7 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 3. Test Procedure: Test storm drainage piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
 4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 5. Prepare reports for tests and required corrective action.
- E. Test force-main piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
 1. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.

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2. Cap and subject piping to static-water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
3. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
4. Prepare reports for tests and required corrective action.

3.8 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION

SECTION 26-0500
COMMON WORK RESULTS FROM ELECTRICAL

1. PART 1 - GENERAL

1.1 SCOPE:

A. The work includes, but is not limited to, the following:

- (1) This specification is intended to cover only that portion of electrical work which is required for site development. The entirety of this work will be under the scope of the Construction Manager.

Note: this work will be performed in 2 parts, see also specification 01-1100.

-Construction manager (CM) scope includes:

Site lighting

Electrical secondary from transformer

Exterior canopy lighting

Conduit and feeders between panels in main and satellite electrical rooms

-Component Contractor (CC) scope not included in this package

- (2) Temporary lighting and power will be under the CM contract.
- (3) Conduit for systems specified in other sections of this division. See individual sections for requirements.

B. Connections to equipment furnished by mechanical trades and other sections of this specification.

1.2 RELATED WORK SPECIFIED IN OTHER DIVISIONS

- A. Foundations and pads required for equipment furnished under this Division of the specifications. CM contract.
- B. Field painting, except such as is required to maintain shop coat and factory finish. CM outside of building

1.3 RECORD DRAWINGS

- A. Architect will be provided with record drawings as specified elsewhere.
- B. Construction manager will provide record drawings for all work outside the component scope of work: including feeder conduit routing, site electrical lighting and secondary service routing from transformer as well

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as telecom service entrance. Contractor shall maintain one set of prints of work specified under this Division on the job site, marked to show as built conditions. Upon completion of project, the Contractor shall prepare record drawings as specified elsewhere.

1.4 SUBMITTALS

- A. Shop drawings: Submit in accordance with front end documents the specified number of sets of required detailed data and dimensioned drawings covering: Site lighting fixtures, wiring devices, etc. Submittal data for other systems shall be required as hereinafter set forth in the individual applicable section. Do not put equipment into manufacture (or order) until shop drawings and brochures have been approved. All required submittal data shall be bound together in one volume with the submittals under each section separately tabbed. Refer elsewhere for preapproval requirements for substitutions. Submission of materials such as conduit and wire is not required as long as product is furnished in accordance with the specifications.

- B. This contract is expected to be funded in whole or in part using funds from the American Recovery and Reinvestment Act (ARRA). Section 1605 of the ARRA prohibits the use of these funds unless all iron, steel, and manufactured goods are produced in the United States. All iron and steel manufacturing processes must take place in the United States, except for metallurgical processes involving refinement of steel additives. There is no requirement for the origin of components and subcomponents of manufactured goods. Products listed at 48 CFR 25.104(a) have been determined to be unavailable in the United States and if required for the project may be purchased from foreign sources. No unauthorized use of foreign iron, steel, and/or manufactured goods will be allowed on this project.

1.5 ELECTRICAL CODES

- A. Conform to rules of local authority, regulations of the National Electrical Code of the National Board of Fire Underwriters and to Recommendations of the National Fire Protection Association. Obtain permits and certificates of approval from authorities having jurisdiction for the installation. Where requirements of any of the authorities mentioned above differ from the plans or specifications, their requirements shall take precedence over drawings and specifications except where plans and specifications exceed their requirements.

- B. The CC and CM are respectively responsible to be familiar with the codes and particular editions thereof under which the local authority will inspect this work.

- C. Applicable codes are as listed on the coversheet and as follows:
 - (1) National Electrical Code 2008 w/ Alaska amendments
 - (2) NFPA 99 2005

(3) NFPA 101 (LSC) 2000

1.6 STANDARDS

- A. All materials and equipment shall be new and bear UL label where such is available and be installed in accordance with labeling.

1.7 REFERENCE AND COORDINATION

- A. As applicable, refer to and coordinate with other sections and Divisions of this Project Manual, the Drawings and with other trades in the field to prevent delays, interferences and untimely installations.

1.8 SUPERVISION

- A. CM work shall be supervised by competent electrical foreman and workmen throughout project duration, insofar as possible.

1.9 SAFETY PRECAUTIONS

- A. CM shall provide and maintain proper safeguards for prevention of accidents and any other items required to secure safety of life and property, including sufficient lights during evening hours to secure such protection.

2. PART 2 - PRODUCTS

2.1 MATERIAL SUBSTITUTION

- A. Where materials, equipment, apparatus or other products are specified by manufacturer, brand name, type or catalog number, such designation is to establish standards or desired quality and style and shall be the basis of the bid. Provide materials so specified under this contract, unless changed by mutual agreement. Refer to front end documents for requirements for preapproval of alternates.
- B. In accordance front end documents, after contract for electrical work is let, provide a list of the items proposed for use including manufacturer, brand name, catalog number, etc.

3. PART 3 - EXECUTION

3.1 DRAWINGS

- A. The electrical plans indicate general layout of complete electrical system, arrangement of feeders, circuits, outlets, switches, controls, panelboards, service equipment, fixtures, and other work.
- B. Field verify scale dimension on plans since locations, distances and elevations will be governed by actual field conditions.

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- C. Where discrepancies occur in plans and specifications, promptly report them to architect/engineer for resolution.
- D. Include items not specifically mentioned in specifications or noted, but which are obviously necessary to meet requirements of applicable code and make a complete working installation.

3.2 EXCAVATION AND BACKFILLING

- A. Perform excavating and backfilling for underground conduit as specified elsewhere and as shown on the electrical plans.
- B. Caution must be exercised in trenching. Existing buried utilities are shown to the extent known and as possible from surface observation. Alert engineer upon any discrepancies.

3.3 SLEEVES, INSERTS AND OPENINGS

- A. Layout and install electrical work in cooperation with other crafts. Install sleeves or openings through floors or walls required for passage of conduits, pipes and ducts that can not be installed prior to installation of floors or walls.
- B. Sleeves: 24 ga. galvanized sheet steel rigidly supported and suitably packed to prevent ingress of wet concrete.
- C. Install inserts and hangers required to support fixtures, conduit, cables and pull boxes, etc.
- D. All boxes and enclosures for emergency circuits shall be marked for ready identification as part of the emergency system. Conduit and boxes, including back boxes, panelboards, etc., shall be spot painted. Conduit shall be identified to within six inches of the box or enclosure. The following color codes shall be utilized:

Yellow	Life Safety Branch
Orange	Critical Branch
Green	Equipment Branch
Red	Fire Alarm System

- E. All junction boxes shall be marked to identify wiring within, (panel and circuit number), fire alarm, nurse call etc.

3.4 TEMPORARY LIGHTING AND POWER

- A. CM shall provide a temporary electrical lighting and power distribution system of adequate size to properly serve following requirements, including adequate feeder sizes to prevent excessive voltage drop. Temporary work to be installed in a neat and safe manner in accordance with National Electrical Code, Article 305.
- B. Provide service and panelboards required for above lighting and power

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outlets.

- C. Install and maintain barricade lighting where required to adequately protect against possible damage and injury.

3.5 GROUNDING

- A. Accomplish in accordance with Article 250 of the National Electrical Code. See Section 16450.

3.6 FOUNDATIONS AND PADS

- A. CM shall furnish and install all foundations and pads required for equipment provided under this Division of Specifications. Site electrical contractor shall be responsible for proper size and location of foundations, pads, anchor bolts and other items to be built into structure.

3.7 REMOVAL OF DEBRIS

- A. Remove surplus materials and debris caused by, or incidental to, electrical work. Remove such debris at frequent intervals. Keep job clean during construction.

3.8 FINAL INSPECTION AND ACCEPTANCE

- A. After completion of electrical work, make a final inspection. Fixtures, lamps, etc., shall be completed and in satisfactory operating condition before final acceptance.

3.9 QUALITY ASSURANCE (CM responsible for site portions)

- A. Electrical work shall be guaranteed against faulty material or workmanship for a period of one year from the date of final acceptance. If the project is occupied or the systems placed into operation in several phases at the request of the Owner, then the guarantee of each system or piece of equipment used, shall begin on the date each system or piece of equipment was placed in satisfactory operation and accepted as such, in writing, by the Owner. The use of building equipment for temporary service and testing does not constitute the beginning of the warranty.
- B. Equipment and material provided under this Division shall be periodically inspected and serviced by competent technicians. This function becomes the responsibility of the Owner when the system is accepted by the Owner. The one year material and workmanship guarantee is not intended to supplant normal inspection or service and shall not be construed to mean the Contractor will provide free service nor to correct without charge, breakage, maladjustment, and other trouble caused by improper maintenance.
- C. Any electrical equipment provided under this division shall be turned over to the Owner in operating condition. Instructions on further maintenance shall be included in the operating instructions.

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- D. Prior to final observation, leave all systems in proper operating condition.

END OF SECTION

SECTION 26-0519
ELECTRICAL POWER CONDUCTORS AND CABLE

1. PART 1 - GENERAL

1.1 STANDARDS

- A. Comply with the latest requirements of the current edition of the NEC and ASTM Specifications.
- B. Use only new wire and cable with size, grade or insulation, voltage and manufacturer's name permanently marked on the outer covering at regular intervals.

1.2 DELIVERY AND PROTECTION

- A. Delivery in complete coils and reels, with attached tags identifying size and installation.
- B. Protect wire and cable from weather and damage during storage and handling.

2. PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Soft drawn copper by Anaconda, General Electric or equal. Number 8 ga. and larger shall be stranded construction, number 10 and smaller shall be solid, factory color coded, where available.
- B. In general, meet the following relevant requirements:
 - (1) Conductors for feeders: 600 volt, type THWN or THHN.
 - (2) See section 16168 for conductors and installation requirements in operating rooms and areas fed from isolation power panels.
 - (3) Conductors for lighting and receptacle branch circuits: 600 volt, Type THWN or Type THHN, except as noted herein. Minimum size No. 12 AWG.
 - (4) Conductors for circuits outside building or in moist environments, types THWN.
 - (5) Use Type THHN control circuit wiring, unless another type is designated, or as specified by manufacturer of equipment. Confirm conductor quantity required with mechanical system control schematic.
 - (6) For 24V control systems, multiconductor #18 AWG wiring is

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acceptable. Confirm conductor quantity required with mechanical system control schematic. Belden or West Penn.

- (7) Conductors for fire alarm system: Use No. 14 THHN color-coded wires or plenum rated power limited cable. Conductors may be solid or stranded.
- (8) Fire alarm system: Tag at all junction points and test free from grounds or crosses between conductors. Make final connections between equipment and the wiring system under the direct supervision of a representative of the manufacturer.
- (9) Wire luminaires with medium base sockets with wire not smaller than number 16 and mogul sockets with wire not smaller than number 14, 150E C insulated in accord with current edition of National Electric Code.
- (10) Wire fluorescent luminaires with Type THHN wire not smaller than number 16. Locate no splice or tap within an arm, stem or chain. Wire shall be continuous from splice in outlet box of the building wiring system to lamp socket or to ballast terminals.

3. PART 3 - EXECUTION

3.1 CABLE INSTALLATION

- A. Do not pull conductors into conduits until work which may cause cable damage is completed. Use only approved cable lubricants.
- B. Unless otherwise noted, each conduit raceway shall contain only those conductors constituting a single feeder circuit.
- C. The maximum number of single phase branch circuits in a single raceway shall be limited to 3 sharing a common neutral as allowed by N.E.C.
- D. Make cable terminals, taps and splices secure with solderless compress on type connectors. Connectors for copper wire shall be Type 54 Series by Thomas & Betts Company or equal and large enough to enclose all conductor strands.
- E. Leave a minimum of 12" slack wire in every outlet box whether it be in use or left as spare for future.
- F. For modular construction, appropriate Amphenol type connectors shall be used at mating points between modules for branch circuits.
- G. Make all splices and connections only at outlet, pull or junction boxes.
- H. All conductors and connections shall test free of grounds, shorts and opens.
- I. Provide number 10 wire in lieu of number 12 wire for any branch circuit in

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excess of 100' linear length.(larger where specifically noted). Provide minimum #8 wire to all site lighting.

- J. Feeders shall be run under building as indicated on power riser diagram. Rough-in must be coordinated with CC fabrication drawings.

3.2 CONNECTIONS

- A. Connect No. 10 wire, and smaller, with Eagle Wing nuts, or equal.
- B. Connect No. 8 wire, and larger, with compression type, connections, T&B Series 54000, or equal.
- C. Insulate connections of No. 8 wire, and larger, with 3M #33 tape.

3.3 COLOR CODING

- A. Color code conductors as follows:

	<u>120/208V</u>	<u>277/480V</u>
Phase A	Black	Brown
Phase B	Red	Yellow
Phase C	Blue	Orange
Neutral N	White	Gray
Ground G	Green	Green

- B. Use factory color coded conductors where commercially available. If not, use black wire and band with color tape.

END OF SECTION

SECTION 26-0526
GROUNDING AND BONDING

1. PART 1 - GENERAL

1.1 NOT APPLICABLE

2. PART 2 - PRODUCTS

2.1 NOT APPLICABLE

3. PART 3 - EXECUTION

3.1 GROUNDING

- A. Ground electrical system in accordance with Article 250, National Electrical Code and local authorities having jurisdiction.
- B. Products shall be as specified in other applicable sections of this specification.
- C. Do not use flexible metal conduit and fittings as a grounding means. Pull a green ground wire in or around each piece of flexible conduit and screw to conduit system with lugs at both ends.
- D. Install insulated code sized ground wires in all feeder and branch circuits. There shall be 2 ground wires in raceways for isolated ground receptacles. Ground wires shall be larger than Code minimum where so indicated on drawings and as required in section G of this specification.
- E. Attach panel ground bars to panel cans and isolate neutral bars. Neutrals shall be connected to grounds only at service entrance equipment. Panels with isolated ground circuits shall have isolated ground buss in addition to equipment ground buss.
- F. Grounding bushings, as required in other sections of these specifications, shall be bonded to the service entrance equipment ground bus with an insulated conductor sized in accordance with the NEC table 250-94 for equipment grounding conductors.

3.2 SERVICE GROUNDING

- A. Install grounding electrode conductor (sized per NEC 250 or as shown on drawings) to main water entrance ahead of cut-off valve and to main gas entrance (as allowed by local code).
- B. The system grounds shall be installed and connected as follows: Provide tripod (3) driven ground rods (10' x 3/4" copperweld) arranged approximately 15' equidistant and interconnected with code sized

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grounding conductor. Connect another code sized bare copper conductor to the main water entrance ahead of the cut-off valve. This same conductor shall be bonded to the building steel. Connect the three grounding conductors to ground bus in service entrance section of main service equipment.

- C. Bond building steel to the ground bus.
- D. Before the grounding electrode conductors are terminated at the ground bus, they shall be temporarily bonded together and tested using a Biddle ground test meter. Ground rods (3/4" x 10' copperweld) shall be driven as required to produce a meter reading of ten ohms or less. Send test data and ohm readings to the Architect at the test conclusion.
- E. Before the grounding electrode conductors are terminated at the ground bus, they shall be temporarily bonded together and tested using a Biddle ground test meter. Ground rods (3/4" x 10' copperweld) shall be driven as required to produce a meter reading of ten ohms or less. Send test data and ohm readings to the Architect at the test conclusion.

END OF SECTION

SECTION 26-0532
RACEWAYS FOR ELECTRICAL SYSTEMS

1. PART 1 - GENERAL

1.1 PERMITTED CONDUIT USES

- A. Use rigid galvanized or IMC conduit except where EMT or PVC are permitted both by these specifications and local code authorities.
- B. Use rigid galvanized or IMC where penetrating or emerging from concrete slab.
- C. Conduits may be used as itemized below:
 - (1) Service entrance conduits below grade, in concrete or in gravel fill: Rigid metal, IMC or PVC encased in minimum 2" concrete or as indicated on drawings.
 - (2) Panelboard feeders exposed, overhead or in open areas, not subject to physical damage: EMT.
 - (3) Panelboard feeders in concrete floor or fill: Rigid metal, IMC or PVC.
 - (4) Branch circuits in hazardous areas: Rigid metal.
 - (5) Branch circuits in slab on grade or fill: Rigid metal IMC or PVC.
 - (6) Branch circuits, normal power only, concealed overhead: EMT or type AC (HFC) Cable, subject to approval of authority having jurisdiction.
 - (7) Branch circuits exposed: EMT, except in hazardous areas where subject to physical damage and in exterior locations.
 - (8) Branch circuits below exterior grade: Rigid metal or Schedule 40 PVC.
 - (9) Primary conduit to pad mounted transformers: Rigid metal or encased Schedule 40 PVC. Verify Power Company requirements.
 - (10) AC (HFC) cable is not permitted on emergency system feeders or branch circuits.

2. PART 2 - PRODUCTS

2.1 SIZE

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- A. Conduits are to be 2" minimum diameter unless noted otherwise on the drawings.
- 2.2 PVC
 - A. Schedule 40 by Carlon or equal.
- 2.3 RIGID GALVANIZED STEEL, IMC AND EMT
 - A. General Electric, Youngstown Company, Wheatland, Triangle, Republic.
- 2.4 COUPLINGS AND CONNECTIONS
 - A. O.Z. Gedney, Appleton, T&B, EFCOR or equal. EMT fittings shall be compression or steel set screw type
- 2.5 FITTINGS IN EXPOSED CONDUIT
 - A. Connectors, couplings, tees, boxes, ball aligners, etc., Crouse Hinds condulet or equal.
- 2.6 SUPPORTING DEVICES & HANGERS
 - A. Provide appropriate supporting devices and hangers as manufactured by Caddy Fasteners, Steel City, Minerallac or approved equal.
- 3. PART-3 EXECUTION**
 - 3.1 INSTALLATION
 - A. Provide complete conduit systems for wire and cable, including outlet and junction boxes, for fire alarm and emergency lighting.
 - B. PVC conduits where used for primary and secondary service entrances and where used for panel feeders longer than 50' shall have long sweep rigid conduit elbows and rigid conduit shall emerge from slab.
 - C. Follow layout indicated on plans; however, this layout is diagrammatic. Where changes are necessary due to structural or site conditions, other apparatus or other causes, make them. Off-sets in conduits are not indicated; furnish as required.
 - D. In slabs on grade having wire mesh reinforcing and no steel bars, install below the vapor barrier.
 - E. Use conduit of sizes indicated and required by NEC for number and sizes of conductors indicated.
 - F. Cut conduit at perpendicular and ream smooth to remove burrs. Cutting by any method which alters the cross section of conduit in any way will

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not be permitted. Keep conduit bends free from dents, kinks and bruises. Protective coating shall be undisturbed. Radii of the bends shall not be less than those stated in current edition of NEC. Do not use more than four 90 degree bends between outlet boxes.

- G. Conduit (metallic) shall be electrically continuous from service equipment to outlets and cabinets. Secure to boxes of sheet metal construction with one locknut outside and one inside box with reinforced bakelite bushing, O.Z. Gedney type "A" through "2" and type "B" for 2-1/2" and larger.
- H. Do not install continuous runs of more than 6 feet of horizontal conduit in walls of any construction. Install horizontal runs in floors or above ceiling.
- I. See that each length of conduit has the manufacturer's name, initials or trademark and the Underwriters' Laboratories Inspection Label thereon.
- J. Where connections are made to motors, not near walls or columns, install a vertical conduit, minimum size 3/4" attached to floor by a floor flange; bring wiring out of this conduit by means of condulets and flexible conduit and extend to motor junction boxes.
- K. Do not use perforated iron or galvanized wire for supporting conduit. Use only fasteners and clips specifically designed for the purpose.
- L. Base required strength of the supporting equipment, size and type of anchors on the combined weight of conduit, hanger and cables.
- M. Support conduits at intervals not to exceed:
 - 1. 2" and 3/4" 5' - 0" o.c.
 - 2. 1" and 1-1/4" 7' - 0" o.c.
 - 3. 1-1/2" and larger 9' - 0" o.c.
- N. Support conduits within three feet of each outlet box, junction box, cabinet or fitting.
- O. Use capped bushings to prevent dirt, concrete, moisture or other foreign matter from entering conduits during construction. Paper, wood or other plugs are unacceptable.
- P. Remove any water from conduits and ducts to avoid freeze damage.
- Q. Conduits to rooftop equipment shall be run in ceiling space below and turn up either at or within rooftop equipment at curb. DO NOT route long runs across roof.
- R. Where installed exposed, run conduits parallel with or at right angles to building lines. Where more than one conduit is following a given path, install with uniform distances between each other and with concentric bends, offsets and saddles.

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- S. Fasten single runs of conduit installed exposed on walls and ceilings with cadmium-plated malleable iron or pressed steel one hole straps, machine screws and lead anchors. Suspend single runs of conduit below ceilings by 3/8" steel rod and malleable iron hinge hangers.
- T. Cut necessary openings in concrete, masonry, brick walls, concrete, wood construction, etc., from both sides to effect a neat workmanlike job.
- U. Coordinate with other trades during placing of concrete and masonry wall construction to ensure proper installation of electrical conduit.
- V. Where conduit passes through building expansion joints, provide O.Z. type "AX" or equal, expansion fittings.
- W. Pull nylon fish wire into conduits left empty.
- X. Provide grounding bushings on all feeder conduits in accordance with NEC 517.
- Y. Provide seal-off fitting in all conduits entering hazardous areas.
- Z. Provide seal-off fittings in all conduits entering walk-in refrigerators or freezer.
- AA. In concrete slabs block up conduit from forms and securely fasten in place. All conduits in slabs shall have a minimum of 1-1/2" concrete coverage above and below.
- BB. Provide fire caulking around all conduits passing through rated wall or floor partitions. Refer to Section 26 05 00 Para. 3.13.
- CC. Junction box covers shall be labeled with panel and circuit numbers of the circuits contained therein.
- DD. In accordance with NEC 517, paint all junction boxes used in the three branches of the emergency power distribution system:

Life Safety Branch	Yellow
Critical Branch	Orange
Equipment Branch	Green
Fire Alarm	Red

END OF SECTION

SECTION 26-5100
LIGHTING EQUIPMENT

1. PART 1 - GENERAL

1.1 DELIVERY AND STORAGE

- A. Deliver luminaires and other lighting equipment in the manufacturer's unopened cartons or containers. Store in a safe, weathertight space.

1.2 STANDARDS

- A. Submit shop drawings/catalog data to the Architect and obtain his approval before ordering.
- B. Submit for approval a complete list of every fixture proposed for this project. Fixture list shall clearly indicate the exact fixture(s) being submitted including all applicable options and operating characteristics. Include a COVER SHEET clearly indicating the supplying distributor and manufacturer and complete catalog number and lamp type for each fixture designation. Contractor shall review and affix his stamp of approval to the list before submitting to Architect. Obtain approval on fixture list before ordering.
- C. All submittals shall consist of original manufacturer cutsheets or original .pdf format prints(not facsimile or photocopy thereof). For architect=s use a color chart shall be included for all fixtures requiring color selection. Actual samples may be requested by architect as deemed necessary for selection.
- D. Submittal shall not be based solely upon catalog number as scheduled but shall include proper voltage characteristics and other operating and mounting characteristics or features as are noted on drawings and as required for proper installation and operation. Refer to head end documents for requirements for preapproval of alternates.
- E. Where possible fixtures shall meet ARRA buy American standards.

2. PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers are as indicated on the lighting fixture schedule. These materials were chosen on a basis of performance, aesthetics, and in many cases, a combination of both. Therefore, if any substitution is considered, the piece of equipment in question must be equivalent to the specified item.

2.2 LUMINAIRES AND LIGHTING EQUIPMENT

- A. Provide luminaires and lighting equipment complete with suspension accessories, canopies, hickey, sockets, lamps, lamp holders, reflectors, ballasts, diffusing material, louvers, plaster frames, recessing boxes, etc., wired and assembled.
- B. Check Architectural Drawings and make lighting fixtures compatible with ceilings.
- C. Recessed fluorescent fixtures shown with acrylic lenses shall be furnished with minimum .125" thick lenses.

2.3 BALLASTS

- A. Fluorescent ballasts shall be T-8 electronic type equal to Valmont Ultra Miser for 32 or 40 W T8 lamps as scheduled on drawings.
- B. Self-contained emergency lighting ballasts in trauma/OR rooms for T8 or T12 lamps shall illuminate one or two lamps and shall produce nominally 3000 lumens for 5 minutes Bodine Gen 1 or equal
- C. Where necessary provide 277:120 stepdown transformers at individual 120V fixtures to allow connection to 277V circuits as indicated on drawings.

2.4 LAMPS

- A. Fluorescent lamps shall be 32W T8 3500 deg. k unless noted otherwise. Philips F32T8/TL735 or equal by G.E. or Sylvania.
- B. Biaxial and compact fluorescent lamps shall be 3500 Deg. K and sized per fixture schedule. Phillips, G.E. or Sylvania.
- C. Incandescent lamps shall be 130V inside frosted except as noted.
- D. HID lamps shall be of the type as recommended by the manufacturer of the fixture in which they are to be placed.

3. PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in locations as indicated on the Drawings or as directed by the Architect.
- B. Install all fixtures and other equipment in accordance with manufacturer's printed instructions.
- C. Install hold down clips for all lay-in fixtures.
- D. Mount fixtures as called for in schedule on drawings. Determine type of

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ceiling to be installed in each space from the architectural drawings and schedules and coordinate fixture mounting hardware and trims accordingly.

- E. Receive, store, uncrate, install and furnish lamps in fixtures shown in drawings schedule that are to be furnished by others.
- F. Adjustable light fixtures shall be adjusted for optimum distribution of light.
- G. Provide lamps for fixtures throughout the project, whether or not furnished by Contractor.
- H. Roadway and Area Luminaires: The General Contractor will provide concrete bases as required for poles as indicated. This Contractor shall coordinate with General Contractor for proper size of bases, anchor bolt arrangements, conduit stubs up to pole bases, etc. Furnish anchor bolts to General Contractor.
- I. Contractor shall adjust or rotate building accent, area and roadway lighting at night to maximize light utilization in intended areas.
- J. Effectively ground all luminaires to poles and all poles to equipment grounding conductor and to separate 3/4" diameter X 10' copperweld ground rod driven at base of each pole. See detail ED201.
- K. Provide fuseblocks within access of handhole to protect each circuit from failure of individual ballast in individual fixture.

END OF SECTION

SECTION 26-5500
PAD MOUNT TRANSFORMER ELECTRIC SERVICE

1. PART 1 - GENERAL

- 1.1 Service available will be underground and will be of the following voltage characteristics: 277/480v 3 phase 4 wire
- 1.2 Service to be grounded in accordance with latest edition of National Electric Code. Article No. 250 and any special requirements as required by Municipal, State or Federal authorities having jurisdiction. See Section 16450 of these specifications.
- 1.3 System will be serviced by: City of Wrangell electric department

2. PART 2 - PRODUCTS

- 2.1 Specific products to be as called for in the Basic Materials Section of these specifications.

3. PART 3 - EXECUTION

- 3.1 Electrical contractor shall coordinate with Wrangell electric to determine final exact location of transformer pad, exact size required and conduit stub-up points for secondary conductors.
- 3.2 Metering to be provided by Wrangell Electric in CT cabinet on building exterior. CT cabinet shall be stainless steel nominal 36" sq X 12" deep with mounting hardware for fixed CT's within cabinet. Confirm specifics with Wrangell Electric prior to purchase and installation.
- 3.3 All primary service routing including underground conductors, marker tape etc. shall be furnished by utility up to the point of demarcation indicated on site plan. Cost for this work shall be included in the project scope of work. Secondary service conduit and conductors are to be Contractor furnished and terminated by utility at transformer.
- 3.4 Pad transformer shall be furnished by the utility. This contractor is to coordinate conduit stub-ups within premanufactured transformer pad.
- 3.5 Contractor shall coordinate location and access with utility's requirements.
- 3.6 Verify and include utility charges for electrical service.

END OF SECTION

SECTION 31 2200

EARTHWORK

1. GENERAL

1.1 GENERAL REQUIREMENTS

- A. This section describes general requirements for all types of earthwork and is applicable to all earthworks required on the project.

1.2 CLASSIFICATION

- A. All excavation is unclassified. The terms earthwork or excavation include all materials excavated or removed regardless of material characteristics. The Contractor shall make his own estimate of the kind and extent of materials, which will be encountered in the excavation.

1.3 QUALITY CONTROL ASSURANCE

- A. Soils and Backfill: Moisture density standard ASTM D1557 or AASHTO T-180 Method "D", unless otherwise specifically approved.
- B. In-place Density Determination: Sandcone method ASTM D1556 or Nuclear Method ASTM D2922.
- C. Classification of Soils ASTM D2487.
- D. Quality assurance monitoring of subgrade backfill and embankment materials shall be paid for by the Owner.
- E. Minimum frequency for testing is indicated below. Additional testing may be necessary depending on circumstances and failure rate.

1. Mechanical Analysis on Imported Material

- a. One sample for approval, prior to use of the following, plus regular checks as shown:

<u>Material</u>	<u>Frequency</u>
Backfill gravel	One per 2000 tons
Foundation gravel	One per 600 L.F.
Bedding, all types	One per 600 L.F.
Crushed Top Course	One per 1000 tons

2. Mechanical Analysis on Native Soils

- a. Street Improvements - minimum one per 600 feet on in place material prior to compaction.

3. Density - Trench Backfill

- a. Dedicated Rights of Way - 3 per 300 L.F. of trench @ spring line, mid trench and surface.

- b. Easements, one at spring line per 300 L.F.

4. Density - Street and Road Construction

- a. One test per 400 L.F. on each lift of classified fill and backfill.
- b. One test per 400 L.F. on completed subgrade prior to approval of concrete pour, or placement of leveling course.

1.4 SUBMITTALS

- A. Import backfill gradation and moisture density compaction curve test reports.
- B. Embankment and native backfill materials gradations and moisture density standards curve test reports.
- C. Certification of gradation and compliance with referenced standards, and moisture density standards test reports from qualified testing laboratory.
- D. Density test results in approved format.
- E. If at any time the Contractor changes the source and/or stockpile from which materials are obtained, certificates of gradation for these new sources will also be required. The Contractor shall make allowances in his unit prices bid for these items to cover expenses incurred in having this certification made and no additional compensation will be allowed.
- F. During construction, the Owner may elect to have further gradation testing completed on the materials being furnished by the Contractor. This testing will be at the expense of the Owner, however, the Contractor shall provide material samples as may be necessary to complete this testing and these material samples will be furnished from material available on the job site or from the Contractor's source and/or supplier.

2. PRODUCTS

2.1 BACKFILL MATERIALS

- A. These materials shall be native materials and as described in this section.

2.2 GRAVEL BEDDING MATERIAL

- A. Bedding material shall be a locally available clean natural occurring or crushed sand/gravel mixture free from organic matter and conforming to the following gradation when tested in accordance with ASTM D422.

<u>U.S. Standard Sieve Size</u>	<u>Percent Passing, by Weight</u>
3/4"	100
3/8"	70 - 100
No. 4	55 - 100
No. 10	35 - 95
No. 20	20 - 80
No. 40	10 - 55
No. 100	0 - 10
No. 200	0 - 3

- B. Aggregate material conforming to "Standard Specifications for Highway Construction", latest edition of the Alaska Department of Transportation and Public Facilities, untreated base classification D-1, will be acceptable in lieu of the

gradations specified in paragraph 2.2A.

2.3 BACKFILL GRAVEL

- A. Backfill gravel shall be naturally occurring screened or crushed gravel. It shall be free from muck, frozen material, roots, sod or other extraneous or objectionable materials. It shall have such characteristics of size and shape that it will compact readily. It shall have a plasticity index not greater than six (6).
- B. All material shall have maximum size of four (4) inches and not more than ten (10) percent shall pass a No. 200 sieve. The percent of minus 200 will be determined on minus three (3) inch material.
- C. Tallying for pay quantities shall be as established by the Contractor and Engineer prior to construction.

2.4 CRUSHED AGGREGATE BASE COURSE

- A. Aggregate shall be crushed stone or crushed gravel, and shall consist of sound, tough, durable pebbles or rock fragments of uniform quality. All material shall be free from clay balls, vegetable matter or other deleterious matters. In addition, aggregate shall meet the following requirements:

Percent of Wear	AASHTO T-96	50 max.
Degradation Value	ATM T-13	45 min.
Percent Fracture	ATM T-4	70 min.

- B. Crushed aggregate base course shall meet the requirements of the State of Alaska "Standard Specifications for Highway Construction", latest edition, section 703-2.03. Gradation shall conform to the requirements of grading D-1 unless otherwise specified.
- C. A special gradation, E-1, for gravel road applications only shall meet all the requirements for grading D-1 except the percent passing the No. 200 sieve shall be between 6-10%.

2.5 SHOT ROCK EMBANKMENT

- 1 A. Shot rock embankment shall be naturally appearing blasted rock from a quarry. It shall generally be 6" minus in size except that the top 6 inches of the embankment shall be 3 inch minus.

2.6 RIPRAP

- A. Riprap shall consist of broken stone, concrete in sacks, or concrete slabs placed on shoulders, slopes or such other places as may be indicated in the Plans or as directed by the Engineer.
- B. The stone for loose riprap shall be hard, sound and durable. It shall be free from segregation, seams, cracks, and other defects tending to destroy its resistance to weather.
- C. Spalls are defined as broken rock in sizes ranging from 3" to 1/3 cubic foot. Loose riprap shall be free of rock fines, soil or other extraneous material.
- D. Should the riprap contain insufficient spalls within the definition and gradation requirement listed above, the Contractor shall furnish and place supplementary spall

- material from a source approved by the Engineer, at the Contractor's expense.
- E. The grading of the riprap shall be determined by the Engineer by visual inspection of the load before it is dumped into place, or, if so ordered by the Engineer, by dumping individual loads on a flat surface and sorting and measuring the individual rocks contained in the load.
 - F. Stone shall be hard angular quarry and have a percentage of wear of not more than 50 at 500 revolutions as determined by ASTM C-535. The least dimension of any piece of stone shall be not less than 160 pounds per dry cubic foot. Rock shall have an absorption rate greater than 2.5% as determined by ASTM C 97-83.
 - G. The riprap stone shall form a smooth gradation curve without a large spread between median and maximum sizes and shall have the following gradation limits.
 - 1. CLASS I – No more than 10% of the stones by total weight shall weigh more than 400 pounds per piece and no more than 15% by weight of the stones shall weigh less than 50 pounds per piece. The stones shall be evenly graded and a minimum of 50% by weight of the stones shall weigh 200 pounds or more per piece.
 - 2. CLASS II – The following gradation is required:

Specific Stone Size Stone Wt. (lbs)	Percent Smaller By Weight %
300	100
150	50 - 80
75	20 - 50
50	0 - 20

- 3. CLASS III – No more than 10% by total weight of the stones shall weigh more than 140 lbs each, and not more than 50% by total weight of the stones shall weigh less than 70 lbs each.

3. EXECUTION

3.1 BEDDING MATERIALS

- A. Bedding materials shall be placed in accordance with the requirements for the utility being installed. Refer to appropriate utility specification section.

3.2 CRUSHED AGGREGATE BASE COURSE

- A. Conform to Section 301 of the AKDOT&PF, SSHC except as follows for placement requirements.
 - 1. Density requirement shall be 95% of the maximum density as determined by WAQTC FOP for AASHTO T180 or ATM 212.

3.3 SHOT ROCK EMBANKMENT

- A. Embankment shall be placed in lifts whose loose thickness does not exceed 2 feet. Material shall be dumped on the existing fill and dozed into place. In addition to mechanical compaction, it shall be compacted by routing the hauling and placing equipment over the entire area prior to placing the next lift.

3.4 RIPRAP

- A. A footing trench shall be excavated along the toe of the slope when shown on the plans. The stones shall be handled or dumped into place so as to secure a stone mass of the thickness, height, and length shown on the plans, or as staked with a minimum of voids.
Undesirable voids shall be filled in with small stones or spalls. The rock shall be manipulated sufficiently by means of a bulldozer, rock tongs, or other suitable equipment to secure a reasonably regular surface and mass stability.
- B. Riprap protection shall be placed to its full course thickness at one operation and in such a manner as to avoid displacing the underlying material. Placing of riprap protection in layers or by dumping into chutes or by similar methods likely to cause segregation will not be permitted.

All material going into riprap protection shall be so placed and distributed that there will be no large accumulation or area composed largely of either the larger or smaller sizes of stone.
- C. Unless otherwise authorized, the riprap protection shall be placed in conjunction with the construction of the embankment with only sufficient lag in construction of the riprap protection as may be necessary to prevent mixture of embankment and riprap material.
- D. The Contractor shall provide a level compact area of sufficient size to dump and sort typical loads of riprap at approved locations(s). He shall further dump loads specified in the area and assist the Engineer as needed to sort and measure the stones in the load for the purpose of determining if the riprap is within specifications.
Mechanical equipment as needed to assist in the sorting shall be provided by the Contractor at not additional cost to the Owner.

END OF SECTION

SECTION 31 2319

DEWATERING

1. GENERAL

1.1 QUALITY CONTROL

- 1 A. It shall be the sole responsibility of the Contractor to control the rate and effect of the dewatering in such a manner as to avoid all objectionable settlement and subsidence.
- 2 B. All dewatering operations shall be adequate to assure the integrity of the finished project and shall be the responsibility of the Contractor.
- 3 C. Structures or Facilities:
 - 4 1. Where critical structures or facilities exist immediately adjacent to areas of proposed dewatering, reference points should be established and observed at frequent intervals to detect any settlement which may develop.
 - 5 2. Should significant settlement be observed, recharge wells could be placed between the structure and the trench and water pumped under pressure back into the soil.
 - 6 3. The responsibility for conducting the dewatering operation in a manner which will protect adjacent structures and facilities rests solely with the Contractor.
 - 7 4. The cost of repairing any damage to adjacent structures and restoration of facilities shall be the responsibility of the Contractor.

2. PRODUCTS

2.1 EQUIPMENT

- 8 A. Before operations begin, the Contractor shall have available on this site of work sufficient pumping equipment and/or other machinery to assure that the operation of the dewatering system can be maintained.

3. EXECUTION

3.1 METHODS

- 9 A. Dewatering shall be done by such method as the Contractor may elect.
- 10 B. Dewatering Operation:

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- 11 1. Dewatering, sufficient to maintain the groundwater level at or below the surface of trench bottom or base of the bedding course, shall be accomplished prior to pipe laying and jointing, if not prior to excavation and placing of the bedding as called for in other sections of the specifications.
- 12 2. The dewatering operation, however accomplished, shall be carried out so that it does not destroy or weaken the strength of the soil under or alongside the trench.
- 13 C. The normal water table shall be restored to its natural level in such a manner as to not disturb the pipe and its foundation.
- 14 D. Well Points or Wells:
 - 15 1. If well points or wells are used, they shall be adequately spaced to provide the necessary dewatering and shall be sand-packed and/or other means used to prevent pumping of fine sands or silts from the subsurface.
 - 16 2. A continual check by the Contractor shall be maintained to insure that the subsurface soil is not being removed by the dewatering operation.
- 17 E. Dewatering of excavations shall be considered incidental to the construction and all costs thereof shall be included in the cost of work to which it relates.
- 18 F. Dispose of water so as not to cause injury to public or private property or to cause a nuisance or menace to the public; construction of temporary facilities to dispose of water shall be incidental to the construction.
- 19 G. Permanent piping systems may not be incorporated in the dewatering systems.

END OF SECTION

TRENCHING, BACKFILLING AND COMPACTION FOR UTILITIES 31-2333-1

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SECTION 31 2333

TRENCHING, BACKFILLING AND COMPACTING FOR UTILITIES

1. GENERAL

1.1 QUALITY CONTROL ASSURANCE

A. Conform to Section 31 0000 and as specified herein.

1.2 SUBMITTALS

A. Conform to Section 31 0000.

2. PRODUCTS

2.1 MATERIALS

A. Materials used for backfill shall be native materials as described herein or imported materials as described in Section 31 0000.

3. EXECUTION

3.1 TRENCHING

A. All material excavated from trenches and piled adjacent to the trench or in a roadway or public thoroughfare shall be piled and maintained so that the toe of the slope of the spoil material is at least two (2) feet from the edge of the trench. It shall be piled in such a manner that will cause a minimum of inconvenience to public travel, and provision shall be made for merging traffic where such is necessary. Free access shall be provided to all fire hydrants, water valves and meters, and clearance shall be left to enable the free flow of storm water in all gutters, conduits, and natural watercourses.

B. All ledge rock boulders, or stones, shall be removed to provide a minimum clearance of six (6) inches under and around the pipe.

C. All materials removed shall be replaced with satisfactory waste materials from other trenches or from imported bedding or backfill, as determined by the Engineer. All costs for backfilling shall be considered as incidental to this item. Engineer shall determine if material conforms with the requirements of Specifications Section 31 0000.

3.2 TRENCHING FOR WATER LINES

A. All trenches shall be dug to true and smooth bottom grades and in accordance with the grades indicated on the Drawings. Trench widths shall not exceed thirty six inches (36 inches) maximum or 12 times outside diameter of the pipe plus 18 inches whichever is greater. Standard excavation equipment shall be adjusted so as to excavate the narrowest ditch possible. Ditch sides shall be straight and vertical unless otherwise required by OSHA.

B. The depth of trenching for water mains shall be such as to give a minimum cover of 48 inches over the top of the pipe unless otherwise specified. No additional

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compensation will be allowed for the small amount of deeper excavation which may be required, due to localized breaks in grade, or installing the new main under existing culverts or other utilities where necessary. Where profile of pipeline and ground surface is shown on the Plans, pipeline shall be laid to elevation shown unless directed otherwise by the Engineer.

- C. Excavation shall be to such depth that the minimum cover over the valve nuts shall be one foot. No valve shall be located in such a position as to be in any roadside ditch, drainage ditch or channel.
- A. The minimum amount of open trench shall conform to the ADOT&PF requirements.
- B. Trenches shall be over excavated below the specified grade to provide for bedding material specified.
- 1 H. The length of trench excavated in advance of the pipe laying shall be kept to a minimum, and in no case shall more than 150 feet of trench be open unless specifically authorized by the Engineer.
- 2 I. Pay limits for import backfill and surface restoration shall apply irregardless of trenching methods employed by Contractor to ensure safe operation and in order to meet OSHA trenching regulations.

3.3 TRENCHING FOR SEWERS

- 3 A. All trenches shall be excavated true to lines and grades in accordance with the grades indicated on the Plans.
- B. Trenches shall be of sufficient width to permit proper jointing of the pipe and backfilling of material along the sides of the pipe.
- C. Trenches shall be excavated with ditch sides straight and vertical unless otherwise required by OSHA. Utilize shoring as required in accordance with Section 31 4100, Shoring.
- D. Excavation for manholes and other structures shall be sufficient to provide a minimum of 12 inches between their outside surfaces and the sides of the excavation.
- 4 E. Trench width at the surface of the ground shall be kept to the minimum amount necessary to install the pipe in a safe manner.
- 5 F. Trench width at the bottom of the trench and up to a point 6 inches above the crown of the pipe shall not exceed 36 inches or 1-1/2 times the outside diameter of the pipe plus 18 inches, whichever is greater, except as shown on the Plans.
- 6 G. Unless otherwise specified, the trenches shall be excavated below the specified grade a sufficient distance to provide for bedding material as specified.
- A. The length of trench excavated in advance of the pipe laying shall be kept to a minimum, and in no case shall more than 150 feet of sewer line trench be open unless specifically authorized by the Engineer.
- 7 I. Pay limits for import backfill and surface restoration shall apply irregardless of

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trenching methods employed by Contractor to ensure safe operation and in order to meet OSHA trenching regulations.

3.4 PIPE FOUNDATIONS

- A. Where the trench bottom is in a material which is unsuitable for foundation or material which will make it difficult to obtain uniform bearing for the pipe, such material shall be removed and a stable foundation provided in accordance with details on the Contract Drawings.
- B. Proper preparation of foundation and placement of foundation material, where required, shall precede the installation of all pipe. This shall include the necessary preparation of the native trench bottom and/or the top of the foundation material to a uniform grade so that the entire length of pipe rests firmly on a suitable properly compacted material. Backfill material around the pipe will be placed in a manner to meet requirements specified in respective sections for installation of pipeline.
- C. Gravel to be used for foundation purposes shall be of a type and gradation to provide a solid compact bedding in the trench. Since trench conditions vary, foundation gravel requirements will change.
- D. Unsuitable material for foundation purposes below the depth required for the specified bedding shall be removed. Excavated materials shall be disposed of at an approved waste site and all costs involved in the excavating and wasting of this material shall be considered as incidental.

3.5 PIPE BEDDING

- A. Placement of bedding material in the pipe zone shall be as specified in the section regarding the pipeline being constructed.

3.6 BACKFILLING

- A. Pipe bedding and backfill to six inches (6") over the top of the pipe shall be completed before backfilling operations are started.
- B. The Contractor shall take all necessary precautions to protect the pipe from any damage, movement or shifting. In general, backfilling shall be performed by pushing the material from the end of the trench into, along and directly over the pipe so that the material will be applied in the form of a rolling slope rather than by side filling which may damage the pipe. Backfilling from the sides of the trench will be permitted after sufficient material has first been carefully placed over the pipe to such a depth to protect the pipe.
- C. The Contractor shall also provide for the proper maintenance of traffic flow and accessibility as may be necessary, and he shall also make adequate provisions for the safety of property and persons.
- D. Temporary cribbing, sheeting, or other timbering shall be removed unless specifically authorized in writing.
- E. The Contractor shall maintain the water level at the bottom of the trench. Where dewatering of the trench has been accomplished by well-points, wells or any other such methods that would lower the water table surrounding the trench areas, such dewatering shall be continued until the trench is completely backfilled.
- F. All brush, stumps, logs, planking, disconnected drains, boulders, etc., shall be removed from the material to be used for backfilling the trench. The cost of removal and disposal of these items shall be considered as incidental to the construction and no further compensation shall be allowed.
- G. Where original excavated material is unsuitable for trench backfill, backfill gravel

TRENCHING, BACKFILLING AND COMPACTION FOR UTILITIES 31-2333-4

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shall be placed. The unsuitable material shall be removed to a disposal area. Backfill gravel shall be used for backfill only where original material is unsuitable and upon approval by the Engineer. Backfill gravel shall be as specified in Section 31 0000.

- H. Where it is required that a blanket of select material be placed on top of the native backfill, the backfill shall be placed to the elevations shown on the Plans, or to the elevation the Engineer may direct, and shall be leveled to provide for a uniform thickness of the selected material. Compaction of the native material shall be as required by the Owner and shall be performed prior to placing the select material.
- I. Backfill gravel: Wherever a trench is excavated in a paved roadway, sidewalk or other area where minor settlements would be detrimental and where the native excavated material is not suitable for compaction as backfill, the trench shall be backfilled to such depth as the Engineer may direct with Backfill Gravel. Backfill Gravel shall be imported backfill gravel or may be suitable materials hauled from another portion of the project conforming to the requirements of Section 31 0000. Engineer shall determine if material conforms with the requirements of Specifications Section 31 0000.

3.7 GENERAL COMPACTION REQUIREMENTS

- A. When working in an existing traveled roadway, restoration and compaction must be achieved as the trench is backfilled so as to maintain traffic.
- B. All trench backfill under roadways shall be mechanically compacted to 95% of maximum density. Maximum lifts shall be 12 inches.
- C. Any trench in which 95% density cannot be achieved with existing backfill, the top four feet shall be replaced with backfill gravel mechanically compacted to 95%. Placement shall be in 12 inch lifts maximum.
- D. All crushed aggregate base course shall be mechanically compacted to 98% of maximum density.
- E. Trench backfill in easements and lawn areas which do not support vehicle traffic shall be mechanically compacted to 90% of maximum density. Maximum lifts shall be 12 inches.

3.8 MECHANICAL COMPACTION

- A. The density of compacted backfill material shall meet 95% of the maximum density as outlined in Section 31 0000 or as outlined in the permit issued by the governing body responsible for the roadway.
- B. The Contractor shall be responsible to provide the proper size and type of compaction equipment and select the proper method of utilizing said equipment to attain the required compaction density.
- C. In place compaction tests shall be made. Contractor shall remove and recompact material that does not meet specified requirements.

END OF SECTION

SECTION 31 2400

SHORING

1. GENERAL

1.1 QUALITY ASSURANCE

- A. Contractor's sheeting and shoring plans shall be designed by a structural engineer with experience in the work.

2. PRODUCTS

2.1 TRENCHES

- A. Materials used shall be at the Contractor's option.

3. EXECUTION

3.1 SAFETY REQUIREMENTS

- A. Shoring shall be placed in accordance with federal, state and local safety requirements.

3.2 CRIBBING AND SHEETING

- A. Unless otherwise provided, the Contractor shall provide all cribbing and sheeting needed to protect the work, adjacent property and improvements, utilities, pavement, etc., and to provide safe working conditions in the trench.
- B. Removal of any or all cribbing and sheeting from the trench shall be accomplished in such a manner as to fulfill all of the above requirements and shall also be accomplished in such a manner as to prevent any damage to the work.
- C. Damages resulting from improper cribbing or from failure to crib shall be the sole responsibility of the Contractor. Cribbing will not be a pay item and the cost thereof shall be included in the contract price for each of the various items of work included in the project unless otherwise provided.
- D. Whether cribbing and sheeting shall be left in place or removed shall be at the option of the Contractor, provided that removal of any an all sheet piling, sheeting or cribbing used in trench or structure excavation shall be accomplished in the manner as to prevent the settlement of the pipes or other work and to prevent increased backfill loading which might overload the pipe or walls of the structure. Should the Owner order that any sheeting or cribbing be left in place, the Contractor shall not remove the same but will receive payment for the materials left in place on a unit price basis, if such be in the Contract or at the market value thereof, if there be no such unit price.

3.3 SPECIAL REQUIREMENT FOR FLEXIBLE PIPE

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- A. Shoring to be removed, or moveable trench shields or boxes, shall be located at least 2½ pipe diameters away from the pipe, if the bottom of the shoring, shield or box extends below the top of flexible pipe, unless a satisfactory means of reconsolidating the bedding or side support material disturbed by shoring removal can be demonstrated. Damages resulting from improper shoring or failure to shore shall be the sole responsibility of the Contractor.

END OF SECTION

SECTION 32-1216

ASPHALT CONCRETE PAVEMENT

1. GENERAL

1.1 REFERENCES

- 1 A. The publications listed below form a part of this specification to the extent referenced; the publications are referred to in the text by basic designation only.
 - 2 1. State of Alaska Department of Transportation and Public Facilities (ADOT&PF), Standard Specifications for Highway Construction 2004 Edition (SSHC).
 - 3 2. American Association of State Highway and Transportation Officials (AASHTO):
 - 4 3. American Society for Testing and Materials (ASTM).
 - 5 4. ADOT&PF Alaska Test Methods, Materials Section (ATM):
 - 6
- 7 B. Testing Requirements
 - 8 WAQTC FOP for AASHTO T27/T11 Sieve Analysis of Fine and Coarse Aggregates and Materials Finer than .075mm (No. 200) Sieve in Mineral Aggregate by Washing
 - 9 AASHTO T308 Determining the Asphalt Content of Hot Mix Asphalt by Ignition Method
 - 10 ATM T313 Aggregate Degradation
 - 11 ATM T17 Marshall Mix Design
 - 12 WAQTC FOP for AASHTO TP61 Determining the Percentage of Fracture in Coarse Aggregate
 - 13 WAQTC TM6 Moisture Content of Bituminous Mixes by Oven
 - 14 ASTM C88 Soundness of Aggregates by use of Sodium Sulfate or Magnesium Sulfate
 - 15 ASTM C117 Materials Finer than 75-um (No. 200) Sieve in Mineral Aggregates by Washing
 - 16 ASTM C131 Resistance to Abrasion of Small Size Coarse Aggregates by Use of the Los Angeles Machine
 - 17 ASTM C136 or WAQTC FOP for AASHTO T27/T11 Sieve or Screen Analysis of Fine and Coarse Aggregate
 - 18 ASTM C183 Sampling Hydraulic Cement
 - 19 ASTM C566 or WAQTC FOP for AASHTO T255/T265 Total Moisture Content of Aggregate by Drying

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- 20 ASTM D75 or WAQTC FOP for AASHTO T2 Sampling Aggregates
- 21 ASTM D995 Requirements for Mixing Plants for Hot-Mixed Hot-Laided Bituminous Paving Mixtures
- 22 WAQTC FOP for AASHTO T209 Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
- 23 WAQTC FOP for AASHTO Sand Equivalent Value of Soils and Fine Aggregate
- 24 WAQTC FOP for AASHTO T166/T275 Bulk Specific Gravity of Compacted Bituminous Mixtures Using Saturated Surface-Dry Specimens
- 25 ASTM D2950 or WAQTC TM8 Density of Bituminous Concrete in Place by Nuclear Method
- 26 ASTM D 3665 Random Sampling of Paving Materials
- 27 ASTM D 3666 Inspection and Testing Agencies for Bituminous Paving Materials
- 28 WAQTC FOP for AASHTO T89/T90 Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- 29 ASTM D 4791 Flat and Elongated Particles in Coarse Aggregate
 - A. Material Requirements
- 30 ASTM D242 Mineral Filler for Bituminous Paving Mixtures
- 31 AASHTO M320 Performance Graded Asphalt Binder
- 32
- 33

1.2 SUBMITTALS

- 34 A. The following shall be submitted in accordance with Division 1 Specifications, and the Special Contract Requirements:
 - 35 1. Job Mix Design:
 - 36 a. The Contractor shall furnish a job mix design to the Engineer for review at least 15 days prior to production and placement of the material.
 - 37 b. The mix design shall conform to the criteria listed below, and shall use the same materials sources, aggregate gradations, and asphalt grade as will be used in the pavement.
 - 38 c. The mix design shall be prepared by an approved, independent laboratory and stamped by a registered Professional Engineer or by a State of Alaska laboratory.
 - 39 d. The mix design shall have been prepared no earlier than 1 year prior to the start of placement of pavement.
 - 40 2. Test reports for tests as specified below.
- 41 B. Certify that materials comply with specification requirements.
- 42 C. Certificate shall be signed by asphalt concrete producer and Contractor.

- 43 D. Submit a paving and plant control plan. Address sequence of operations and outline steps to assure process quality control.

44 1.3a QUALITY CONTROL TESTING

45 The Contractor shall perform all quality control tests necessary to control the production and construction processes applicable to these specifications. The testing program should include, but not necessarily be limited to, tests for asphalt content, aggregate gradation, temperatures, aggregate/bituminous moistures and field compaction. Test reports shall be submitted daily. The Engineer reserves the right to monitor any or all of the Contractors testing and laboratory procedures.

46 1.3b SAMPLING

47 The Contractor will be responsible for all sampling as directed by the Engineer. Sampling will include Hot Mix taken from behind the screed prior to compaction and Cores taken from the mat. The Engineer will determine the location of the samples by a random method (ASTM D3665). Sampling for Assurance testing will be witnessed by the Engineer or his representative and the samples will be turned over for Assurance testing. Splitting of Assurance samples by the Engineer to provide for Contractor Quality Control testing is encouraged.

- A. All sampling will be in accordance with standard procedures specified.

48 Field: Sample plate with finder cable, square-nose shovel and metal containers with lids will be required for the sampling of Hot Mix behind the screed. The sample plate should be dimensioned to require only one placement of the plate during sampling, yielding enough material to perform the required tests. A cookie cutter may be used but is not required. Coring equipment shall be capable of cutting a neat full depth 6 inch core.

49

50 1.4 QUALITY ASSURANCE

- 51 A. The Engineer shall establish and maintain control of the work covered under this section to insure compliance with the contract requirements, including but not limited to the items listed below.

52 1. Asphalt concrete tests shall be performed for gradation of aggregate materials, asphalt content, density and thickness as follows.

53 2. The project quantity for each phase of paving will be considered as one Lot. The Lot will be divided into 10 equal sub-lots, each randomly sampled and tested for asphalt content, density and gradation. Any test results from a subplot which fall outside of the tolerance limits may be cause for rejection.

54 3. Any area that is visibly segregated, fails to meet surface tolerance requirements, or cools below the Contractors ability to complete the minimum specified compaction is considered unacceptable. The Engineer may reject material which appears to be defective based on visual inspection. If you request a test of the rejected material, two samples will be collected and tested. If all test results are within specifications, you will be paid. If any of the

test results fail to meet Specifications, no payment will be made and you must remove and dispose of the rejected material.

55 4. Samples:

56 a. Cement Content and Gradation: Samples taken for determination of asphalt cement content and gradation will be taken from behind the screed and prior to compaction in each sub-lot at the random location selected by the Engineer.

57 b. Density: The Contractor shall cut one full-depth core with a minimum diameter of 6 inches from each sub-lot at the random location selected by the Engineer, within 24 hours of final rolling.

58 c. All voids left by sampling will be filled with asphalt material and compacted within 24 hours.

59 5. Testing:

60 a. Cement Content: Asphalt cement content will be determined by AASHTO 308, Ignition Method.

61 b. Gradation: Aggregate remaining after the ignition oven has burned off the asphalt cement.

62 c. Density: The Target value for Mat Density shall be **95%** of the theoretical Maximum Specific Gravity (MSG) as determined by WAQTC FOP for AASHTO T209. Tolerance limits for Mat Density shall be 93-98%. For Densities less than the Target value a price adjustment of 2% for each 1% below the Target value, shall be deducted for the subplot. For the first Lot the MSG will be determined by the Job Mix Formula (JMF). This may be adjusted if the testing of the first two sublots demonstrates a minimum average variance of 2 pcf from the JMF MSG, all other factors being equal. Subsequent sublots will use the average MSG of the first two sublots within that Lot.

63 Cores taken for evaluation of density will be tested for BSG in accordance with WAQTC FOP for AASHTO T166/T275.

64

2. PRODUCTS

2.1 MATERIALS

65 A. Asphalt-concrete pavement shall conform to Section 401 of ADOT&PF-SSHC 2004 Edition in its entirety, with gradation meeting Type II of Table 703-3, except as otherwise specified herein.

66 1. Material:

67 a. Asphalt cement shall be PG 58-28 conforming to the requirements of AASHTO M-320.

68 b. Asphalt content shall be the optimum as determined by Alaska Test Method T-17, Standard Method of Test of Bituminous Mix

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Design by the Marshall Method with anti-strip agent equal to 0.3% by weight of the asphalt cement.

69 c. A single source of asphalt material shall be used for the entire job.

70 2. The job mix design shall be prepared by Alaska Test Method T-17, using the criteria listed under Table 401-1, Sec. 401 of the ADOT&PF-SSHC, Class "B".

71 3. Maximum acceptable tolerance of asphalt content shall be within 0.4% from optimum asphalt content, except that minimum tolerance shall not fall below 4.8%. Design asphalt content shall not be lower than 5.0% by total weight of mix.

72 4. The job design mix material for asphalt concrete mixture shall conform with ADOT&PF, SSHC, Sec. 703-2.04 and Table 703-3, Type II gradation. Production tolerances will conform to Table 401-2 of Section 401 for gradation.

73

74 5. Paragraphs 401-4.01, 401-4.03, and 401-5.01, regarding method of measurement, contract price adjustments, and basis of payment shall not apply.

75 C. Tack coat and prime coat shall conform to Section 402 Tack Coat and Section 403 Prime Coat of ADOT&PF-SSHC in its entirety, except as otherwise specified herein.

76 1. Tack coat material shall be asphalt conforming to ASTM D-2397, Type CSS-1.

77 2. Prime coat material shall be Grade MC-30 or MC-70 of AASHTO M-82.

78 3. Paragraphs 402-4.01, 402-5.01, 403-4.01, and 403-5.01 regarding measurement and payment shall not apply.

3. EXECUTION

3.2 ASPHALT-CONCRETE PAVEMENT

79 A. Aggregates shall be properly stockpiled. Aggregates that have become mixed with earth or foreign material, or become coated with undesirable material shall not be used.

80 B. Hot mix tests shall be performed to verify compliance with approved job mix design.

81 1. Asphalt content shall be determined by AASHTO T308. Samples taken for the determination of asphalt content shall be taken from behind the screed prior to initial compaction, or at the end of the auger.

82 2. Density and stability shall be determined in accordance with WAQTC FOP for AASHTO T166/T275.

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- 83 3. Aggregate gradation shall be determined in accordance with WAQTC FOP for AASHTO T27/T11.
- 84 4. Sampling shall provide a representative sample of aggregate incorporated into the asphalt concrete mixture.
- 85 C. Placing and compacting operations shall be complied with as specified in ADOT&PF-SSHC.
- 86 D. Rolling shall be continued until a relative density of not less than that specified of the theoretical MSG is obtained within the asphalt concrete.
- 87 1. Joints: The formation of all joints shall be made to ensure a continuous bond between the courses and obtain the required density. Cold joints shall be cut back and a tack coat applied prior to the laydown of asphalt concrete.
- 88 E. Compaction shall be determined in accordance with AASHTO T-230 except that the standard specimen shall be prepared in accordance with AASHTO T-245.
- 89 F. Mat Thickness: Minimum tolerance shall be within 1/4-inch of the specified thickness of asphalt-concrete pavement.
- 90 G. The Contractor shall cover the asphalt concrete in trucks when:
- 91 1. The temperature is below 50 degrees F and falling or 40 degrees F and rising.
- 92 2. Rain is imminent or falling.

3.3 TACK COAT AND PRIME COAT

- 93 A. The tack coat shall be applied at a rate that will result in an asphalt residual covering of 0.015 to 0.045 gallons per square yard.
- 94 B. Application Rate:
- 95 1. The rate of application of the prime coat shall be from 0.1 to 0.3 gallons per square yard.
- 96 2. For MC-30, the specification is modified to allow 35% maximum (instead of 25%) distillate at 437 degrees F and a minimum of 100 poises (instead of 300) viscosity on residue from distillation at 140 degrees F.
- 97 C. Tack coat and prime coat shall be applied only when the atmospheric temperature is above 50 degrees F in the shade.
- 98 D. The proper cure period shall be allowed prior to placing any materials on top of prime coat or tack coat.

3.4 CLEANING UP

- 99 A. The Contractor shall at all times keep the construction area free from accumulations of waste materials or rubbish and, prior to completion of the work,

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remove any rubbish from and about the premises and all tools, equipment and materials not the property of the Government.

- 100 B. Upon completion of the construction, the Contractor shall leave the work and premises in a clean, neat and satisfactory condition.

END OF SECTION

SECTION 32 1217

PAVEMENT REPAIR AND RESURFACING

1. GENERAL

1.1 QUALITY ASSURANCE

- 1 A. Comply with Section 32 1216, Asphalt Concrete Pavement.
- 2 B. Testing requirements to be performed at the Contractor's cost include:
 - 3 1. Any and all Quality Control tests necessary for product and placement control.
 - 4 2. Sampling of Hot mix and Cores, as directed by the Engineer, for Assurance testing. All Assurance testing will be paid for by the Owner.

1.2 PAVING QUALITY REQUIREMENTS

- 5 A. General: In addition to other specified conditions, comply with following minimum requirements.
 - 6 1. Comply with requirements of ADOT&PF.
 - 7 2. Provide final surfaces of uniform texture, conforming to required grades and cross-sections.
- 8 B. Surface Smoothness:
 - 9 1. Test finished surface of each asphalt concrete course for smoothness, using a 10 foot straight edge applied parallel to and at right angles to centerline of paved areas.
 - 10 2. Surfaces will not be acceptable, if exceeding 1/4-inch in 10 feet, unless more rigid requirements are established by the City of Craig.

1.3 JOB CONDITIONS

- 11 A. Weather Limitation:
 - 12 1. Construct only when temperatures are above minimum specified in ADOT&PF Standard Specifications for Highway Construction unless waived by the agency having jurisdiction.
 - 13 2. Do not construct pavement or base when the base surface is wet or contains an excess of moisture which would prevent uniform distribution and the required penetration.

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- 14 B. Grade Control: Establish and maintain the required lines and grades, including crown, cross-slope, and super elevation for each course during construction operations.
- 15 C. Traffic Control:
 - 16 1. Maintain vehicular and pedestrian traffic during paving operations, as required for other construction activities.
 - 17 2. Provide flagmen, barricades, warning signs, and warning lights for movement of traffic and safety and to cause the least interruption of work.
 - 18 3. See Section 01570 Traffic Regulation, for additional requirements.

1.4 ROAD AND STREET RESTORATION REQUIREMENTS

- 19 A. Road Restoration:
 - 20 1. The Contractor's responsibility as to road restoration shall include, but not be limited to, proper backfill and compaction of excavation, shaping and general restoration of the roadway, restoration of public and private improvements when damaged by construction, restoration of drainage facilities, scarification of existing surfacing, if required, removal of debris and surplus material and all other requirements of these specifications.
 - 21 2. In addition, upon completion of the above restoration, backfill material and/or crushed aggregate surfacing shall be placed where required, as directed by the Engineer.
- 22 B. Final Grade and Cross Section:
 - 23 1. Unless specifically authorized by the authority responsible for the roadway, the final grade and cross section shall conform to applicable City & Borough of Wrangell standard cross sections.
 - 24 2. In case of existing private road they shall conform to the roadway that existed prior to construction.
 - 25 3. The removal and disposal of existing materials necessary to fulfill the above requirements shall be considered incidental to the construction and the costs thereof shall be included in the items for which payment is provided.
- 26 C. Manhole rings, valve boxes, and monument cases shall be adjusted to final grade as shown on the Plans.
- 27 D. The Contractor shall comply with all requirements of all permits for installation of pipelines in authorized rights-of-way.
- 28 E. The Contractor shall place and maintain sufficient and proper lights and barricades at all locations on roads not accepted by the Borough and/or ADOT&PF.
- 29 F. Pipeline Installation-General:

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- 30 1. After completion of pipeline installation the Contractor shall clean up drainage ditches and restore all existing drainage structures which may have been damaged during the course of construction.
- 31 2. Contractor shall also comply with all drainage requirements of the agency involved upon which the agencies' acceptance of the roads is conditioned.
- 32 3. Contractor shall restore any private improvement on road rights-of-way including, but not limited to, culverts, driveways, curbs, sidewalks, parking strips, parking areas, or other permanent improvements, whether or not a permit for such improvements has been obtained, and the cost of all such restoration shall be included in the unit bid price for the pipe, or material in place, and no additional compensation will be allowed.
- 33 G. Pipeline Installation-Shoulders:
- 34 1. On streets where the pipeline is located on the shoulder alongside existing bituminous or concrete surfacing, no payment shall be made for cost of restoring street surfacing which may be damaged by the Contractor's operations.
- 35 2. If the Engineer requires crushed aggregate spread on the shoulder, it shall be paid under the crushed aggregate bid item.
- 36 H. Pipeline Installation:
- 37 1. Construction of pipelines in the City & Borough of Wrangell are intended to be constructed such that no more than one lane of the roadway is disrupted, except at roadway crossings.
- 38 2. No payment will be made for asphalt restoration more than 12 inches beyond centerline.
- 39 3. The Contractor is also cautioned that any disturbance of pavement beyond 12 inches from centerline will require complete lane replacement for minimum lengths as required by these Contract Documents, the Plans, and applicable agency standards.
- 40 4. No payment will be allowed for asphalt replacement required by ADOT&PF beyond the centerline limit.
- 41 I. Street Maintenance:
- 42 1. All streets in the construction area as well as any unpaved streets used by Contractor's trucks or any other equipment hauling material to and from the area, whether within the improvement district or adjacent thereto, and any unpaved streets used as detours during the construction shall be serviced with an application of oil or continuous use of sprinkler trucks to allay the dust, and the cost thereof shall be included in the various items for the improvements.

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- 43 2. The oiling or sprinkling of the dust on roads or streets will continue until accepted by the Borough and/or ADOT&PF or the roads or streets have been graveled, dust oiled or resurfaced.
- 44 3. All streets, when required, shall be sprinkled at least twice daily.
- 45 4. Until accepted in writing by the Borough and/or ADOT&PF, the Contractor shall maintain all roads in a condition satisfactory to the agency concerned.
- 46 5. This shall include periodic grading of all streets on which traffic is allowed wherever in the opinion of the Engineer, such grading is required.
- 47 6. A suitable motor grader shall be available for this work.
- 48 J. It is specifically understood and agreed that the Contractor is responsible for complying with all requirements of the City & Borough of Wrangell necessary to obtain written acceptance of the roads by the agency concerned, and for such work the Contractor will be paid only for the items included in this Contract.
- 49 K. Any settlement and pavement damage which occurs during the first 2 years after final contract acceptance shall be repaired by the Contractor at his own expense.

2. PRODUCTS

2.1 CRUSHED AGGREGATE

- 50 A. Crushed aggregate base course shall comply with Section 703-2.03 of ADOT&PF, SSHC for material requirements and Section 301 for placement requirements.

2.2 ASPHALT CONCRETE PAVEMENT

- 51 A. Asphalt concrete pavement shall comply with Section 34 2550, Asphalt Concrete Pavement.

2.3 ASPHALT TREATED BASE

- 52 A. Asphalt treated base shall conform to the ADOT&PF Standard Specifications for Highway Construction, latest edition.
- 53 B. Asphalt Lifts:
- 54 1. Unless otherwise noted, the asphalt treated base shall be applied in two lifts.
- 55 a. The first lift shall include application of 45 pounds per square yard of aggregate grading B and 0.6 gallons per square yard of CRS-2 liquid asphalt.
- 56 b. The second lift shall include application of 25 pounds per square yard of aggregate grading E and 0.4 gallons per square yard of CRS-2 liquid asphalt.

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- 57 2. The first lift shall be preceded by a prime coat applied at 0.25 gallons per square yard.

2.4 PRIME COAT

- 58 A. Prime coat shall comply with Section 32 1216, Asphalt Concrete Pavement.

2.5 TACK COAT

- 59 A. Tack coat shall comply with Section 32 1216, Asphalt Concrete Pavement.

3. EXECUTION

3.1 GENERAL PAVEMENT REPAIR REQUIREMENTS

- 60 A. Pavement patching shall be scheduled to accommodate the demands of traffic and shall be performed as rapidly as possible to provide maximum safety and convenience to public travel.

- 61 B. The placing and compaction of the trench backfill, and the preparation and compaction of the subgrade shall be in accordance with the requirements of Section 31 2221, Trenching, Backfilling, and Compaction for Utilities.

- 62 C. Prior to trench excavation on asphalt concrete surfaces, straight vertical trim lines shall be cut in order to minimize breakage and cracking of the remaining surfacing.

- 63 D. Prior to trench excavation on cement concrete pavement, the pavement shall be cut with a concrete saw to a sufficient path to permit removal without damaging adjacent pavement to remain in place.

- 64 E. Before the patch is constructed all pavement cuts shall be trued so that the marginal lines of the patch will form a rectangle with straight edges and vertical faces.

- 65 F. Roadway Restoration:

- 66 1. After completion of the patches, the entire roadway surface shall be cleaned by brooming, flushing, or such other methods as may be required.

- 67 2. The early completion of this phase of the restoration is required, not only to facilitate public relations, control dust and traffic problems, but also to prevent the further break-up and cracking of the existing pavement.

- 68 3. If, in the opinion of the Engineer, the Contractor is not diligently pursuing the work in such a manner as to place the patch as soon as reasonably possible, the Contractor may be required to re-trim and remove any and all cracked areas in such a manner to produce a straight uniform edge.

- 69 G. All incidental work required to complete the patching of street surfaces as specified, including joints where required, shall be considered as incidental to the

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patching and the costs thereof shall be included in the items for which payment is provided.

3.2 ASPHALT CONCRETE TRENCH PATCH

70 A. Preparation:

71 1. As soon after compacting the trench backfill, placing and compacting backfill material where required, and placing and compacting subbase material, the Contractor shall place and compact crushed aggregate surfacing in the trench area to a minimum depth of 4 inches.

72 2. Additional existing asphalt paving shall then be cut back such that asphalt concrete trench patch is 20-foot wide (perpendicular to the traveled way) and centered on the constructed utility.

73 3. Prime coat shall be applied at the rate of 0.02 to 0.08 gallon per square yard of retained asphalt through the use of mechanical equipment to all surfaces on which any course of asphalt concrete is to be placed or abutted.

74 4. The spreading equipment shall be capable of uniformly distributing asphalt materials over any area in controlled amounts and shall be equipped with hand operated spray equipment for use only on inaccessible and irregularly shaped areas.

75 5. Tack coat shall be applied to existing asphalt concrete that will be in contact with the new patch.

76 B. Asphalt Lifts:

77 1. Immediately after the subgrade has been properly prepared and prime coat applied, the Contractor shall place one lift of asphalt concrete pavement as shown on the Plans for the typical roadway reconstruction section for City & Borough of Wrangell.

78 2. The top edge shall be hand raked to produce a smooth edge where the patch abuts the existing pavement.

79 3. The thickness shall be adjusted so that a smooth uniform grade exists after rolling.

80 4. The asphalt patch shall be rolled in such a way as to match the abutting surfaces, including wheel ruts if applicable.

3.3 CEMENT CONCRETE PAVEMENT PATCH

81 A. After the subgrade for the pavement has been compacted and constructed to line and grade, the cement concrete pavement patch shall be placed, compacted and struck off to the grade of the adjacent pavement.

82 B. Through and dummy joints shall be placed and edged to match existing joints.

83 C. The surface shall be finished and brushed with a fiber brush.

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- 84 D. Approved curing compound shall be placed on the finished concrete immediately after finishing.
- 85 E. Concrete used in patches shall be in accordance with Division 3 specifications unless Type III Portland cement is required because of urgency of opening the street to traffic.

3.4 ASPHALT CONCRETE PAVEMENT

- 86 A. Installation of full lane-width asphalt concrete pavement for resurfacing the Wrangell City Streets shall conform to the applicable requirements of these Specifications.
- 87 B. After the subgrade has been properly prepared and prime coat applied, the Contractor shall place one lift of asphalt concrete pavement as shown on the Plans for the typical roadway reconstruction section for Wrangell City Streets.
- 88 C. The edges of the existing asphalt pavement and castings shall be painted with hot asphalt cement or tack coat immediately before placing the asphalt patching material.
- 89 D. The asphalt concrete pavement shall then be placed, leveled, and compacted to conform to established cross section, grade, and super elevation to match adjacent paved surface.

3.5 ASPHALT CONCRETE OVERLAY

- 90 A. Asphalt Preparation:
 - 91 1. Before construction of an asphalt concrete pavement overlay on an existing surface, all fatty asphalt patches, grease drippings, and other objectionable matter shall be entirely removed from the existing pavement.
 - 92 2. All excess asphalt joint filler shall be completely removed and all pre-molded joint filler shall be removed to at least 1-1/2 inch below the surface of the existing pavement.
 - 93 3. All types of existing pavement or bituminous surfaces shall be thoroughly cleaned by sweeping to remove dust and other foreign matter.
- 94 B. Asphalt Placement:
 - 95 1. When the surface of the existing pavement or old base is irregular, it shall be brought to uniform grade and cross section as required by ADOT&PF.
 - 96 2. Pre-leveling of uneven or broken surfaces over which asphalt concrete is to be placed is required and may be accomplished by the use of asphalt concrete placed with a motor patrol grader, a paving machine, by hand raking, or by a combination of these methods.
 - 97 3. After placement, the asphalt concrete used for pre-leveling shall be compacted thoroughly with rollers.

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- 98 C. Existing Pavement / Oiled Surface:
- 99 1. When asphalt concrete pavement is to be constructed over an existing paved or oiled surface, in addition to the preparation as outlined hereinbefore, all holes and small depressions shall be filled with an appropriate class of asphalt concrete mix.
- 100 2. The surface of all patched area shall be leveled and compacted thoroughly.
- 101 3. All previous patches that have settled shall be pre-leveled so that depth of overlay does not exceed 2 inches in thickness.
- 102 D. All existing surfaces shall be treated with a tack coat prior to paving.
- 103 E. Surfacing:
- 104 1. After preparation of the base course, a 2 inch minimum compacted full width layer of Type II asphalt concrete shall be placed on top of an existing paving surface.
- 105 2. Surfacing shall be placed in such a manner as to prevent disturbing existing drainage.
- 106 3. Surfacing shall be feathered out as required to meet existing driveways, catch basins, traffic control pads, street intersections, etc., and shall include thickened edge paving where it is now existing.
- 107 F. Asphalt overlay shall conform to ADOT&PF Standard Specifications for Highway Construction, latest edition.

3.6 BITUMINOUS

- 108 A. Unless otherwise specified, all light bituminous surface treatment shall conform to ADOT&PF Standard Specifications for Highway Construction, latest edition.
- 109 B. The subbase shall be treated with prime coat prior to application of the first lift of bituminous surface treatment.

3.7 CRUSHED AGGREGATE SURFACING

- 110 A. Existing crushed aggregate surfacing shall be replaced with new material.
- 111 B. Thickness of the course shall be as shown on the Plans or as directed by the Engineer.
- 112 C. When the utility line is along the shoulder of the roadway, the Contractor may be directed to place crushed surfacing along shoulder of the roadway; thickness shall be as required by ADOT&PF.

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- 113 D. During dry periods, the Engineer may require water sprinkling prior to and during the placement of crushed aggregate; the cost of such sprinkling shall be included in the unit bid for crushed aggregate.

3.8 TEMPORARY TRENCH PATCH

- 114 A. The Contractor may be required to furnish and install a temporary trench patch only when specifically directed by the Owner or as provided in the Plans.
- 115 B. Patch shall be 2-inch thick course of crushed aggregate and a 2-inch thick course of cold asphalt plant mix placed over the trench area.
- 116 C. The Contractor shall maintain temporary patch until the permanent patch is installed.

3.9 DUST OIL

- 117 A. General:
- 118 1. All dust oil shall be PS-300 Fuel Oil or equivalent.
- 119 2. The dust oil shall be applied by means of a bituminous distributor, so that uniform distribution is obtained over all points of the surface to be treated.
- 120 3. The entire width of the roadway shall be treated.
- 121 4. Dust oiling will not be permitted at temperatures below 50°F.
- 122 5. Oiling shall not be started unless trenches have been compacted, streets cleaned and reshaped and base course of crushed rock or gravel applied.
- 123 6. Dust oil shall not be applied to top course material.
- 124 7. The allaying of dust prior to and subsequent to this application of dust oil shall be solely the Contractor's obligation in accordance with other provisions of these specifications.

3.10 ADJUSTING MANHOLES TO GRADE

- 125 A. Manholes:-
- 126 1. The Contractor shall adjust manhole castings to final grade by adding grade rings and/or mortar under the casting and patching with Type III asphalt concrete.
- 127 B. The Contractor shall exercise extreme care in preventing foreign material from entering the sewer system.
- 128 C. All manholes shall be adjusted to grade after the asphalt concrete surfacing has been placed.

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- 129 D. Disturbed area around cover shall be patched and sealed to the satisfaction of ADOT&PF.
- 130 E. The Contractor shall take care not to extend the manholes above finished grade.

3.11 ADJUSTING MONUMENT CASES AND VALVE BOXES TO GRADE

- 131 A. Monument cases and/or valve boxes shall be adjusted to final grade and patched with Type III Portland cement concrete.
- 132 B. Adjustment shall be made after the resurfacing.
- 133 C. Patching around monument case and/or valve boxes shall be done to the satisfaction of ADOT&PF.
- 134 D. Valve boxes shall be adjusted to the satisfaction of ADOT&PF.
- 135 E. The Contractor shall take care not to extend the monument cases and/or valve boxes above the finished grade.

END OF SECTION

SECTION 32-1600
CURBS AND SIDEWALKS

PART I GENERAL

1.1 SECTION INCLUDES

- A. Preparation and placement of combination portland cement concrete curb and gutter.
- B. Preparation and placement of portland cement concrete curb.
- C. Preparation and placement of portland cement concrete sidewalk.

1.2 REFERENCE STANDARDS

- A. American Concrete Institute (ACI) latest edition
 - 1. 304R Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete
 - 2. 308 Standard Practice for Curing Concrete
- B. American Society for Testing and Materials (ASTM) latest edition
 - 1. A 615 Deformed and Plain Billet-Steel for Concrete Reinforcement
 - 2. C 33 Concrete Aggregates
 - 3. C 94 Ready-Mixed Concrete
 - 4. C 150 Portland Cement
 - 5. C 260 Air-Entraining Admixtures for Concrete
 - 6. C 309 Liquid Membrane-Forming Compounds for Curing Concrete
 - 7. C 494 Chemical Admixtures for Concrete
 - 8. D 1751 Performed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
- C. FS TT-C-800 - Curing Compound, Concrete, for New and Existing Surfaces.

1.3 QUALITY ASSURANCE

- A. Establish and maintain required lines and elevations.
- B. Check surface areas at intervals necessary to eliminate ponding areas. Remove and replace unacceptable work as directed by Owner.

1.4 SUBMITTALS

- A. Submit materials certificate to the independent testing laboratory which is signed by materials producer and Contractor, certifying that materials comply with, or exceed, requirements specified herein.

1.5 PROJECT CONDITIONS

- A. Maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize temporary striping, flagmen, barricades, warning signs, and warning lights as required.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects. Use flexible spring steel forms or laminated boards to form radius bends as required. Forms shall be of depth equal to depth of curbing or sidewalk, and so designed as to permit secure fastening together at tops. Coat forms with non-staining type of coating that will not discolor or deface surface of concrete.
- B. Reinforcing Bars: Deformed steel bars, ASTM A 615, Grade 40.
- C. Concrete Materials: Comply with requirements of Section 03300 for concrete materials, admixtures, bonding materials, curing materials, and others as required.
- D. Joint Fillers: Resilient pre-molded bituminous impregnated fiberboard units complying with ASTM D 1751, FS HH-F-341, Type II, Class A.
- E. Joint Sealers: Non-priming, pourable, self-leveling polyurethane. Acceptable sealants are Sonneborn "Sonolastic Paving Joint Sealant" Sonneborn "Sonomeric CT 1 Sealant", Sonneborn "Sonomeric CT 2 Sealant", Mameco "Vulken 245", or Woodmont Products "Chem-Caulk".

2.2 MIX DESIGN AND TESTING

- A. Concrete mix design and testing shall comply with requirements of Section 03300.
- B. Design mix to produce normal weight concrete consisting of Portland cement, aggregate, water-reducing admixture, air-entraining admixture, and water to produce following:
 - 1. Compressive Strength: 3,000 psi, minimum at 28 days, unless otherwise indicated on Construction Drawings.
 - 2. Slump Range: 2 to 5-inches at time of placement
 - 3. Air Entrainment: 5 to 7 percent

PART 3 EXECUTION

3.1 PREPARATION

- A. Proof-roll prepared base material surface to check for unstable areas. Begin paving work only after unsuitable areas have been corrected and are ready to receive paving.
- B. Remove loose material from compacted base material surface to produce firm, smooth surface immediately before placing concrete.

3.2 INSTALLATION

A. Form Construction

- 1. Set forms to the required grades and lines, rigidly braced and secured.
- 2. Install sufficient quantity of forms to allow continuance of work and so that forms remain in place minimum of 24 hours after concrete placement.
- 3. Check completed formwork for grade and alignment to following tolerances:
 - a. Top of forms not more than 1/8-inch in 10'-0"
 - b. Vertical face on longitudinal axis, not more than 1/4-inch in 10'-0"
- 4. Clean forms after each use and coat with form release agent as often as required to ensure separation from concrete without damage.

B. Concrete Placement

- 1. Place concrete in accordance with requirements of Section 03300.
- 2. Do not place concrete until base material and forms have been checked for line and grade. Moisten base material if required to provide uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until set at required finish elevation and alignment.
- 3. Place concrete using methods which prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices.
- 4. Deposit and spread concrete in continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2 hour, place construction joint. Automatic machine may be used for curb and gutter placement. Machine placement shall be at required cross section, line, grade, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete as specified herein.

C. Joint Construction

- 1. Contraction Joints: Construct concrete curb or combination concrete curb and gutter, where specified on Construction Drawings, in uniform sections of length specified on Construction Drawings. Form joints between

sections either by steel templates, 1/8-inch in thickness, of length equal to width of curb and gutter, and with depth which will penetrate at least 2-inches below surface of curb and gutter; or with 3/4-inch thick performed expansion joint filler cut to exact cross section of curb and gutter; or by sawing to depth of at least 2-inches while concrete is between 4 and 24 hours old. If steel templates are used, they shall be left in place until concrete has set enough to hold its shape, but shall be removed while forms are still in place.

2. Longitudinal Construction Joints: Tie concrete curb or combination concrete curb and gutter, where specified on Construction Drawings, to concrete pavement with 1/2-inch round deformed reinforcement bars of length and spacing shown on Construction Drawings.
3. Transverse Expansion Joints: Concrete curb, combination concrete curb and gutter, or concrete sidewalk shall have filler cut to exact cross section of curb, gutter, or sidewalk. Joints shall be similar to type of expansion joint used in adjacent pavement.

D. Joint Fillers

Extend joint fillers full-width and depth of joint, and not less than 1/2-inch or more than 1-inch below finished surface where joint sealer is indicated. Furnish joint fillers in 1-piece lengths for full width being placed, wherever possible. Where more than 1 length is required, lace or clip joint filler sections together.

E. Joint Sealants

Seal joints with approved exterior pavement joint sealants. Install in accordance with manufacturer's recommendations.

3.3 CONCRETE FINISHING

- A. After striking off and consolidating concrete, smooth surface by screeding and floating. Adjust floating to compact surface and produce uniform texture. After floating, test surface for trueness with 10'-0" straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide continuous smooth finish.
- B. Work edges of sidewalks, gutters, back top edge of curb, and formed joints with edging tool, rounding edge to 1/2-inch radius. Eliminate tool marks on concrete surface. After completion of floating and trowelling, when excess moisture or surface sheen has disappeared, complete surface finishing, as follows:
 1. Curbs, gutters, and sidewalks: Broom finish by drawing fine-hair broom across surface perpendicular to flow of traffic. Repeat operation as necessary to produce fine line texture.
- C. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point up minor honeycombed areas. Remove and replace areas or sections with major defects, as directed Owner.
- D. Protect and cure finished concrete paving using acceptable moist-curing methods, more particularly described in "water-curing" section of ACI 308.

3.4 BACKFILL

- A. After concrete has set sufficiently, spaces on either side of concrete curb, combination concrete curb and gutter, or concrete sidewalk shall be refilled to required elevation with suitable material compacted in accordance with Section 31 2200.

3.5 CLEANING AND ADJUSTING

- A. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just prior to final inspection.
- B. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials.

END OF SECTION

SECTION 33 1000

WATER LINES

1. GENERAL

1.01 SCOPE

This section covers water pipelines, fittings, valves, and connections to existing water lines as shown on the drawings and as specified herein.

1.02 OUTAGES

It is the responsibility of the Contractor to notify any and all water customers who will have their services interrupted during the work. The nature and lead-time for the notice shall depend on the number and type of customers affected and shall be determined by Owner on a case-by-case basis. Only in an emergency shall the notice be less than 24 hours. Outages to allow insertion of new valves and connections shall not exceed four hours and shall be scheduled with approval of the owner to minimize inconvenience to customers.

Where longer outages are necessary to construct new mains, the Contractor shall provide temporary water service to existing customers in accordance with Section 01515 of the Specifications

1.03 WATER SYSTEM CONTROL

Owner shall operate all existing main line valves, without exception. Except in an emergency, Owner shall be provided a minimum of 24 hours notice.

1.04 QUALITY CONTROL

Tests shall include, but not be limited to, the following:

- Pressure tests
- Disinfection (Bacteriological)
- Continuity testing

1.05 SUBMITTALS

- A. Project data submittals shall include catalog information confirming pipe, fittings, valves, hydrants, water service fittings, castings, coatings, and other materials conform to the requirements of this section.
- B. Certificates of qualifications for persons who will be fusing the HDPE pipe.

2. PRODUCTS

2.01 DUCTILE IRON PIPE AND FITTINGS

- A. Ductile iron pipe shall be new centrifugally cast, rubber gasket push-on or mechanical

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type joint in accordance with AWWA C151. Joints shall conform to AWWA C111. Pipe shall be bituminous coated and mortar lined in accordance with AWWA C104. All classes of pipe shall be Thickness Class 52 for additional corrosion protection:

Where the plans indicate restrained joint pipe, provide mechanical joint pipe with joint restraint follower glands. Joint restraint follower glands are specified in Section 2.11.

Alternative proprietary restrained joint systems which provide equivalent strength and flexibility, and allow disassembly, may be permitted subject to approval by the Engineer.

- B. Fittings shall be ductile iron in accordance with AWWA C110, cement lined in accordance with AWWA C104, with bituminous exterior coating, Class 250 minimum unless otherwise indicated on the plans. Fittings conforming to AWWA C153 may be used for sizes up to 12-inches in diameter.
- C. Unless fastenings are specified to be stainless steel, flange bolts shall be hot dipped galvanized in the length and diameter specified in AWWA C110 (mechanical joints) or C115 (flanged joints). Nuts shall be heavy hex, hot-dipped galvanized. Note that some regular hex, hot-dipped galvanized nuts will also be required to assemble fittings with restricted clearances. Bolt threads shall be greased prior to installation using petroleum-based grease for galvanized and black iron fastenings. For stainless steel fastenings, use nickel based anti-seize lubricant and thread sealant to prevent galling during assembly.
- D. Gaskets shall be NSF 61 Certified. US Pipe Flange-Tyte, SBR full-face, 1/8-inch thickness; American Toruseal SBR full-face 1/8-inch flange gasket may also be substituted, or an approved equal by Engineer.
- E. Polyethylene encasement shall be 8-mil polyethylene in accordance with AWWA C-105. All buried ductile iron pipe, fittings, and appurtenances shall be encased in polyethylene.

2.02 HDPE PIPE AND FITTINGS

- A. Qualifications of Pipe Manufacturers. The HDPE pipe shall be manufactured in a plant capable of providing continuous quality control through inspection. Manufacturer shall be listed with the Plastic Pipe Institute as meeting recipe and mixing requirements of resin manufacturer for resin used to manufacture pipe for this project. The facility shall have the necessary testing equipment to verify that the pipe meets the requirements of AWWA C901 or C906, NSF Standard #61, blue color coded, and the applicable ASTM standards. Pipe and fittings shall have a pressure rating of 200

psi. All pipes will be provided in standard straight lengths. No coiled pipe will be accepted for installation in this project.

- 1 B. Qualifications of the Fittings Manufacturer. The facility shall have the necessary testing equipment to verify that the fittings meet the requirements of AWWA C901 for sizes ½" to 3" and AWWA C906 for sizes 4" through 54".
- C. Materials. Polyethylene pipe and fittings shall be made from resin meeting the requirements of the Plastic Pipe Institute as PE4710. The resin shall meet the requirements of ASTM D3350-06 with a cell classification of 445574C.
- D. Markings. Markings shall be legible during the usual handling of pipe and be applied in a manner that will not damage the pipe. The following markings shall be applied; 1) nominal size and OD, 2) standard material code designation, 3) dimension ratio, 4) pressure class, 5) AWWA designation for this standard (AWWA C906-99), 6) manufacturers' production code, 7) material test category of pipe, 8) NSF 61 approved.
- E. Interchangeability of Pipe and Fittings. Different manufacturers can supply high-density polyethylene pipe and fittings as long as they meet the above ASTM D3350-06 cell classification.
- F. Sizes 4-inches and Larger - Pipe sizes shall conform to and have a manufacturing standard of ASTM F-714. Pipe O.D. sizes from 4" to 54" shall be supplied in steel pipe sizes (IPS). Pipe shall be fabricated from PE4710 HDPE resin with a SDR 11 (200psi WPR) rating unless otherwise specified on the plans. The pipe shall contain no recycled compounds except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. All pipes shall be suitable for use as pressure conduits, listed as NSF 61 rated, and per AWWA C906 Pressure Class (PC) 200, have a nominal burst value of three and one-half times the Working Pressure Rating (WPR) of the pipe.
- G. Butt Fusion Fittings. HDPE fittings shall be fabricated from PE4710 HDPE resin, Cell Classification of 445574C, as determined by ASTM D3350-06, and approved for AWWA use. Butt fusion fittings shall have a manufacturing standard of ASTM D3261. Molded & fabricated fittings shall have a pressure rating equal to the pipe of Pressure Class (PC) 200 unless otherwise specified in the plans. Data Logger records shall be maintained on fabricated fittings.

Temperature, fusion pressure and a graphic representation of the fusion cycle shall be part of the Quality Control records. All fittings shall be suitable for use as pressure conduits, listed as NSF 61 rated, and per AWWA C906 Pressure Class (PC) 200, have nominal burst values of three and one-half times the Working Pressure Rating (WPR) of the fitting.

H. Pipe Manufacturer's Quality Control. The pipe manufacturer shall have an on-going Quality Control program for incoming and outgoing materials. High-density polyethylene (HDPE) resins for manufacturing of pipe shall be checked for density, melt flow rate, and contamination. The manufacturer of the HDPE resin shall certify the Cell Classification as indicated in section 2.01.1 (F). These incoming resins shall be approved by plant Quality Control and verified to be approved by NSF before being converted to pipe.

Pipe shall be checked for outside diameter, wall thickness, length, roundness, and surface finish on the inside, outside, and end cut.

I. Fittings Manufacturer's Quality Control. The fitting manufacturer shall have an on-going quality control program for incoming and outgoing materials. The resin shall be checked as indicated in section 2.01.1 (C). Pipe for fabricated fittings shall be checked as indicated in 2.01.1 (F). Molded fittings shall be inspected for voids and knit lines. All fabricated fittings shall be inspected for joint quality and alignment. All fabricated fitting's welds shall be made using a Data Logger. The fitting manufacturer shall maintain a record of the temperature, pressure and graph of the fusion cycle.

J. Permanent Records. The Manufacturer of the pipe and fittings shall maintain permanent QC and QA records. Data Logger records shall be maintained on fabricated fittings.

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- K. Compliance Testing. If requested, the pipe or fittings manufacturer can be required to retest or verify certification data. All retesting shall be at the requestor's expense, and shall be performed as required in the specifications. Flanges shall be ductile iron, ASTM A536, conforming to ANSI/ ASME Class 150 dimension requirements, and compatible with one-piece molded polyethylene stub ends. Flanged connections shall have the same or greater pressure rating as the pipe. Unless fastenings are specified to be stainless steel, flange and gland bolts shall be hot dipped galvanized, in length and diameter specified in AWWA C115 (flanged joints). Nuts shall be heavy hex, hot-dipped galvanized. Note that some regular hex, hot-dipped galvanized nuts will also be required to assemble fittings with restricted clearances. Bolt threads shall be greased prior to installation using petroleum-based grease for galvanized and black iron fastenings. For stainless steel fastenings, use nickel based anti-seize lubricant and thread sealant to prevent galling during assembly.
- L. Bolt and nut assembly to be of sufficient length to show a minimum of three (3) complete threads when the joint is made and tightened. Retorque nuts after 24 hours.
- M. Gaskets shall be NSF 61 Certified. US Pipe Flange-Tyte, SBR full-face, 1/8-inch thickness; American Toruseal SBR full-face 1/8-inch flange gasket may also be substituted, or an approved equal by Engineer.
- N. Bolt Torque Specifications for Flanged Joints shall be as described in the Plastic Pipe Institute's Technical Note 38, latest adopted edition
- O. Installation of HDPE to Ductile Iron MJ Adapters shall include placement of the internal stainless steel stiffener before assembly occurs. Extra length tee-bolts are required for the MJ adapter assembly and shall be manufactured from stainless steel. Stainless tee-head bolts with stainless heavy-hex nuts are commercially available in both 6 and 7-inch lengths. If required, longer lengths can be manufactured from welded, threaded 3/4-inch stainless rod.

2.03 COPPER PIPE AND FITTINGS

- A. All copper tubing shall conform to ASTM B88, type 'K' annealed tubing. Tubing installed on bridges or exposed surfaces shall be straight tube sections. Coil tubing may be used for buried installations.
- B. Joints shall be made with bronze compression couplings, Mueller Type 110 or approved equal.

Couplings shall be of the stab type with no flaring or soldering necessary to complete connection with Type K copper.

1. The interior surface of the coupling nut, including threads, shall have a baked-on fluorocarbon coating to reduce assembly friction and prevent the gasket

from turning and twisting during tightening. The nut shall bottom on a cast or machined shoulder on the body when properly assembled. This design will provide a visual check to assure connection is properly assembled.

2. The sealing gasket shall be of molded synthetic rubber (ASTM D-2000) with molded in place bronze spring (ASTM A-134, Alloy #6) to assure electrical continuity should thawing be required, and to eliminate the possible cold flow of the gasket between the pipe and fitting.
3. A gripper band of hardened stainless steel (ANSI Type 410) shall be fitted into the gasket. When the gasket is compressed it will cause the gripper ring to distort the pipe giving the fitting a high resistance to pull out. The gripper band shall overlap itself to prevent cold flow of the gasket into the cavity under the band.

2.04 VALVES

- A. Gate valves, if required, will be furnished by the Owner and installed by the Contactor. Owner furnished valves will not include gaskets, bolts, or follower glands for inlets. Joint restraint follower glands will be used on MJ valves throughout and will be furnished by the Contractor.
- B. Gate Valves:
 1. Gate valves shall conform to AWWA C509 and shall be iron body, resilient seat type. All bolts are to be greased prior to installation.
 2. Valves shall be non-rising stem, counterclockwise opening, with standard square stem nuts.
 3. Provide exterior bituminous coating for buried service. Provide epoxy coating, 10 mil DFT, for exposed service.
 4. Enclosed, bevel gear-case operators shall be provided for valves 14 inches or larger.
 5. All valves must have a fully unobstructed flow way free of cavities or projections. The sealing mechanism is withdrawn from the waterway in the full open position.
 6. All valves must be equipped with a replaceable, internally rein-forced specially contoured molded rubber disc seat ring attached to the face of the disc with self-locking stainless steel screws.
 7. All valves shall be equipped with solid guide lugs on the disc to provide for a positive stop.
 8. All valves must pressure test at 200 psi. seat test and 400 psi. shell test.

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- C. Butterfly valves, if required, will be furnished by the Owner and installed by the Contactor. Owner furnished valves will not include gaskets, bolts, or follower glands for inlets. Joint restraint follower glands on MJ valves will be used throughout and will be furnished by the Contractor.
- D. Butterfly valves shall conform to the latest revision of AWWA Standard C-504, Class 150-B, and comply with the following:
1. Valve bodies shall be cast iron, ASTM A-126 Class B. Body ends shall be flanged with facing and drilling in accordance with ANSI B16.1, Class 125; or mechanical joint in accordance with AWWA C-111. All mechanical joint end valves shall be furnished complete with joint accessories (bolts, nuts, gaskets, and glands). All valves shall conform to AWWA Standard C-504, Table 3, Laying Lengths for Flanged Valves and Minimum Body Shell Thickness for all Body Types. All valves must pressure test at 200 psi. seat test -
 2. Actuators are required and shall be of the traveling nut design amply sized for the line conditions. Manual actuators shall turn counterclockwise to open and shall be capable of withstanding 450 foot-pounds of input torque against the open or closed stops. All actuators shall have adjustable mechanical stop limits. The closed position stop shall be externally adjustable. Actuators shall be sized to provide sufficient output torque to operate the valve at 150 psi. and 16 feet per second flow velocity.
 3. Valve interiors shall be epoxy coated in conformance to AWWA Standard C-550, latest revision. Interior wetted ferrous surfaces shall be coated a nominal 10 mils thick. Body exterior shall have exterior bituminous coating suitable for buried service.
 4. Valve discs shall be cast iron ASTM A-126 Class B (12" – 20") or ASTM A-48 Class 40 (20"). Sizes 30" and larger shall be ductile iron ASTM A-536, grade 65-45-12. Disc shall be furnished with 316 stainless steel seating edge to mate with the rubber seat on the body. Valve disc shall be of the offset design providing 360 degree uninterrupted seating. Full open (12" - 20") valve to create no more friction loss than a 45° elbow.
 5. Valve seat shall be Buna-N rubber located in the valve body. In sizes 20" and smaller, valves shall have bonded seats that meet test procedures outlined in ASTM D429 Method B. Sizes 24" and larger shall be retained in the valve body by mechanical means without the use of metal retainers or other devices located in the flow stream. When specified, valves 24" and larger shall be provided with an external means of seat adjustment with the valve in-line without entering or dewatering the line.
 6. Valve shafts shall be stainless steel conforming to ASTM A-276, Type 304. Shaft seals shall be standard self-adjusting chevron "V" type packing. Shaft seals shall be of a design allowing replacement without removing the valve shaft.
 7. Valve bearings shall be sleeve type that are corrosion resistant and self-lubricating. Bearing load shall not exceed one-fifth of the compressive strength

of the material.

8. Shaft bearings shall be contained in the integral hubs of the valve body and shall be self-lubricated sleeve type.

E. Bevel Gear Operators:

1. Bevel gear valve operators shall be the totally enclosed type.

2.05 VALVE BOXES

This section applies to valves 2 inches and larger

Valve boxes for buried service shall be Seattle Slip Type with Lug Caps. Valve boxes shall provide a minimum of 12 inches of adjustment after installation. The overlapping areas of the sliding extension shall be lubricated with grease prior to installation.

2.06 SERVICE VALVE BOXES

This section applies to valves 1-1/2 inches and smaller.

Valve boxes for buried service shall be Ford EA2-50-50-42R.

2.07 WATER SERVICE FITTINGS

Curb stops, corporation stops, adapters and fittings for HDPE service lines shall be heavy brass and bronze alloys conforming to ASTM B62; manufactured and tested to ANSI/ AWWA C800 standard.

- A. All curb or corporation stop valves shall be quarter turn valve and the fully open and closed positions shall be controlled by high strength check lugs which are integral parts of the key and body. Integral tee head and plug for solid one-piece strength. Full opening round port with port O-rings. Top and bottom O-rings for positive pressure sealing and easy turning. The maximum pressure rating shall be 175 psig water at a maximum temperature of 180 °F. Curb stop plug shall be coated with antifriiction fluorocarbon to reduce the possibility of sticking or freezing. Mueller Oriseal or approved equal by Engineer.

2.08 SERVICE SADDLES - BURIED LOCATIONS

- A. Service saddles for ductile iron pipe to 24-inch diameter shall be iron, Romac Style 202S, painted saddle with double stainless straps. Romac Style 202BS, bronze w/ double stainless straps, may be required by the Owner in corrosive environments. Where bronze is required, the Contractor shall be paid an additional amount equal to the difference in manufacturer's list price for the equivalent models plus a ten (10) percent markup for profit and overhead.
- B. Service saddles for ductile iron pipe greater than 24-inches shall be Rockwell 366.
- C. Service saddles for HDPE pipe shall be electrofusion type with a pressure rating of 160

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psig minimum. Fittings shall be PE4710 HDPE resin, Cell Classification of 445574C, as determined by ASTM D3350-06, and approved for AWWA use. Molded & fabricated fittings shall have a pressure rating equal to the pipe unless otherwise specified in the plans. Corporation saddles shall have brass or stainless steel adaptive inserts with American National taper pipe threads specified in ANSI/ASME B1.20.1.

- D. Side Fusion Branch Saddles meeting AWWA C 906 may also be used with a brass threaded insert and 316 stainless compression ring

2.09 SERVICE SADDLES - EXPOSED LOCATIONS

Service saddles for ductile iron pipe at exposed locations shall be nylon-coated ductile iron, with double stainless steel straps. Sizes 24-inch or smaller shall be Romac Style 202N.

2.10 COMBINATION AIR/ VACUUM RELIEF VALVE

Combination air/vacuum relief valve shall be a 2 inch Valmatic Model 202C.2 w/ 316 SS float, trim, and CF8M stainless body or approved equal.

2.11 AIR RELIEF VALVE

For those extreme occasions where the water main may operate under near vacuum conditions, only an air relief valve shall be installed at the high point. It shall be a Valmatic Model 45 VC w/ 316 SS float, trim, CF8M body, vacuum check or approved equal.

2.12 JOINT RESTRAINT FOLLOWER GLANDS

Joint restraint follower glands shall include a restraining mechanism which imparts a multiple wedging action against the pipe, increasing its resistance as the pressure increases. The restraining gland shall be Megalug Series 1100, EBBA Iron, Inc.

Glands shall be coal tar epoxy coated, 16 mil DFT on glands, 6 to 8 mil DFT on small parts. Flexibility of joint shall be maintained after burial. Twist-off nuts shall be used to ensure correct bolt torque. Glands shall be designed for a 250 psi. working pressure with a 2:1 factor of safety.

Alternative proprietary restrained joint systems which provide equivalent strength and flexibility, and allow disassembly, may be permitted subject to approval by the Owner.

2.13 FIRE HYDRANT

- A. Fire hydrants shall conform to AWWA C502 and shall be Mueller Super Centurian with two each 3-1/2-inch National Standard Hose Thread and one 5-inch Storz Connection.
- B. Hydrants, if required, will be furnished by the Owner and installed by the Contractor. Owner-furnished hydrants will not include gaskets, bolts, or follower glands for inlets. This hardware is to be furnished by the Contractor.
- C. Hydrants shall be field painted above the bury line after installation with two coats of paint matching the Owner's standard.
- D. Detailed hydrant specifications are as follows:

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1. The operating nut shall be bronze, non-rising, pentagonal in shape. Pentagon shall have a depth of at least one and one-quarter inch. The hold down nut shall be concealed by a "weather cap," or shall incorporate a resilient weather seal protecting the operating mechanism from the elements. The direction of opening shall be clearly embossed near the operating nut.
2. A lubrication chamber shall be provided, sealed top and bottom with "O" rings and filled with a non-toxic lubricant which shall remain fluid through a temperature range of 60 degrees to +150 degrees. The design shall be such that the thrust collar and the threaded operating parts are automatically lubricated each time the hydrant is cycled.
3. There shall not be less than two "O" rings separating the oil reservoir from the waterway and that portion of the stem contacting these "O" rings shall be sleeved with bronze. An anti-friction device shall be in place above the thrust collar to further minimize operating torque. 33 2660-10
4. The hydrant bonnet shall be attached to the upper barrel by not less than eight bolts and nuts, and with a cloth inserted flat rubber gasket as a pressure seal.
5. Hydrants shall be "three way," having two 3-1/2-inch hose nozzles with National Standard Threads and one 5-inch Storz Connections. Nozzles shall thread counterclockwise into hydrant barrel utilizing "O" ring pressure seals. A suitable nozzle lock shall be in place to prevent inadvertent nozzle removal.
6. Hydrants shall be "traffic model" upper and lower barrels joined approximately 2 inches above the groundline by a separate and breakable "swivel" flange providing 360 degree rotation of upper barrel for proper nozzle facing. This flange shall employ not less than eight bolts. The pressure seal between the barrels shall be a cloth inserted flat rubber gasket. The groundline, which shall be clearly embossed on the lower barrel, shall be not less than 18 inches from the centerline of the lowest nozzle.
7. Main valves shall be "compression" type, closing with the pressure and shall not be less than 5-1/4-inch diameter. Composition of the main valve shall be molded rubber or neoprene having a durometer hardness of 94 ± 5 and shall be not less than 1-inch thick.
8. Hydrants shall be equipped with drain valves which drain the barrel when the hydrant is closed and seal shut when the hydrant is opened. These drain valves shall be an integral part of the one-piece bronze upper valve plate. They shall operate without the use of springs, toggles, tubes, levers, or other intricate synchronizing mechanism.
9. The upper valve plate, seat ring and drain ring (shoe bushing) must be bronze (ASTM B62) and work in conjunction to form an all bronze drainway. Two drain openings are required and, if they are in the cast iron shoe, they must be bronze lined.

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10. The bronze seat ring shall thread into a bronze drain ring (or shoe bushing) providing bronze-to-bronze connection. Seat ring seals shall be "O" rings.
11. The 6-inch shoe connection shall have ample blocking pads for sturdy setting. A minimum of six bolts and nuts is required to fasten the shoe to the lower barrel.
12. The interior of the shoe, including the lower valve plate and stem cap nut, shall have a protective coating of a two-part thermosetting epoxy of at least 4 mils. If a stem cap is utilized, a stainless steel lock washer or similar non-corrosive device must lock it in place.
13. Hydrant shall have a working pressure rating of 200 psig and be tested at 400 psig.
14. Hydrants shall be warranted by the manufacturer against defects in materials or workmanship for a period of 10 years from the date of manufacture.

2.14 INSULATION

- A. Insulation for trench installation shall be Dow Styrofoam Brand High Load HI-60 extruded polystyrene, Owens Corning Foamular 600 Extruded Polystyrene Insulation, or approved equal by Engineer.
- B. Exposed Pipe not Subject to Seawater Infiltration
 1. Pipe insulation shall be FOAMGLAS complying with ASTM C-552, as manufactured by Pittsburgh Corning Corporation or approved equal.
 2. Insulation shall be covered with the following inner jacket:

Pipe not Subject to Sea Water (above elevation 24.0 feet MLLW datum) -
Pittcote 404 coating with tack coat of 3 to 4 gallons per 100 square feet.
Immediately embed PC Fabric 79 with a minimum lap of 3 inches followed by
finish coat of 3 to 4 gallons per 100 square feet.
 3. A metallic outer jacket shall be installed over the non-metallic jacket as listed below:
 - a. Pipe Not Subject to Sea Water - 16-gauge aluminum with stainless steel bands.
 4. All insulation and jackets shall be installed in strict conformance with the manufacturer's instructions.
 5. Contractor shall ensure continuity and integrity of insulation and jackets at all fittings and valves.
- C. Alternate Insulation Method for Pipe not Subject to Seawater Infiltration

- a. All insulated pipe and fittings supplied shall utilize the same manufacturer as un-insulated core pipe.
2. Heat tracing conduits shall consist of an extruded molding and shall be applied to the core pipe prior to application of the insulation. The conduit will be securely fastened to the pipe to prevent the ingress of foam during the insulation process. Each conduit shall be checked after insulating to ensure they are not plugged. The ends shall be sealed prior to shipping to prevent any foreign material from entering the conduit while in transit or during installation.
3. Insulation shall be rigid polyurethane foam with a minimum thickness of 2-inches and the following physical properties:
 - i. Density: 4 pounds/ ft³ (ASTM D 1622)
 - ii. Closed Cell Content: 96% Minimum (ASTM D 2856)
 - iii. Water Absorption: 0.83% by volume (ASTM C 272)
4. Outer Jacket shall be 16-gauge (0.063") aluminum with stainless steel bands.
5. Insulated pipe shall be Themacor-Northwest, Urecon Pre-Insulated Pipe, or approved equal.

2.15 COUPLINGS AND ADAPTERS

- A. Flanged x mechanical joint coupling adapters shall be cast ductile iron throughout. Substitution of a NPT threaded flanged end onto MJ pipe is not allowable. Ductile iron pipe barrel to conform to the requirements of AWWA C151. Flanges to meet requirements of AWWA C115 and C110
- B. Couplings for joining plain end ductile iron pipe shall be ductile iron sleeves w/ Megalug Series 1100 restraint installed at both ends.
- C. Expansion couplings shall be double-ended without stops and shall be Romac ES402 or Rockwell 612. Expansion couplings shall accommodate a minimum pipeline expansion of 12 inches.
- D. Expansion couplings shall have fusion bonded, epoxy coated sleeves (inside and outside) and follower glands. Epoxy coating shall be FDA approved for potable water service, minimum 16 mil DFT.
- E. For pipe adapters and couplings subject to sea water (installed below elevation 24.0 feet MLLW datum), bolts shall be stainless steel conforming to ASTM F593, Alloy Group 2. Nuts shall be stainless steel conforming to ASTM F594, Alloy Group 2.

2.16 PVC PLATE

The plate or block for placement under service valves shall be 3/4-inch-thick high-density polyvinyl chloride or polypropylene; 12-inches x 12-inches.

2.17 PRESSURE REDUCING VALVES

For sizes 1 1/2" and under, the pressure reducing valve shall be of the balanced single seat design with valve body and cover of bronze and stainless steel trim. It shall be Cla Val Co model 990 or approved equal.

2.18 HEAT TRACE

Heat trace shall be self-limiting heater, 120 volt, model 5BTV1 from Chemelex Division of Raychem Corporation or approved equal. System shall be designed by Contractor and shall utilize PMK-JLP power connector and PMK-LE end seal by Chemelex or equal.

For Utility water main installations, design shall also include connection to electric utility, meter base, disconnect, and GFI breaker. Electric service shall be fed by underground conduit from adjacent pole to pedestal at location shown on plans. Contractor shall obtain any and all permits for service which shall conform in all respects to requirements of The City and Borough of Wrangell Electric Department.

For residential or commercial water service installations, design shall follow The City and Borough of Wrangell Electric Department standards.

2.19 LOCATING WIRE & DETECTOR TAPE

The Contractor shall supply all locating wire and detector tape. For HDPE installations, the copper locating wire shall be No. 8 gauge for HDPE mainlines and No. 12 gauge, coated wire for HDPE service lines (should HDPE be used for service lines). For both HDPE and Ductile Iron installations, detection tape shall be composed of a solid aluminum foil encased in a protective plastic jacket. Tapes shall be color coded in accordance with AWWA color codes with the following legends: Water Systems, Safety Precaution Blue "Caution, Water Line Buried Below". Tape shall be permanently printed with no surface printing allowed. Tape width shall be a minimum of 3-inches. Tape shall be equal to Lineguard Type II Detectatape, or equal.

3. EXECUTION

3.01 GENERAL

Water lines shall be installed in accordance with the pipe manufacturer's instructions and AWWA Standards C600 and C906 except as modified by the applicable sections of these specifications and the following paragraphs.

Mainline pipe shall be ductile iron or HDPE in the sizes and classes shown on the plans. Service lines 4 inches and greater shall be ductile iron. Service lines smaller than 4 inches shall be copper, Type K.

3.02 HANDLING OF PIPE

- A. All types of pipe shall be handled in such manner as will prevent damage to the pipe, pipe lining or coating. Pipe and fittings shall be loaded and unloaded using hoists and slings in a manner so as to avoid shock or damage, and under no circumstances shall they be dropped or skidded or rolled against other pipe.

- B. Limit stacking of HDPE pipe to a height that will not cause excessive deformation of bottom layers of pipes under anticipated temperature conditions.
- C. Where necessary due to ground conditions, store pipe on wooden sleepers, spaced suitably, and of such widths as not to allow deformation of pipe at the point of contact with sleeper or between supports.
- D. If any part of the coating or lining is damaged, repair thereof shall be made by the Contractor at its expense and in a manner satisfactory to Owner. Damaged pipe will be rejected and the Contractor shall immediately place all damaged pipe apart from the undamaged and shall remove the damaged pipe from the site within 24 hours.
- E. If HDPE pipe is excessively cut or scored during installation (to a depth greater than 5% of its wall thickness), the damaged portion shall be removed, discarded, and replaced. Repair thereof shall be made by the Contractor at its sole expense and in a manner satisfactory to Owner.
- F. Threaded pipe ends shall be protected by couplings or other means until laid.
- G. Dirt or other foreign material shall be prevented from entering the pipe or pipe joint during handling or laying operations, and any pipe or fitting that has been installed with dirt or foreign material in it shall be removed, cleaned and relaid. At times when pipe laying is not in progress, the open ends of the pipe shall be closed by a watertight plug or by other means approved by Owner to ensure cleanliness inside the pipe.

3.03 CONSTRUCTION

- A. Unless shown otherwise on the plans, or described otherwise in the specifications, pipelaying shall conform to AWWA C600 and C906. All joints and flanges shall be washed with clean water to remove any debris prior to beginning assembly.
- B. The water lines shall be laid to provide a minimum cover over the pipe of 48 inches, unless indicated otherwise on the drawings.
- C. Valve boxes shall be installed vertically aligned and perpendicular to the water main to ensure access to the valve-operating nut with a valve wrench. The centerline of the valve box shall be within 1/2 inch of the centerline of the valve stem. Overlapping areas of the valve boxes shall be coated with grease prior to installation. The overlap shall be 12 inches. The entire valve box shall be bedded with a minimum of 6-inches of the DOT& PF's Specification for Aggregate Base Course, Grading D-1 and the bedding compacted to 95 percent of maximum dry density. Remove the threaded portion of the lower valve box section prior to installing the upper section. This allows for future adjustment. Refer to Section 02510, paragraph 3.05 Adjusting valve boxes to grade.

3.04 DUCTILE IRON CONSTRUCTION

- A. Flexible couplings shall be installed in accordance with the manufacturer's recommendations. All surfaces which are exposed after installation of the coupling shall be coated with Bitumastic No. 50 to produce a dry film thickness in excess of 1/32 inch.

- B. Deflection from straight line and grade, as required by vertical curves, horizontal curves and offsets shall not exceed eighty percent (80%) of the maximum deflection per joint as recommended by the pipe manufacturer. If the alignment requires deflection in excess of eighty percent (80%) of the maximum recommended, special bends or a sufficient number of shorter lengths of pipe shall be used to provide angular deflections within the limits set forth.

- C. After the pipe has been joined, aligned and permanently bedded, the joints shall be drawn up to assure permanent water tightness, but not so tight as to prevent flexibility to allow for some movement caused by vibrations, expansion and contraction.

- D. Except where restrained joint pipe is used, or unless otherwise called out on the drawings, all free ends, bends, tees, laterals and any change in direction of unrestrained joint piping shall be adequately braced and blocked by use of concrete thrust blocks and vertical blocking. Turnbuckles and rods shall be coated with at least one coat of Bitumastic No. 50 to produce a dry film thickness in excess of 1/32 inch. Concrete thrust blocks shall be cast against undisturbed ground, with formed sides. Thrust blocks shall be provided where indicated on the plans and at any bends not shown on the plans and as otherwise determined by the Engineer. The concrete shall not cover any pipe or fitting joint.

3.05 HDPE CONSTRUCTION

- A. Butt Fusion Joining
 - 2. 1. Plain end pipe and fittings shall be made using thermal butt-fusion. The butt fusion procedures shall be in accordance with the manufacturer or the Plastic Pipe Institute. The fusion equipment operator shall be certified using the recommended procedures. The Contractor shall be responsible to verify that the fusion equipment is in good operating condition and that the operator has been certified within the past twelve months. The fusion equipment shall be equipped with a Data Logger. Numbered records of the welds (heater temperature, fusion pressure, and a graph of the fusion cycle) shall be maintained and copies provided to the Owner for five (5) years. Each weld shall be readily identified in a permanent manner using the same record weld number. Should the contractor elect to use a colored marking system, caution should be taken that only a non-petroleum marker is used to identify the weld. Fusion beads shall not be removed. Only automated butt-fusion equipment that automated consistent hydraulic pressure application during the joining process shall be allowed for butt-fusion welds.

 - 2. 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 degrees Fahrenheit, alignment, and an interfacial fusion pressure of 75

PSI. The butt-fusion joining will produce a joint weld strength equal to or greater than the tensile strength of the pipe itself.

3. Pipe lengths, fittings, and flanged or MJ connections to be joined by thermal butt-fusion shall be of the same type, grade, and class of polyethylene compound and supplied from the same raw material supplier.
4. Fittings shall be molded for sizes 6-inches or smaller and shall be fabricated from polyethylene pipe and for sizes 8-inches and larger, by means of thermal butt-fusion. Ends of fabricated fittings shall not be trimmed to match pipe section to which they are going to be joined. Polyethylene fittings shall have the same or higher pressure rating as the pipe when installed.
5. In some instances, the weight of the polyethylene pipe is such that it cannot all be joined into a single length at the jobsite above ground. In this situation, the joining of continuous heavy lengths of polyethylene pipe may require the contractor to lift one end of a segment of unburied polyethylene pipe already in the open trench onto a platform spanning the trench where the pipe-fusing machine is installed. The next continuous heavy length of pipe is then brought to the trench and thermally butt fused in place on the platform. After cooling, the platform and fusing machine are removed, and the newly joined heavy segments are then lowered into the open trench. In the case of 30-inch SDR 9 pipe, the longest feasible continuous length that is readily handled is about 160-feet. The contractor should be aware of and include the additional cost of fusing these continuous lengths at the open trench when preparing his bid. Since an extended amount of trench must remain open in order to lift the ends of the polyethylene to be joined at the trench, the contractor should also include the provision of sufficient concrete Jersey barrier for traffic control on both sides of the open trench.

Recent projects have found that supporting fused sections of HDPE pipe on segments of C900 PVC pipe cut in half while fusing the next HDPE segment prevent damage and allow the HDPE pipe to be readily moved. Segments of C900 have also been used to span the trench and support the HDPE pipe before lowering into the ditch

Each of these methods and materials, if required, are incidental to the amount bid per foot for the installation of the pipe.

6. The contractor shall provide the jobsite facility where sections of polyethylene pipe are to be joined together. The jobsite facility shall be completely weather tight and heated, if required by ambient or inclement weather conditions. All polyethylene pipe sections shall be clean and dry before the contractor begins any fusion joining and remain so during the fusing process. Fusion joining at the open trench as described above shall also have adequate weather protection to keep the pipe ends clean and dry until fusing is completed.
7. Guidelines:
 - a) Bring the heating surfaces to the proper temperature.
 - b) Clean the inside and outside of the components to be joined (both pipes, or pipe and fitting) by wiping with a clean, lint free cloth moistened by isopropyl alcohol. Remove all foreign matter.

- c) Clamp the components in the machine. Check alignment of the ends and adjust as needed. Face off the ends.
- d) Remove the facing device and clean away cuttings from inside and outside the pipe. Bring the piping components together and check for alignment, gap, and ovality. Adjust as required. The ends of the piping components should meet squarely around their entire circumference.
- e) Push the ends to be joined against the heater in such time sequence that the recommended heating time for each component is satisfied. To ensure proper and full contact is made between the components and the heater, the initial contact should be under moderate pressure. After holding this pressure very briefly, it should be released without breaking contact. Continue to hold the components in place without movement while an even bead of molten polyethylene develops around the components as a result of thermal expansion.
- f) At the end of the heating cycle move the pipe component ends away from the heater, remove the heater and immediately bring the ends together with sufficient force to develop an interface pressure that will form a uniform bead around the entire circumference of the joint and that is found to produce acceptable joint strength characteristics.
- g) Hold the assembly under fusion force (pressure) until the joint has solidified. (Guidelines for the cooling time of the different materials are often available from the pipe component supplier).
- h) Visually inspect the joint. If a heat shield was used, both beads should be approximately the same size.

B. Sidewall Fusion Joining

- 1. Sidewall fusions for connections to outlet piping shall be performed in accordance with HDPE pipe and fitting manufacturer's specifications. The heating irons used for sidewall fusion shall have an inside diameter equal to the outside diameter of the HDPE pipe being fused. The size of the heating iron shall be ¼ inch larger than the size of the outlet branch being fused. The sidewall fusions shall be made perpendicular to the major axis of the polyethylene pipe and installed at the spring line (in a transverse cross section of the pipe, the line of maximum horizontal dimension). Errors in fabrication made by the contractor that then require additional field fittings to make connection to other existing or newly installed utilities are incidental to the amount bid for that connection.

D. Mechanical Joining

- i. Mechanical joining will be used only 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. **No mechanical joint that is not**

specifically identified within these Contract Documents shall be installed without prior express written permission granted by the Owner.

The flange adapter shall be attached to pipe using butt fusion. The flange adapter shall be aligned and centered relative to the pipe. Flange adapters should be square with the valve or other flange before tightening of bolts. Bolts should not be used to draw the flange into alignment. Bolt threads shall be lubricated. Bolts shall be tightened using a “star-tightening pattern”. See manufacturers’ recommendations. Twenty four hours after first tightening the flange bolts, they must be retightened using the same “star tightening pattern” referred to above. The final tightening torque shall be as described in the Plastic Pipe Institute’s Technical Note 38, latest adopted edition

MJ joining shall be accomplished in accordance with the pipe manufacturer’s recommendations, subject to the approval of the Engineer.

For HDPE MJ fittings connected to DI pipe, or DI fittings joined to HDPE pipe, using MJ adapters, the bolt-torque for three-quarter inch (3/4”) bolts shall be ninety (90) foot-pounds

When tightening the ¾” bolts, it is the best practice that the gland be evenly brought up towards the pipe flange; maintaining approximately the same distance between the gland and the face of the flange at all points around the socket. This is normally accomplished by partially tightening the bottom bolt first, then the top bolt, followed by the bolts to each side on the horizontal, and lastly, the rest of the bolts, using a “star” criss-cross pattern of tightening. Repeat this pattern two or three more times until all the bolts are evenly torqued within the above standard industry guideline (90 ft-lbs)

If effective joint sealing is not attained at the maximum torque of 90 ft-lbs, the joint shall be disassembled, cleaned thoroughly, and reassembled

Bolts shall not be over torqued to try to compensate for poor assembly and installation practice. **Retorque bolts again after 24 hours.**

- E. Socket fusion, hot gas fusion, threading, solvents, and epoxies shall not be used to join HDPE pipe.
- F. Heat Fusion Training. In the event that the contractor does not submit current certificates of qualifications for the person(s) who will be fusing the HDPE pipe, the supplier of the pipe and fittings shall provide a person certified by the pipe manufacturer and the fusion equipment manufacturer to train contractor fusion equipment operators and inspectors representing the Owner.
- G. Other Joining Methods

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1. Mechanical Joining. Polyethylene pipe and fittings may be joined together using Flanges or Mechanical Joint (MJ) adapters. These fittings shall be made from PE4710 HDPE resin, Cell Classification of 445574C as determined by ASTM D3350-06, Flanged and MJ adapters shall have a manufacturing standard of ASTM D3261. They shall have a pressure rating equal to the pipe unless otherwise specified on the plans.
2. Flanged Joining. Prior to bolting-up any flanged connection, the face flanges shall be aligned so that any gap is minimal. The mating flange faces shall be aligned square and true and conform to the measurement criterions established by the Plastic Pipe Institute (PPI) Technical Note 38. Measurements shall be taken and recorded of the offset, angularity, and gap of each flanged connection prior to bolt up. No flange shall be bolted-up until the gap meets the PPI Technical Note 38 alignment requirements.
3. Electrofusion couplings. Polyethylene pipe and fittings may be joined using approved electrofusion couplings. Fittings shall be PE3408 HDPE, cell classification of 345464C as determined by ASTM D3350-02 or PE4710 HDPE as determined by ASTM D3350-06 with a cell classification of 445574C. Electrofusion Fittings shall have a manufacturing standard of ASTM F1055. Fittings shall have a pressure rating equal to the pipe. All electrofusion fittings shall be suitable for use as pressure conduits, and per AWWA C906, have nominal burst values of three and one-half times the Working Pressure Rating (WPR) of the fitting.

H. Installation

1. Installation. Pipe and fittings shall be installed using procedures recommended by the manufacturer.
2. General. Pipe and fittings shall be packaged in a manner suitable for shipment by a commercial carrier. Upon receipt at job site, a receiving inspection shall be prepared. Inspect the pipe for defects before installation and fusion. Defective, damaged or unsound pipe shall be rejected. The quantity shall be verified and any shipping damage shall be reported to the supplier within 7 days.
4. Pipe and Large Fitting Handling: A nylon fabric choker sling capable of safely handling the weight of the pipe or fitting, shall be used to lift, place and move pipe and fittings. Position slings for handling pipeline away from the butt-fused joints. Exercise care when lowering pipe into the trench to prevent damage or twisting of pipe.
5. Excavate trench bottom out sufficiently to ensure clearance between the undisturbed trench bottom and the flange, valve, or connection being installed.
5. Cold (Field) Bending: Contractor shall not bend the pipe to fit a trench more than that allowed by the pipe manufacturer. For 6 and 8-inch SDR pipe, the bending radius shall not be less than 20 times the outer diameter of the pipe. For SDR 11 pipe, the bending radius shall not be less than 25 times the

outer diameter of the pipe.

6. Installation by Pulling In: Contractor shall submit to Owner maximum proposed pull-in length for the pressure class and diameter pipe proposed to be pulled into an open trench. Pull-in lengths will not exceed the maximum lengths recommended by manufacturer for the class and diameter of the pipe. Final tie-ins should be made not less than 24 hours after pulling in to allow the pipe to recover from the stress of pulling.

3.06 ELECTRICAL CONTINUITY (DUCTILE IRON ONLY)

The Contractor shall provide adequate means to permit an electrical current flow of 500 amperes across all ductile iron pipe joints without exceeding an allowable voltage drop of one volt per joint.

For pipe joints 4-inch or larger in nominal diameter, continuity shall be provided by an insulated, No. 4 AWG cable using CadWeld connections on each side of the joint. At valves, electrical continuity shall be provided by two each, insulated No. 4 AWG cables, welded as above, between pipes either side of the valve. CadWeld connections shall be those designed for use with ductile iron pipe.

3.07 CONNECTIONS TO EXISTING MAINS AND SERVICES

General requirements for connections to existing piping are shown on the drawings. The Contractor shall determine and verify all existing piping, dimensions and elevations to assure proper fit. Approximate location of existing piping is provided on the plans, however, other pipelines may exist that are not shown. The Contractor shall be responsible for the protection of all existing piping and appurtenances during construction and shall take care not to damage them or their protective coatings or impair the operation of the existing system in any way. The Contractor must be sure that all proper valves are closed and restrained before cutting into existing water lines and that all necessary temporary bypass lines and temporary plugs are in place before making connections.

All required materials and equipment (including emergency equipment) for the connection shall be on hand prior to the shutdown of existing water service or main.

Connection of new pipe to existing pipe perpendicular to the centerline of the existing pipe shall be made with the pipe, valves, and fittings indicated on the plans and whatever additional pipe and fittings required by the configuration and condition of the existing pipe.

Connections to existing services shall be incidental to pipeline, water service, fitting, and other bid items.

3.08 TESTING

- A. Source of Water: Water for testing shall be obtained from Owner's distribution system.

Initial Flushing - All pipelines shall be cleaned of all dirt and debris prior to testing. Lines 24-inch and smaller shall be flushed. Larger pipelines shall be swept. The Contractor shall provide the Owner with 24 hours notice prior to beginning flushing the line.

- B. Ductile Iron Pipe Testing Pressure tests on the piping and valves installed by the Contractor shall be made in accordance with the provisions of AWWA C600, except as

modified herein.

The Contractor, who shall conduct all tests under the observation of Owner, shall furnish all equipment necessary to make the tests. The Contractor shall provide Owner with 24 hours notice of times and locations of tests. Prior to testing, the section of the pipeline to be tested shall be filled with water, air evacuated as required, and placed under a slight pressure for at least 24 hours.

Testing Pressure, pounds / square inch (psi) - The minimum test pressure for new mains shall be 150 psi. or 1.5 times working pressure (whichever is greater) measured at the low end of the pipeline between the main valves, but not more than 200 psi. Owner shall provide such working pressure information. Tests shall be conducted against both sides of valves

Prior to connecting to existing services, and for services to future connections, new service lines shall be flushed and tested at the testing pressure as specified above for the main and shall be accepted if free of visible leaks. New services shall not be backfilled or insulated prior to successful testing. The same test shall apply to hydrant leads.

Pass/ Fail Criteria – If no visual leakage is observed, and pressure during the test phase remains steady (with only a max of 5 psi drop) for the 1-hour test phase period, a passing test is indicated.

Note: If the new line will be used as a sprinkler/ fire line, the pressure test will be 200 psi, plus 5 psi.

C. HDPE Pipe Testing

Pressure testing shall be conducted in accordance with ASTM F2164, Field Leak Testing of Polyethylene Pressure Piping Systems Using Hydrostatic Pressure, except as modified herein. For safety reasons, hydrostatic testing only will be permitted.

Testing Pressure, pounds / square inch (psi) - The minimum test pressure for new mains shall be 150 psi plus 15 psi or 1.5 times the working pressure, plus 15 psi (Whichever pressure is greater.)

Filling - Fill the pipeline with water after it has been laid; bleed off any trapped air. (Warning - Entrapped air can result in an explosive, violent, and dangerous catastrophic failure because both the pressure stress on piping and the energy used to compress the entrapped air is released.)

Initial Expansion Phase – Gradually pressurize the test section to test pressure, and maintain test for three (3) hours. During the initial expansion phase, polyethylene pipe will expand slightly. Additional test liquid will be required to maintain pressure. It is not necessary to monitor the amount of water added during the initial expansion phase.

Test phase – reduce test pressure by 10 psi and monitor pressure for 1 hour. Do not

increase pressure or add make-up water.

Pass/ Fail Criteria – If no visual leakage is observed, and pressure during the test phase remains steady (with only a max of 5 psi drop) for the 1-hour test phase period, a passing test is indicated.

Prior to connecting to existing services, and for services to future connections, new service lines shall be flushed and tested at the working pressure of the main and shall be accepted if free of visible leaks. New services shall not be backfilled or insulated prior to successful testing. The same test shall apply to hydrant leads.

Note: If the new line will be used as a sprinkler/ fire line. Pressure test will be 200 PSI, plus 15 PSI.

Note: Under no circumstances shall the total time under test exceed eight (8) hours at 1.5 times the system pressure rating. If the test is not complete within this time limit (due to leakage, equipment failure, etc.), the test section shall be permitted to “relax” for eight (8) hours prior to the next test sequence.

3.09 DISINFECTION

Disinfection of the new water mains shall be performed by the Contractor prior to connection to the existing water lines and shall be in accordance with AWWA Specification C651, except as modified herein.

The initial concentration of chlorine in the line shall be not less than 50 milligrams per liter (mg/l) which is also expressed as 50 parts per million (ppm). This solution shall be held for a period of 24 hours and the disinfecting solution strength shall not drop below 10 ppm as measured at the completion of the 24-hour period. If the measured solution strength is below 10 ppm at that time, the Contractor shall re-disinfect the water main until this criterion is met.

Upon completion of the chlorination disinfection period, the heavily chlorinated water shall be flushed to prevent damage to the pipe lining. To prevent damage to the environment, heavily chlorinated water shall be neutralized with an EPA approved chemical for discharge into streams and oceans before disposal. It is the Contractor’s responsibility to determine the proper flushing point for the discharge of all flushing water and to meet EPA requirements for disposal of the heavily chlorinated water. The line should be further flushed until chlorine residual discharged is equivalent to that of the incoming potable water’s chlorine residual.

Upon completion of chlorination and flushing, the line will sit undisturbed for a minimum of another 24 hours. At that time, a bacteriological test shall be taken for analysis by an ADEC approved laboratory followed by a second set of bacteriological samples collected at least another 24 hours later.

Upon obtaining both satisfactory bacteriological test results, the system may be put into service after a final flushing. If either bacteriological test is unsatisfactory, the chlorination disinfection routine in its entirety as described above shall be repeated until a subsequent bacteriological test analysis meets the ADEC requirements.

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All test gear will be furnished and installed by the Contractor. At the completion of the disinfection process, the Contractor will remove all test gear including those appurtenances affixed to the new water main other than the saddle(s). Each saddle's threaded opening shall be sealed using a single bronze, solid bodied, plug of the same threaded pipe diameter. Neither bronze, open bodied plugs nor threaded bushings or reducers shall be allowed.

3.10 ABANDONED MAINS, SERVICES, AND VALVES

Where existing services or main valves are abandoned or replaced, existing valve and curb boxes shall be removed. Abandoned mains shall be plugged with concrete at open ends.

END OF SECTION

SECTION 33 2730

SANITARY SEWERS

1. GENERAL

1.01 SCOPE

This section applies to the construction or repair of sanitary sewer pipelines that may be required as part of the work. Materials and installation requirements are also provided for reference on items, such as manholes, which may be cross-referenced by other specification sections.

1.02 RELATED WORK SPECIFIED ELSEWHERE

Trenching, Backfilling, and Compaction: Section 31 2333.

1.03 HDPE FORCE MAIN

HDPE sewer force main (including HDPE arctic pipe) shall conform to the requirements of section 33 1000, except SDR 21 pipe shall be used.

2. MATERIALS

All new sewers shall be SDR 35 PVC, rated for 150 psi unless otherwise stated in the bid schedule. Patching of existing DI, CMP, RCP, or AC sewers, if required, may be with either SDR 35 PVC rated for 150 psi, or material matching existing, subject to approval of material and adapters by the Engineer.

2.01 SEWER PIPE AND FITTINGS

A. PVC SDR 35:

Polyvinyl chloride plastic sewer pipe shall be PVC SDR 35 rated for 150 psi, with integral bell and spigot joints and elastomeric seal (gasket). Pipe to fit industry standard cast iron fittings AWWA C-110.

Pipe to be AWWA-C900-81, made of compound 12454A as per ASTM D1784, and to meet the requirements of DR 18.

The elastomeric seal to meet ASTM F477. The gasketed joint assembly to meet ASTM D3139. The installation to meet UniB3, AWWA M23.

2.03 CAST IRON FRAMES AND COVERS

- A. Cast iron frames and covers shall be 24-inch minimum opening for manholes, 18-inch minimum opening for cleanouts.
- B. Castings shall conform to ASTM A48, Class 30, bituminous coated, marked

"Sewer."

- C. Manhole covers to be Neenah Foundry R-1733-M. Cleanout covers to be Inland Foundry 240 or approved equal.

2.04 SUBMITTALS

Provide catalog cuts for castings, manholes, manhole connections, and joint sealing. Provide manufacturer's certification for pipe and fittings.

3. INSTALLATION

3.01 PIPE

A. Survey line and grade for new sewers shall be taken from project benchmarks and reference points. The Contractor shall transfer line and grade at numerous intermediate points for control of his or her work. The Contractor shall retain the use of a pipe laser to set and lay all grades of sub-grade and pipe, as well as to confirm pipe alignment.

B. The pipe bedding shall be placed so that the entire length of the pipe will have full bearing on the bedding. No blocking of any kind shall be used to adjust the pipe to grade. The pipe bedding shall be D-1 crushed surfacing.

Bedding shall be placed in conformance with AWWA C600-99 Type V pipe bedding procedures, described as follows. Bedding shall be placed in more than one lift. The first lift to provide at least 6-inch thickness under any portion of the pipe shall be placed before the pipe is installed and shall be spread smoothly so that the pipe is uniformly supported along the barrel. Bedding shall then be placed and compacted along the side of the pipe to a height equal to one half of the pipe diameter. Subsequent lifts of not more than 6-inch thickness of D-1 bedding shall be placed over the crown on the pipe and individually compacted to 95 percent of maximum density as shown in the contract plans.

C. Where unauthorized excavation has been made below the established grade, the Contractor shall provide, place, and compact suitable bedding material to the proper grade elevation at his or her own expense.

D. Laying of sewer pipe shall be accomplished to line and grade in the trench only after it has been dewatered and the foundation and/or bedding has been prepared. Mud, silt, gravel, and other foreign material shall be kept out of the pipe and off the jointing surfaces.

E. All pipe laid shall be retained in position by mechanical means or otherwise, as to maintain alignment and joint closure until sufficient backfill has been completed to adequately hold the pipe in place.

F. Variance from established line and grade shall not be greater than one quarter of an inch, provided that such variation does not result in a level or reverse sloping invert. Failure to pass the deflection test outlined in section 3.06 B shall be cause for rejection.

G. The sewer pipe shall be laid upgrade. The sewer pipe shall be installed with the bell end forward or upgrade. No gravel, trash, or other foreign matter shall be allowed to enter the sewer system during construction. When pipe laying is not in progress, the forward end of

the pipe shall be kept tightly closed with a temporary plug.

H. As the pipe is installed, it shall be backfilled with the specified bedding material and selected native material as shown on the plans, taking care that the backfill is in contact with the entire periphery of the pipe. The backfill shall be so carefully placed and firmly compacted that the subsequent backfilling operations will not disturb the pipe in any way.

I. All pipe branches, stubs or other open ends which are not to be connected immediately shall be plugged with approved material consistent with these Specifications and secured in place.

J. Pipe Jointing:

1. All extensions, additions and revisions of the sewer system, unless otherwise specified, shall be made with sewer pipe jointed by means of a flexible gasket which shall be fabricated and installed in accordance with these Specifications.

2. Pipe handling after the gasket has been affixed shall be carefully controlled to avoid disturbing the gasket and knocking it out of position, or loading it with dirt or other foreign material. Any gaskets so disturbed shall be removed and replaced, cleaned and relubricated if required before the jointing is attempted.

3. Care shall be taken to properly align the pipe before joints are entirely forced home. During insertion of the tongue or spigot, the pipe shall be partially supported by hand, sling or crane to minimize unequal lateral pressure on the gasket and to maintain concentricity until the gasket is properly positioned. Since most flexible gasketed joints tend to creep apart when the end pipe is deflected and straightened, such movement shall be held to a minimum once the joint is home.

4. Sufficient pressure shall be applied in making the joint to assure that it is home, as described in the installation instructions provided by the pipe manufacturer. Not more than one inch of the bell shall be exposed once the pipe is inserted. Sufficient restraint shall be applied to the line to assure that joints once home are held so, until fill material under and alongside the pipe has been sufficiently compacted. At the end of the work day, the last pipe laid shall be blocked to prevent creep during "down time."

3.02 MANHOLES

A. Standard manholes for sanitary sewers shall be constructed of precast concrete units.

B. Adequate foundations for all new manhole structures shall be obtained by removal and replacement of unsuitable material with well graded granular material or by tightening with coarse ballast rock, or by such other means as provided for foundation preparation of the connected sewers.

C. Base shall be a well-graded granular bedding course conforming to the requirements for sewer bedding but not less than 12 inches in thickness and extending either to the limits of the excavation or to a minimum of 12 inches outside the outside limits of the base section. In the latter case, the balance of the excavated area shall be filled with select material well tamped to the level of the top of the bedding to positively prevent any lateral movement of

the bedding when the weight of the manhole is placed upon it. The bedding course shall be firmly tamped and made smooth and level to assure uniform contact and support of the pre-cast elements. Bedding shall be compacted to 95% maximum density.

D. A minimum of 6-inches D-1 bedding shall be placed around the entire manhole structure and compacted to 95% maximum density.

D. All lift holes shall be thoroughly wetted and then be completely filled with mortar, smoothed and feathered both inside and out to ensure water-tightness.

E. Final elevation and tilt of cover shall conform to the restored street surface unless otherwise specified. Manhole castings shall be readjusted to meet uniform street grades. Warping of surfacing to meet grade of castings will not be allowed. Not less than 6 inches or more than 12 inches shall be provided between the top of the cone or slab and the underside of the manhole casting ring for adjustment of the casting ring to street grade or ground surface. Plastic adjustment rings shall be utilized to adjust elevation between the top of the cone or slab and the underside of the manhole casting ring.

F. Channels shall be made to conform accurately to the sewer grade and shall be brought together smoothly with well rounded junctions. Channel sides shall be carried up vertically to the crown elevation of the various pipes, and the concrete shelf between channels shall be smoothly finished and warped evenly with slopes to drain. If channels are to be cast in place a concrete jointing compound shall be placed on all concrete surfaces to be attached to new concrete.

G. A watertight joint shall be provided where the pipe passes through the manhole wall by utilizing Z-loc connection that has been pre-cast into the manhole wall. Z-loc shall be installed per manufactures recommendations. Pipe connection into entry coupling shall be sealed with a rubber ring. No pipe joint shall be placed within ten feet (10') of the manhole wall.

H. The Contractor shall be responsible for repairing all damage to the manholes resulting from his or her operations.

Manhole joints shall be assembled with a layer of butyl laid on a clean lip surface between the two pre-cast sections. Exterior joints shall then be grouted to a water-tight seal. Manholes shall have no visible leaks at any joint.

Manhole exterior joint waterproofing shall be a Miradri system as manufactured by Mirafi, Inc. including Miradri P-804 primer, Miradri 861 Membrane, and Miradri M-800 mastic, or approved equal that includes a membrane and adhesive system for positive water exclusion. The membrane shall extend at least 18" each side of manhole joints, except this width may be reduced to 9" each side of manhole joints if the joint is less than four feet below finished grade and the joint is above the maximum water table.

Precast concrete manholes shall conform to the requirements of ASTM C478 and details on Contract Drawings.

Manholes shall be cast with z-loc pipe connectors into the manhole openings.

3.03 EXISTING MANHOLES TO BE REMOVED

For existing manholes to be the contractor shall remove the entire structure.

3.04 SERVICE LATERALS

There will be a maximum of 2 fittings allowed on service laterals unless approved by the engineer.

3.05 CLEANING

New sewer sections, pipes and manholes, shall be cleaned such that no foreign material exists prior to testing.

3.06 TESTING & INSPECTIONS

A. **PRESSURE TESTING:** All new and replacement lines shall be air-tested to a minimum of 5 psi and shall hold at least 5 psi for one (1) hour. This requirement shall be waived for patches to existing services.

At the Contractor's option, in lieu of either of the above, the gravity sewer pipe may be hydrostatically tested for water tightness. Where the leakage exceeds the rate of 0.05 gallons per hour per inch diameter per 100 feet of sewer pipe with a minimum test pressure of six (6) feet of water above the crown at the upper end of the pipe, or above the active ground water table, whichever is higher, the section so leaking will not be accepted until satisfactory repairs are made at the Contractor's expense. Maximum height of water column shall be limited to sixteen (16) feet above the invert of the pipe at the lower end of the test section. This requirement shall be waived for patches to existing services; however, upstream lines shall be flushed and the lines observed for leaks prior to completion of bedding above the pipe springline.

Mains and new services as far as test tees shall be tested at one time between adjacent manholes. Upstream sewage shall be bypassed by pumping during tests. Contractor shall notify property owners of affected services before and after test and advise them not to discharge during test period.

B. **DEFLECTION TESTING:** All C900 PVC pipe may be tested for deflection after backfilling is completed at the owners discretion. Deflection testing shall be performed in accordance with ASTM specifications D3034 (4"-15") or F679 (18"-27"). A vertical ring deflection greater than seven and one half percent (7.5%) will not be allowed. This deflection is defined as a seven and one half percent reduction in the average inside diameter or deviation from alignment.

The method of testing shall be subject to the approval of the Engineer. The deflection test may be conducted with a mandrel, a ball, a cylinder, or in another manner acceptable to the Owner, accomplished on a manhole-to-manhole basis, following complete flushing of the line by the Contractor. If rigid balls or mandrels are used to test the pipe deflection, no mechanical pulling devices shall be used. Rigid balls or mandrels shall be 92% of the base inside diameter of the pipe to be tested as described in ASTM F679. If mandrels are used, they shall be similar or equal to that manufactured by Cherne Industries, Inc. Mandrels shall be fluted with an odd number of flutes and a minimum of nine (9) flutes.

A different gage is required for each different diameter of pipe, and the Contractor shall furnish

all equipment required to complete the deflection tests. The deflection tests shall be witnessed by the Owner or the Owners representative. Any section of pipe that fails to meet the aforementioned requirements shall be excavated and the failed sections shall either be relayed or replaced, and retested for deflection until the requirements are met; this work will be done at no cost to the Owner.

The sewer shall be completely cleaned by the Contractor prior to performing deflection tests or camera inspections.

Deflection test shall be performed no less than thirty (30) days after all sewer pipe trenches have been backfilled to finished grade and all sewers have passed both the leakage test(s) and camera inspections.

C. CAMERA INSPECTION: A camera inspection will be performed and approved by the Owner before acceptance of new sewer lines. The purpose of the camera inspection is to identify improperly seated joints and/or gaskets, to ensure the pipe has been installed to the design grade and any other defects not detected by pressure testing and deflection testing. Defects found to be outside the limits of a generally acceptable new sewer installation, as determined by the project Engineer, shall be fixed or the pipe re-laid at no cost to the Owner.

Camera inspections shall be completed before the sewer becomes active. In the event that a sewer must be active prior to inspection the maximum depth of flow in the sewer line segment being inspected shall not exceed: twenty (20) percent of the depth in 6 to 10 inch diameter sewers, twentyfive (25) percent of the depth in 12 to 24 inch diameter sewers, or thirty (30) percent of the depth in sewers 30 inches or larger in diameter. In the event that the depth of flow exceeds these criteria, the Contractor shall control the flow to an acceptable depth of flow or reschedule the inspection to a low flow period of time (typically 2 a.m. to 5 a.m.). The additional cost of controlling the flow or working during alternate hours shall be borne by the Contractor.

The contractor shall provide access where needed for inspections

The Contractor shall clean the sewer lines so that they are free of foreign material prior to camera inspections.

3.07 INFLOW PRECAUTIONS

The sanitary sewers discharge to pump stations with limited capacity. It is extremely important that groundwater and surface drainage be kept out of the collection system to keep sediments out of the pipelines and avoid overloading the pump stations, and the Contractor shall exercise all possible care to prevent such inflows during construction.

The Contractor shall advise the City and Borough of Wrangell, Department of Public Works, in case of damage to sewers and prior to adjustments in any service line connections. Notify both the Public Works Director (874-3904).

END OF SECTION

SECTION 33 2520

STORM DRAINAGE

1. GENERAL

1.1 QUALITY ASSURANCE

- A. Conform to the requirements of 31 0000.

2. PRODUCTS

2.1 BEDDING MATERIALS

- A. Refer to Section 31 0000.

2.2 GENERAL REQUIREMENTS FOR PIPE MATERIAL

- A. Pipe used for storm sewer and drainage culvert construction may be of any of the materials specified herein unless otherwise provided.

2.3 GALVANIZED CORRUGATED STEEL PIPE

- A. Galvanized corrugated steel pipe shall conform to the requirements of AASHTO Designation M36 or M167 as applicable, 16 gage unless otherwise provided.
- B. Coated uniformly inside and out with asphalt coating to meet the requirements of AASHTO Designation M190. The Contractor may substitute polymer coating such as "Black Klad", if approved by the Engineer. All fittings and couplings shall be coated.
- C. Coupling band shall meet the requirements AASHTO M36 and wide enough to cover at least two annular corrugations. Gasket shall be provided.
- D. When specified, galvanized steel end sections shall be flared, beveled shop-assembled units to serve as structural, hydraulic and aesthetic end treatment to corrugated steel culverts. They may be attached to corrugated steel culverts by threaded rods, by riveting or bolting per manufacturer's standard procedure. End sections shall have a turned down lip or toe plate at the wide end to act as a cut-off. The material for the end section shall be galvanized steel meeting the requirements of AASHTO M36 or same gage as pipe.

3. EXECUTION

3.1 INSTALLATION

- A. Conform to applicable requirements of Section 02560 except as modified herein.

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3.2 BEDDING FOR CORRUGATED PIPE

- A. Material for sidefill around and to the crown elevation of corrugated metal pipe shall be selected and shall not contain stones larger than 3 inches in greatest dimension, frozen lumps, roots, or moisture in excess of that permitting thorough compaction.
- B. Material placed within the pipe compaction zone shall be brought up simultaneously on each side of the pipe to the top of the pipe and compacted to 95% as defined by Section 31 0000.

END OF SECTION