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STANDARD SPECIFICATIONS FOR CIVIL ENGINEERING PROJECTS AND SUBDIVISION IMPROVEMENTS

ERRATA 5-16

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PREFACE

These Standard Specifications for Civil Engineering Projects and Subdivision Improvements have been developed for consistent construction practices for work that is performed for and within the City and Borough of Juneau (CBJ). The Standard Specifications for Civil Engineering Projects and Subdivision Improvements are incorporated into the written agreement between CBJ as a Contracting Agency and the CONTRACTOR (or Subdivision Developer) except where the contract indicates that a particular Specification has been amended with a special provision to resolve a Project specific issue. The decision to amend or replace any standard Specification with a special provision is made during the design process and is based upon the sound engineering judgment of the Project designer and/or the Chief Regulatory Engineer. The Standard Specifications support and do not supplant the Municipal Code.

These Specifications reflect years of refinement through the projects that the CBJ Engineering Department delivers each year. In addition, this document is the result of hundreds of hours of development and review by internal CBJ staff as well as consultants and contractors in the private sector.

This preface is for informational purposes only and is not to be used to interpret or affect the terms of the contract between CBJ and the CONTRACTOR (or Subdivision Developer).

If during the use of this document, you identify errors or have recommendations or changes for improvement, please send your comments to the CBJ Engineering Department by one of the following methods:

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FAX Number:	907-463-2606
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This document is also available on the web at www.juneau.lib.ak.us/engineering/

Prepared by: Rosemary Matt, P.E.
City Engineer
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City and Borough of Juneau

PREFACE

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City Engineer
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SECTION 01045 – CUTTING AND PATCHING

PART 1 – GENERAL

1.1 DEFINITION

A. "Cutting and Patching" is defined to include the cutting and patching of nominally completed and previously existing concrete, steel, wood and miscellaneous metal structures; piping and pavement, in order to accommodate the coordination of WORK, or the installation of other facilities or structures or to uncover other facilities and structures for access or inspection, or to obtain samples for testing, or for similar purposes.

1.2 REQUIREMENTS OF STRUCTURAL WORK

A. Structural WORK shall not be cut and patched in a manner that results in a reduction of load-carrying capacity or load/defection ratio.

B. Prior to cutting and patching the following categories of WORK, the CONTRACTOR shall obtain the ENGINEER's approval to proceed with:

1. Structural steel
2. Miscellaneous structural metals, including equipment supports, stair systems and similar categories of WORK
3. Structural concrete
4. Foundation construction
5. Timber and primary wood framing
6. Bearing and retaining walls
7. Structural decking
8. Exterior curtain wall construction
9. Pressurized piping, vessels and equipment
10. Asphalt pavement, concrete or asphalt curb/gutter, and concrete sidewalk.

1.3 OPERATIONAL AND SAFETY LIMITATIONS

A. The CONTRACTOR shall not cut and patch operational elements and safety-related components in a manner resulting in a reduction of capacities to perform in the manner intended or resulting in decreased operational life, increased maintenance or decreased safety.

B. Before cutting and patching the following categories of WORK, the CONTRACTOR shall obtain the ENGINEER's approval to proceed with:

1. Sheeting, shoring and cross bracing
2. Operating systems and equipment
3. Water, moisture, vapor, air, smoke barriers, membranes and flashing
4. Noise and vibration control elements and systems
5. Control, communication, conveying and electrical wiring systems.

1.4 VISUAL REQUIREMENTS

A. The CONTRACTOR shall not cut and patch WORK which is exposed on the exterior or exposed in occupied spaces, in a manner resulting in a reduction of visual qualities or

resulting in substantial evidence of the cut and patch WORK, both as judged solely by the ENGINEER. The CONTRACTOR shall remove and replace WORK judged by the ENGINEER to have been cut and patched in a visually unsatisfactory manner.

1.5 APPROVALS

A. When prior approval for cutting and patching is required, the CONTRACTOR shall submit the request and obtain approval prior to performing the WORK. The request should include a description of why cutting and patching cannot reasonably be avoided; how it will be performed; how structural elements (if any) will be reinforced; products to be used; firms and tradespeople who will perform the WORK; approximate dates of the WORK; and anticipated results in terms of structural, operational, and visual variations from the original WORK.

PART 2 – PRODUCTS

2.1 MATERIALS USED IN CUTTING AND PATCHING

A. Unless otherwise indicated, the CONTRACTOR shall provide materials for cutting and patching which will result in an equal-or-better product than the material being cut and patched, in terms of performance characteristics and including visual effects where applicable. The CONTRACTOR shall use material identical with the original materials where feasible.

B. Materials shall comply with the requirements of the Technical Specifications wherever applicable.

PART 3 – EXECUTION

3.1 PREPARATION

A. The CONTRACTOR shall provide adequate temporary support for WORK to be cut to prevent failure

B. The CONTRACTOR shall provide adequate protection of other WORK during cutting and patching.

3.2 INSTALLATION

A. The CONTRACTOR shall employ skilled tradespeople to perform cutting and patching. Except as otherwise indicated, the CONTRACTOR shall proceed with cutting and patching at the earliest feasible time and perform the WORK promptly.

B. The CONTRACTOR shall use methods least likely to damage WORK to be retained and WORK adjoining.

1. In general, where physical cutting action is required, the CONTRACTOR shall cut WORK with sawing and grinding tools, not with hammering and chopping tools. Openings through concrete WORK shall be core-drilled.
2. Comply with the requirements of Technical Specifications wherever applicable.

3. Comply with the requirements of applicable sections of Division 2 where cutting and patching requires excavation and backfill.

C. The CONTRACTOR shall patch with seams which are as invisible as possible and comply with specified tolerance for the WORK.

D. The CONTRACTOR shall restore exposed seams of patched area; and, where necessary, extend finish restoration onto retained WORK adjoining, in a manner, which will eliminate evidence of patching.

END OF SECTION

SECTION 01070 - ACRONYMS OF INSTITUTIONS

PART 1 - GENERAL

1.1 GENERAL

A. Wherever in these Specifications references are made to the standards, specifications, or other published data of the various international, national, regional, or local organizations, such organizations may be referred to by their acronym or abbreviation only. As a guide to the user of these Specifications, the following acronyms or abbreviations, which may appear in these Specifications shall have the meanings, indicated herein.

1.2 ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AI	The Asphalt Institute
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AITC	American Institute of Timber Construction
APA	American Plywood Association
API	American Petroleum Institute
APWA	American Public Works Association
ASCE	American Society of Civil Engineers
ASSE	American Society of Sanitary Engineers
ASTM	American Society for Testing and Materials
ATM	Alaska Test Methods
AWPA	American Wood Preservers Association
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Water Works Association
CBJ	City and Borough of Juneau
CLFMI	Chain Link Fence Manufacturer's Institute
CMA	Concrete Masonry Association
CRSI	Concrete Reinforcing Steel institute
DCDMA	Diamond Core Drill Manufacturer's Association
EIA	Electronic Industries Association
ETL	Electrical Test Laboratories
FPL	Forest Products Laboratory
ICBO	International Conference of Building Officials
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society
IME	Institute of Makers of Explosives
IOS	International Organization for Standardization
IPCEA	Insulated Power Cable Engineers Association
ISA	Instrument Society of America
ITE	Institute of Traffic Engineers
MTI	Marine Testing Institute
NACE	National Association of Corrosion Engineers
NBS	National Bureau of Standards
NEC	National Electrical Code

NEMA	National Electrical Manufacturer's Association
NFPA	National Fire Protection Association
NFPA	National Forest Products Association
NLGI	National Lubricating Grease Institute
NWMA	National Woodwork Manufacturers Association
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
SAMA	Scientific Apparatus Makers Association
SPR	Simplified Practice Recommendation
SSPC	Steel Structures Painting Council
SSPWC	Standard Specifications for Public Works Construction
TFI	The Fertilizer Institute
UBC	Uniform Building Code
UL	Underwriters Laboratories, Inc.
WCLIB	West Coast Lumber Inspection Bureau
WCRSI	Western Concrete Reinforcing Steel Institute
WIC	Woodwork Institute of California
WRI	Wire Reinforcement Institute, Inc.
WWPA	Western Wood Products Association

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01090 - REFERENCE STANDARDS

PART 1 - GENERAL

1.1 GENERAL

A. Titles of Sections and Paragraphs. Captions accompanying Specification sections and paragraphs are for convenience of reference only and do not form a part of the Specifications.

B. Applicable Publications. Whenever in these Specifications references are made to published specifications, codes or other requirements, it shall be understood that wherever no date is specified, only the latest specifications, standards, or requirements of the respective issuing agencies which have been published as of the date that the WORK is advertised for bids, shall apply; except to the extent that said standards or requirements may be in conflict with applicable laws, ordinances, or governing codes. No requirements set forth herein or shown on the Drawings shall be waived because of any provision of, or omission from, said standards or requirements.

C. Specialists, Assignments. In certain instances, Specification text requires (or implies) that specific WORK is to be assigned to specialists or expert entities who must be engaged for the performance of that WORK. Such assignments shall be recognized as special requirements over which the CONTRACTOR has no choice or option. These requirements shall not be interpreted so as to conflict with the enforcement of building codes and similar regulations governing the WORK; also they are not intended to interfere with local union jurisdiction settlements and similar conventions. Such assignments are intended to establish which party or entity involved in a specific unit of WORK is recognized as "expert" for the indicated construction processes or operations. Nevertheless, the final responsibility for fulfillment of the entire set of contract requirements remains with the CONTRACTOR.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of other requirements of the Specifications, all WORK specified herein shall conform to or exceed the requirements of applicable codes and the applicable requirements of the following documents:

1. References herein to "Building Code" or "Uniform Building Code" shall mean Uniform Building Code of the International Conference of Building Officials (ICBO).
2. Similarly, references to "Mechanical Code" or "Uniform Mechanical Code," "Plumbing Code" or "Uniform Plumbing Code," "Fire Code" or "Uniform Fire Code," shall mean Uniform Mechanical Code, Uniform Plumbing Code and Uniform Fire Code of the International Conference of the Building Officials (ICBO). "Electric Code" or "National Electric Code (NEC)" shall mean the National Electric Code of the National Fire Protection Association (NFPA). The latest edition of the codes as approved by the Municipal code and used by the local agency as of the date that the WORK is advertised for bids, as adopted by the agency having jurisdiction, shall apply to the WORK herein, including all Addenda, modifications, amendments, or other lawful changes thereto.
3. In case of conflict between codes, reference standards, Drawings and other Contract Documents, the most stringent requirements shall govern. All conflicts

shall be brought to the attention of the ENGINEER for clarification and directions prior to ordering or providing any materials or furnishing labor. The CONTRACTOR shall bid for the most stringent requirements.

B. The CONTRACTOR shall construct the WORK specified herein in accordance with the requirements of the Contract Documents and the referenced portions of those referenced codes, standards, and Specifications listed herein.

C. References herein to "OSHA Regulations for Construction" shall mean Title 29, Part 1926, Construction Safety and Health Regulations, Code of Federal Regulations (OSHA), including all changes and amendments thereto.

D. References herein to "OSHA Standards" shall mean Title 29, Part 1910, Occupational Safety and Health Standards, Code of Federal Regulations (OSHA), including all changes and amendments thereto.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01300 – CONTRACTOR SUBMITTALS

PART 1 – GENERAL

1.1 GENERAL

A. Wherever submittals are required hereunder, all such submittals shall be submitted to the ENGINEER by the CONTRACTOR.

B. Within 14 Days after the date of commencement as stated in the Notice To Proceed, the CONTRACTOR shall submit the following items to the ENGINEER for review:

1. A preliminary schedule of Shop Drawings, sample, and proposed substitutes or "or-equal" submittals.
2. A list of all permits and licenses the CONTRACTOR shall obtain indicating the agency required to grant the permit and the expected date of submittal for the permit and required date for receipt of the permit.
3. A complete progress schedule for all phases of the Project.
4. Material Safety Data Sheets on products used on the Project.
5. A traffic maintenance plan, as required.
6. A plan for temporary erosion control and pollution control, as required.
7. A letter designating the CONTRACTOR's Superintendent, defining that person's responsibility and authority.
8. A letter designating the CONTRACTOR's safety representative and the Equal Employment Opportunity (EEO) Officer and that person's responsibility and authority.
9. Individual Mining Plan shall be submitted and approved, by CBJ Engineering, prior to any materials extraction from the CBJ/State Lemon Creek Gravel Pit.

C. No payments shall be made to the CONTRACTOR until all of these items are submitted in their entirety, as determined by the ENGINEER.

1.2 SHOP DRAWING SUBMITTAL

A. Wherever called for in the Contract Documents, or where required by the ENGINEER, the CONTRACTOR shall furnish to the ENGINEER, for review, eight (8) copies of each Shop Drawing submittal. The term "Shop Drawings" as used herein shall be understood to include detail design calculations, Shop Drawings, fabrication drawings, installation drawings, erection drawings, lists, graphs, operating instructions, catalog sheets, data sheets, and similar items.

B. All Shop Drawing submittals shall be accompanied by the CONTRACTOR's standard submittal transmittal form. Any submittal not accompanied by such a form, or where all applicable items on the form are not completed, will be returned for re-submittal.

C. Normally, a separate transmittal form shall be used for each specific item or class of material or equipment for which a submittal is required. Transmittal of a submittal of various items using a single transmittal form will be permitted only when the items taken together constitute a manufacturer's "package" or are so functionally related that expediency indicates review of the group or package as a whole. A multiple-page submittal shall be collated into sets, and each set shall be stapled or bound, as appropriate, prior to transmittal to the ENGINEER.

D. Except as may otherwise be provided herein, the ENGINEER will return prints of each submittal to the CONTRACTOR with its comments noted thereon, within 30 calendar days following receipt of them by the ENGINEER. It is considered reasonable that the CONTRACTOR shall make a complete and acceptable submittal to the ENGINEER by the second submission of a submittal item. The OWNER reserves the right to withhold monies due to the CONTRACTOR to cover additional costs of the ENGINEER's review beyond the second submittal. The ENGINEER's maximum review period for each submittal including all re-submittals will be 30 days per submission. In other works, for a submittal that requires two re-submittals before it is complete, the maximum review period for that submittal could be 90 days.

E. If three (3) copies of a submittal are returned to the CONTRACTOR marked "NO EXCEPTIONS TAKEN," formal revision and resubmission of said submittal will not be required.

F. If three (3) copies of a submittal are returned to the CONTRACTOR marked "MAKE CORRECTIONS NOTED," formal revision and resubmission of said submittal is not required.

G. If one (1) copy of the submittal is returned to the CONTRACTOR marked "AMEND-RESUBMIT," the CONTRACTOR shall revise said submittal and shall resubmit the required number of copies of said revised submittal to the ENGINEER.

H. If one (1) copy of the submittal is returned to the CONTRACTOR marked "REJECTED-RESUBMIT," the CONTRACTOR shall revise said submittal and shall resubmit the required number of copies of said revised submittal to the ENGINEER.

I. Fabrication of an item may be commenced only after the ENGINEER has reviewed the pertinent submittal and returned copies to the CONTRACTOR marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED." Corrections indicated on submittals shall be considered as changes necessary to meet the requirements of the Contract Documents and shall not be taken as the basis for changes to the Contract requirements only a Change Order can alter the Contract Price, Contract Time, or Specifications.

J. All CONTRACTOR Shop Drawing submittals shall be carefully reviewed by an authorized representative of the CONTRACTOR, prior to submission to the ENGINEER. Each submittal shall be dated, signed, and certified by the CONTRACTOR, as being correct and in strict conformance with the Contract Documents. In the case of Shop Drawings, each sheet shall be dated, signed, and certified. No consideration for review by the ENGINEER of any CONTRACTOR submittal will be made for any items which have not been so certified by the CONTRACTOR. All non-certified submittals will be returned to the CONTRACTOR without action taken by the ENGINEER, and any delays caused by thereby shall be the total responsibility of the CONTRACTOR.

K. The ENGINEER's review of CONTRACTOR Shop Drawing submittals shall not relieve the CONTRACTOR of the entire responsibility for the correctness of details and dimensions. The CONTRACTOR shall assume all responsibility and risk for any misfits

due to any errors in CONTRACTOR submittals. The CONTRACTOR shall be responsible for the dimensions and the design of adequate connections and details.

1.3 SAMPLES SUBMITTAL

A. Whenever in the Specifications samples are required, the CONTRACTOR shall submit not less than three (3) samples of each item or material to the ENGINEER for acceptance at not additional cost to the OWNER.

B. Samples, as required herein, shall be submitted for acceptance a minimum of 21 days prior to ordering such material for delivery to the job site, and shall be submitted in an orderly sequence so that dependent materials or equipment can be assembled and reviewed without causing delays in the WORK.

C. All samples shall be individually and indelibly labeled or tagged indicating thereon all specified physical characteristics and supplier's names for identification and submitted to the ENGINEER for acceptance. Upon receiving acceptance of the ENGINEER, one (1) set of the samples will be stamped and dated by the ENGINEER and returned to the CONTRACTOR, and one (1) set of samples will be retained by the ENGINEER, and one (1) set of samples shall remain at the job site until completion of the WORK.

D. Unless clearly stated otherwise, it is assumed that all colors and textures of specified items presented in sample submittal are from the manufacturer's standard colors and standard materials, products, or equipment lines. If the samples represent non-standard colors, materials, products or equipment lines, and their selection will require an increase in Contract Time or Contract Price, the CONTRACTOR will clearly indicate this on the transmittal page of the submittal.

1.4 OPERATIONS AND MAINTENANCE MANUAL SUBMITTAL

A. The CONTRACTOR shall include in the Operations and Maintenance Manuals for each item of mechanical, electrical, and instrumentation equipment, the following:

1. Complete operating instructions, including location of controls, special tools or other equipment required, related instrumentation, and other equipment needed for operation.
2. Lubrication schedules, including the lubricant SAE grade and type, temperature range of lubricants, and including frequency of required lubrication.
3. Preventive maintenance procedures and schedules.
4. Parts lists, by generic title and identification number, complete, with exploded views of each assembly.
5. Disassembly and reassembly instructions.
6. Name and location of nearest supplier and spare parts warehouse.
7. Recommended troubleshooting and startup procedures.
8. Reproducible prints of the record Drawings, including diagrams and schematics, as required under the electrical and instrumentation portions of these Specifications.
9. Tabulation of proper settings for all pressure relief valves, (low/high) pressure switches and other related equipment protection devices.
10. Detailed test procedures to determine performance efficiency of equipment.

11. List of all electrical relay settings including alarm and contract settings.

B. The CONTRACTOR shall furnish to the ENGINEER five identical sets of technical manuals. Each set shall consist of one or more volumes, each of which shall be bound in a standard size, 3-ring, loose-leaf vinyl plastic hard cover binder suitable for bookshelf storage. Binder ring size shall not exceed 2.5 inches. A table of contents shall be provided which indicates all equipment in the technical manuals.

C. All technical manuals shall be submitted complete and in final form to the ENGINEER prior to the requests for final payment.

D. Incomplete or unacceptable Operations and Maintenance Manuals shall constitute sufficient justification to withhold payment for WORK completed.

1.5 SPARE PARTS LIST SUBMITTAL

A. The CONTRACTOR shall furnish to the ENGINEER five (5) identical sets of spare parts information for all mechanical, electrical, and instrumentation equipment. The spare parts list shall include the current list price of each spare part. The spare parts list shall be limited to those spare parts which each manufacturer recommends be maintained by the OWNER in the inventory at the plant site. Each manufacturer or supplier shall indicate the name, address, and telephone number of its nearest outlet of spare parts to facilitate the OWNER in ordering. The CONTRACTOR shall cross-reference all spare parts lists to the equipment numbers designated in the Contract Documents. The spare parts lists shall be bound in standard size, 3-ring, loose leaf, vinyl plastic hard cover binders suitable for bookshelf storage. Binder ring size shall not exceed 2.5 inches.

1.6 RECORD DRAWINGS SUBMITTALS

A. The CONTRACTOR shall keep and maintain, at the job site, one record set of Drawings. On these, it shall mark all project conditions, locations, configurations, and any other changes or deviations which may vary from the details represented on the original Contract Drawings, including buried or concealed construction and utility features which are revealed during the course of construction. Special attention shall be given to recording the horizontal and vertical location of all buried utilities that differ from the locations indicated, or which were not indicated on the Contract Drawings. Said record drawings shall be supplemented by any detailed sketches as necessary or directed to indicate, fully, the WORK as actually constructed. These master record Drawings, of the CONTRACTOR's representation of as-built conditions, including all revisions made necessary by Addenda, Change Orders, and the like shall be maintained up-to-date during the progress of the WORK.

B. In the case of those Drawings which depict the detail requirement for equipment to be assembled and wired in the factory, such as motor control centers and the like, the record drawings shall be updated by indicating those portions which are superseded by Change Order Drawings or final Shop Drawings, and by including appropriate reference information describing the Change Orders by number and the Shop Drawings by manufacturer, Drawing, and revision numbers.

C. Record drawings shall be accessible to the ENGINEER at all times during the construction period and shall be delivered to the ENGINEER on the 20th working day of every third month after the month in which the Notice to Proceed is given as well as upon completion of the WORK.

D. Final payment will not be acted upon until the CONTRACTOR-prepared Record Drawings have been delivered to the ENGINEER.

1.7 PROGRESS SCHEDULES

A. The progress schedule shall be in Bar Chart or Critical Path Method (CPM) form as required by the ENGINEER.

B. The progress schedule shall show the order in which the CONTRACTOR proposes to carry out the ~~WORK~~ WORK and the contemplated date on which the CONTRACTOR and their ~~Subcontractors~~ Subcontractors will start and finish each of the salient features of the ~~WORK~~WORK, including any scheduled periods of shutdown. The schedule shall also indicate any anticipated periods of multiple-shift WORK.

C. Upon substantial changes to the CONTRACTOR's progress schedule of work or upon request of the ENGINEER, the CONTRACT shall submit a revised progress schedule(s) in the form required. Such revised schedule(s) shall conform with the contract time and take into account delays which may have been encountered in the performance of the WORK. In submitting a revised schedule, the CONTRACTOR shall state specifically the reason for the revision and the adjustments made in his schedule or methods of operation to ensure the completion of all the WORK within the contract time.

1.8 PROPOSED SUBSTITUTES OR "OR-EQUAL" ITEM SUBMITTAL

A. Whenever materials or equipment are specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular supplier, the naming of the item is intended to establish the type, function, and equality required. If the name is followed by the words "or-equal" indicating that a substitution is permitted, materials or equipment of other suppliers may be accepted by the ENGINEER if sufficient information is submitted by the CONTRACTOR to allow the ENGINEER to determine that the material or equipment proposed is equivalent or equal to that named, subject to the following requirements:

1. The burden of proof as to the type, function, and quality of any such substitute material or equipment shall be upon the CONTRACTOR.
2. The ENGINEER will be the sole judge as to the type, function, and quality of any such substitute material or equipment and the ENGINEER's decision shall be final.
3. The ENGINEER may require the CONTRACTOR, to furnish at the CONTRACTOR's expense, additional data about the proposed substitute.
4. The OWNER may require the CONTRACTOR to furnish at the CONTRACTOR's expense a special performance guarantee or other surety with respect to any substitute.
5. Acceptance by the ENGINEER of a substitute item proposed by the CONTRACTOR shall not relieve the CONTRACTOR of the responsibility for

full compliance with the Contract Documents and for adequacy of the substitute item.

6. The CONTRACTOR shall be responsible for resultant changes and all additional costs which the accepted substitution requires in the CONTRACTOR's WORK, the WORK of its Subcontractors and of other contractors, and shall effect such changes without cost to the OWNER. This shall include the cost for redesign and claims of other Contractor affected by the resulting change.

B. The procedure for review by the ENGINEER will include the following:

1. If the CONTRACTOR proposes to furnish or use a substitute item of material or equipment, the CONTRACTOR shall make written application to the ~~ENGINEER~~ ENGINEER on the "Substitution Request Form" for acceptance thereof.
2. Unless otherwise provided by law or authorized in writing by the ENGINEER, the "Substitution Request Form(s)" shall be submitted within the 21-day period after Notice To Proceed.
3. Wherever a proposed substitute material or equipment has not been submitted within said 21-day period, or wherever the submission of a proposed substitute material or equipment has been judged to be unacceptable by the ENGINEER, the CONTRACTOR shall provide material or equipment named in the Contract Documents.
4. The CONTRACTOR shall certify that the proposed substitute will perform adequately the functions and achieve the results called for by the general design, be similar and of equal substance to that specified, and be suited to the same use as that specified.
5. The ENGINEER will be allowed a reasonable time within which to evaluate each proposed substitute. In no case will this reasonable time period be less than 30 days.
6. As applicable, no Shop Drawing submittals will be made for a substitute item nor will any substitute item be ordered, installed, or utilized without the ENGINEER's prior written acceptance of the CONTRACTOR's "Substitution Request Form" which will be evidenced by a Change Order.
7. The ENGINEER will record the time required by the ENGINEER in evaluating substitutions proposed by the CONTRACTOR and in making changes in the Contract Documents occasioned thereby. Whether or not the ENGINEER accepts a proposed substitute, the CONTRACTOR shall reimburse the OWNER for the charges of the ENGINEER for evaluating each proposed substitute.

C. The CONTRACTOR's application using the "Substitution Request ~~Form~~Form" shall contain the following statements and/or information which shall be considered by the ENGINEER in evaluating the proposed substitution:

1. The evaluation and acceptance of the proposed substitute will not prejudice the CONTRACTOR's achievement of Substantial Completion on time.
2. Whether or not acceptance of the substitute for use in the WORK will require a change in any of the Contract Documents to adopt the design to the proposed substitute.
3. Whether or not incorporation or use of the substitute in connection with the WORK is subject to payment of any license fee or royalty.

4. All variations of the proposed substitute for that specified will be identified.
5. Available maintenance, repair, and replacement service and its estimated cost will be indicated.
6. Itemized estimate of all costs that will result directly or indirectly from acceptance of such substitute, including cost of redesign and claims of other contractors affected by the resulting change.

1.9 MATERIAL CERTIFICATION SUBMITTAL

A. The ENGINEER may permit the use, prior to sampling, inspection and testing, of certain materials or assemblies when accompanied by manufacturer's material certifications stating that such materials or assemblies fully comply with the requirements of the Contract. The certification shall be signed by the manufacturer, and will specifically reference the material's compliance with the AASHTO, ASTM and/or CBJ Standards specified in the applicable Contract Documents.

B. Material certifications shall be submitted to the ENGINEER prior to incorporating the item into the WORK.

C. Materials or assemblies used on the basis of material certifications may be sampled, inspected and/or tested at any time, and if found not in conformity with these specifications, will be subject to rejection whether in place or not.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

(SUBSTITUTION REQUEST FORM - next page)

CBJ Engineering Department
SUBSTITUTION REQUEST FORM

TO: _____ Project: _____

Contract No.: _____

OWNER: _____

SPECIFIED ITEM:

_____	_____	_____	_____
Section	Page	Paragraph	Description

The undersigned requests consideration of the following:

PROPOSED SUBSTITUTION: _____
Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of the request. Applicable portions of the data are clearly identified.

The undersigned states that the following paragraphs, unless modified on attachments are correct:

1. The proposed substitution does not affect dimensions shown on Drawings and will not require a change in any of the Contract Documents.

2. The undersigned will pay for changes to the design, including engineering design, detailing, and construction costs caused by the requested substitution which is estimated to be $_____.

3. The proposed substitution will have no adverse affect on other contractors, the construction schedule (specifically the date of substantial completion), or specified warranty requirements.

4. Maintenance and service parts will be locally available for the proposed substitution.

5. The incorporation or use of the substitute in connection with the WORK is not subject to payment of any license fee or royalty.

The undersigned further states that the function, appearance, and quality of the Proposed Substitution are equivalent or superior to the Specified item.

Submitted by CONTRACTOR: _____
Signature _____
Firm: _____
By: _____
Title: _____
Date: _____
Attachments: _____

Reviewed by ENGINEER _____
☐ Accepted ☐ Accepted as Noted
☐ Not Accepted ☐ Received Too Late
Date: _____
Telephone: _____

END OF SECTION

SECTION 01400 - QUALITY CONTROL

PART 1 - GENERAL

1.1 DEFINITION

A. Specific quality control requirements for the WORK are indicated throughout the Contract Documents. The requirements of this section are primarily related to performance of the WORK beyond furnishing of manufactured products. The term "Quality Control" includes inspection, sampling and testing, and associated requirements.

1.2 INSPECTION AT PLACE OF MANUFACTURE

A. Unless otherwise indicated, all products, materials, and equipment shall be subject to inspection by the ENGINEER at the place of manufacture.

B. The presence of the ENGINEER at the place of manufacturer, however, shall not relieve the CONTRACTOR of the responsibility for furnishing products, materials, and equipment which comply with all requirements of the Contract Documents. Compliance is the duty of the CONTRACTOR, and said duty shall not be avoided by any act or omission on the part of the ENGINEER.

1.3 SAMPLING AND TESTING

A. Unless otherwise indicated, all sampling and testing shall be in accordance with the methods prescribed in the current standards of the ASTM, ATM, and AASHTO as applicable to the class and nature of the article or material considered; however, the OWNER reserves the right to use any generally-accepted system of sampling and testing which, in the opinion of the ~~ENGINEER~~ ENGINEER will insure the OWNER that the quality of the WORK is in full accord with the Contract Documents.

B. Any waiver by the OWNER of any specific testing or other quality assurance measures, whether or not such waiver is accompanied by a guarantee of substantial performance as a relief from the specified testing or other quality assurance requirements as originally specified, and whether or not such guarantee is accompanied by a performance bond to assure execution of any necessary corrective or remedial WORK, shall not be construed as a waiver of any requirements of the Contract Documents.

C. Notwithstanding the existence of such waiver, the ENGINEER reserves the right to make independent investigations and tests, and failure of any portion of the WORK to meet any of the requirements of the Contract Documents, shall be reasonable cause for the ENGINEER to require the removal or correction and reconstruction of any such WORK in accordance with the General Conditions.

1.4 INSPECTION AND TESTING LABORATORY SERVICE

A. Inspection and testing laboratory service shall comply with the following:

1. OWNER will appoint, employ, and pay for services of an independent firm to perform inspection and testing or will perform inspection and testing itself.

2. The ENGINEER will perform inspections as specified in individual Specification sections.
3. Reports will be submitted by the independent firm to the ENGINEER in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.
4. The CONTRACTOR shall cooperate with the ENGINEER or independent firm and furnish samples of materials, design mix, equipment, tools, storage and assistance as requested.
5. The CONTRACTOR shall notify ENGINEER 24 hours prior to the expected time for operations requiring inspection and laboratory testing services.
6. Retesting required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by the ENGINEER. The CONTRACTOR shall bear all costs from such retesting at no additional cost to the OWNER.
7. For samples and tests required for CONTRACTOR's use, the CONTRACTOR shall make arrangements with an independent firm for payment and scheduling of testing. The cost of sampling and testing for the CONTRACTOR's use shall be included in the Contract Price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 INSTALLATION

A. Inspection. The CONTRACTOR shall inspect materials or equipment upon the arrival on the job site and immediately prior to installation, and reject damaged and defective items.

B. Measurements. The CONTRACTOR shall verify measurements and dimensions of the WORK, as an integral step of starting each installation.

C. Manufacturer's Instructions. Where installations include manufactured products, the CONTRACTOR shall comply with manufacturer's applicable instructions and recommendations for installation, to whatever extent these are more explicit or more stringent than applicable requirements indicated in the Contract Documents.

END OF SECTION

SECTION 01505 - MOBILIZATION

PART 1 - GENERAL

1.1 GENERAL

A. Mobilization shall include obtaining all permits; moving all plant and equipment onto the site; furnishing and erecting plants, temporary buildings, and other construction facilities; implementing security requirements, all as required for the proper performance and completion of the WORK. Mobilization shall include the following principal items:

1. Moving all the CONTRACTOR's plant and equipment required for operations onto the site.
2. Providing all on-site communication facilities, including radios and cellular phones.
3. Providing on-site sanitary facilities.
4. Obtaining all required permits.
5. Having all OSHA-required notices and establishment of safety programs.
6. Having the CONTRACTOR's superintendent at the jobsite full time.
7. Submitting initial submittals.
8. Installation of CBJ Project sign in accordance with CBJ Standard Detail 127A - Project Sign Display. Sign board and sign graphics will be provided by the OWNER. All other materials and installation shall be provided by the CONTRACTOR.

1.2 PAYMENT FOR MOBILIZATION

A. The CONTRACTOR's attention is directed to the condition that no payment for Mobilization, or any part thereof, will be approved for payment under the Contract Documents until all Mobilization items listed above have been completed as specified.

B. As soon as practicable, after receipt of Notice to Proceed, the CONTRACTOR shall submit a breakdown showing the estimated value of each major component of Mobilization to the ENGINEER for approval. When approved by the ENGINEER, the breakdown will be the basis for initial progress payments in which Mobilization is included.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01530 - PROTECTION AND RESTORATION OF EXISTING FACILITIES

PART 1 - GENERAL

1.1 GENERAL

A. The CONTRACTOR shall protect all existing utilities and improvements not designated for removal and shall restore damaged or temporarily relocated utilities and improvements to a condition equal to or better than they were prior to such damage or temporary relocation, all in accordance with the requirements of the Contract Documents.

B. All utility locates shall be the responsibility of the CONTRACTOR. Call DIAL BEFORE YOU DIG at 586-1333 for locates of all underground utilities within the WORK limits prior to any work.

C. The CONTRACTOR shall verify the exact locations and depths of all utilities and the CONTRACTOR shall make exploratory excavations of all utilities that may interfere with the WORK. All such exploratory excavations shall be performed as soon as practicable after award of the contract and, in any event, a sufficient time in advance of construction to avoid possible delays to the CONTRACTOR's WORK. Any utility or service in conflict with the WORK will be reburied by the CONTRACTOR prior beginning the WORK to avoid damage.

D. The number of exploratory excavations required shall be that number which is sufficient to determine the alignment and grade of the utility.

E. The ENGINEER shall be notified of the CONTRACTOR’s field-locate schedule.

1.2 RIGHTS-OF-WAY

A. The CONTRACTOR shall not do any WORK that would affect any oil, gas, sewer, or water pipeline; any telephone, cable television, telegraph, or electric transmission line; any fence; or any other structure, nor shall the CONTRACTOR enter upon the rights-of-way involved until notified by the ENGINEER that the OWNER has secured authority therefor from the proper party. After authority has been obtained, the CONTRACTOR, shall give said party due notice of its intention to begin WORK, if required by said party, and shall remove, shore, support to otherwise protect such pipeline, transmission line, ditch, fence, or structure or replace the same. When two (2) or more contracts are being executed at one time on the same or adjacent land in such manner that work on one contract may interfere with that on another, the OWNER shall determine the sequence and order of the WORK. When the territory of one contract is the necessary or convenient means of access for the execution of another contract, such privilege of access or any other reasonable privilege may be granted by the OWNER to the CONTRACTOR so desiring, to the extent, amount, in the manner, and at the times permitted.

B. No such decision as to the method or time of conducting the WORK or the use of territory shall be made the basis of any claim for delay or damage, except as provided for temporary suspension of the WORK in Article 15 of the General Conditions of the Contract Documents.

1.3 PROTECTION OF SURVEY MONUMENTS, STREET AND/OR ROADWAY MARKERS

A. The CONTRACTOR shall not destroy, remove, or otherwise disturb any existing survey monuments or other existing street or roadway markers without proper authorization. No pavement breaking or excavation shall be started until all survey or other permanent marker points that will be disturbed by the construction operations have been properly referenced. All survey monuments, markers or points disturbed by the CONTRACTOR shall be accurately re-established, at the CONTRACTOR's expense unless provided for elsewhere in the Contract Documents, after all street or roadway resurfacing has been completed. Re-establishment of all survey monuments shall be by a Registered Alaskan Land Surveyor.

1.4 RESTORATION OF PAVEMENT

A. General. All paved areas, including asphalt concrete berms, cut or damaged during construction shall be replaced with similar materials and of equal thickness to match the existing adjacent undisturbed areas, except where specific resurfacing requirements have been called for in the Contract Documents or in the requirements of the agency issuing the permit. All temporary and permanent pavement shall conform to the requirements of the affected pavement owner. All pavement which are subject to partial removal shall be neatly saw cut in straight lines.

B. Temporary Resurfacing. Wherever required by the public authorities having jurisdiction, the CONTRACTOR shall place temporary surfacing promptly after backfilling and shall maintain such surfacing for the period of time fixed by said authorities before proceeding with the final restoration of improvements.

C. Permanent Resurfacing. In order to obtain a satisfactory junction with adjacent surfaces, the CONTRACTOR shall saw cut and trim the edge so as to provide a clean, sound, vertical joint before permanent replacement of an excavated or damaged portion of pavement. Damaged edges of pavement along excavations and elsewhere shall be trimmed back by saw cutting in straight lines. All pavement restoration and other facilities restoration shall be constructed to finish grades compatible with adjacent undisturbed pavement.

D. Restoration of Sidewalks or Private Driveways. Wherever sidewalks or private roads have been removed for purposes of construction, the CONTRACTOR shall place suitable temporary sidewalks or roadways promptly after backfilling and shall maintain them in satisfactory condition for the period of time fixed by the authorities having jurisdiction over the affected portions before proceeding with the final restoration or, if no such period of times is so fixed, the CONTRACTOR shall maintain said temporary sidewalks or roadways until the final restoration thereof has been made.

1.5 EXISTING UTILITIES AND IMPROVEMENTS

A. General. The CONTRACTOR shall protect all underground utilities and other improvements which may be impaired during construction operations. It shall be the CONTRACTOR's responsibility to ascertain the actual location of all existing utilities and other improvements that will be encountered in its construction operations, and to see

that such utilities or other improvements are adequately protected from damage due to such operations. The CONTRACTOR shall take all possible precautions for the protection of unforeseen utility lines to provide for interrupted service and to provide such special protection as may be necessary.

B. Utilities to be Moved. In case it shall be necessary to move the property of any public utility or franchise holder, such utility company or franchise holder will, upon request of the CONTRACTOR, be notified by the OWNER to move such property within a specified reasonable time. When utility lines that are to be removed are encountered within the area of operations, the CONTRACTOR shall notify the ENGINEER a sufficient time in advance for the necessary measures to be taken to prevent interruption of service.

C. Where the proper completion of the WORK requires the temporary or permanent removal and/or relocation of an existing utility or other improvement which is indicated, the CONTRACTOR shall remove and, without unnecessary delay, temporarily replace or relocate such utility or improvement in a manner satisfactory to the ENGINEER and the owner of the facility. In all cases of such temporary removal or relocation, restoration to former location shall be accomplished by the CONTRACTOR in a manner that will restore or replace the utility or improvement as nearly as possible to its former locations and to as good or better condition than found prior to removal.

D. OWNER's Right of Access. The right is reserved to the OWNER and to the owners of public utilities and franchises to enter at any time upon any public street, alley, right-of-way, or easement for the purpose of making changes in their property made necessary by the WORK of this contract.

E. Underground Utilities Indicated. Existing utility lines that are indicated or the locations of which are made known to the CONTRACTOR prior to excavation and that are to be retained, and all utility lines that are constructed during excavation operations shall be protected from damage during excavation and backfilling and, if damaged, shall be immediately repaired or replaced by the CONTRACTOR.

F. Underground Utilities Not Indicated. In the event that the CONTRACTOR damages any existing utility lines that are not indicated or the locations of which are not made know to the CONTRACTOR prior to excavation, a written report thereof shall be made immediately to the ENGINEER. If directed by the ENGINEER, repairs shall be made by the CONTRACTOR under the provisions for changes and extra WORK contained in Articles 10, 11, and 12 of the General Conditions.

G. All costs of locating, repairing damage not due to failure of the CONTRACTOR to exercise reasonable care, and removing or relocating such utility facilities not shown in the Contract Documents with reasonable accuracy, and for equipment on the Project which was actually working on the portion of the WORK which was interrupted or idled by removal or relocation of such utility facilities, and which was necessarily idled during such WORK will be paid for as extra WORK in accordance with the provisions of Articles 10, 11, and 12 of the General Conditions.

H. Approval of Repairs. All repairs to a damaged utility or improvement are subject to inspection and approval by an authorized representative of the utility or improvement owner before being concealed by backfill or other WORK.

I. Maintaining in Service. All oil and gasoline pipelines, power, and telephone, cable television or the communication cable ducts, gas and water mains, irrigation lines, sewer lines, storm drain lines, poles, and overhead power and communication wires and cables encountered along the line of the WORK shall remain continuously in service during all the operations under the contract, unless other arrangement satisfactory to the ENGINEER are made with the owner of said pipelines, duct, main, irrigation line, sewer, storm drain, pole, or wire or cable. The CONTRACTOR shall be responsible for and shall repair all damage due to it operations, and the provisions of this section shall not be abated even in the event such damage occurs after backfilling or is not discovered until after completion of the backfilling.

1.6 TREES WITHIN STREET RIGHTS-OF-WAY AND PROJECT LIMITS

A. General. The CONTRACTOR shall exercise all necessary precautions so as not to damage or destroy any trees or shrubs, including those lying within street rights-of-way and Project limits, and shall not trim or remove any trees unless such trees have been approved for trimming or removal by the jurisdictional agency or OWNER. All existing trees and shrubs which are damaged during construction shall be trimmed or replaced by the CONTRACTOR or a licensed landscaping company under permit from the jurisdictional agency and/or the OWNER. Tree trimming and replacement shall be accomplished in accordance with the following paragraphs:

1. Trimming. Symmetry of the tree shall be preserved; no stubs or splits or torn branches left; clean cuts shall be made close to the trunk or large branch. Spikes shall not be used for climbing live trees. All cuts over 1-1/2 inches in diameter shall be coated with an asphaltic emulsion material.
2. Replacement. The CONTRACTOR shall immediately notify the jurisdictional agency and/or the OWNER if any tree is damaged by the CONTRACTOR's operations. If, in the opinion of said agency or the OWNER, the damage is such that replacement is necessary, the CONTRACTOR shall replace the tree at its own expense. The tree shall be of a like size and variety at the tree damaged, or, the CONTRACTOR shall pay to the owner of said tree a compensatory payment acceptable to the tree owner, subject to the approval of the jurisdictional agency or OWNER.

1.7 PROTECTION OF EXISTING STRUCTURES

A. Compaction Equipment and Operations. The CONTRACTOR shall restrict compaction operations as necessary to assure no damage occurs to adjacent building. This may require the use of smaller compaction equipment than is usually employed for trench backfill and roadway embankment compaction operations when in the vicinity of buildings sensitive to vibrating or other impact-type activities. It shall be the CONTRACTOR's responsibility to determine in which areas of the Project the compaction operations must be restricted, to avoid damage to existing buildings. The foregoing restrictions on the size of, and magnitude of impact energy exerted by,

compaction equipment will in no way relieve the CONTRACTOR from the compaction requirements as specified in other sections of the Contract Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01550 - SITE ACCESS AND STORAGE

PART 1 – GENERAL

1.1 HIGHWAY LIMITATIONS

A. The CONTRACTOR shall make its own investigation of the condition of available public and private roads and of clearances, restrictions, bridge load limits, and other limitations affecting transportation and ingress and egress to the site of the WORK. It shall be the CONTRACTOR's responsibility to construct and maintain any haul roads required for its construction operations.

1.2 TEMPORARY CROSSINGS

A. General. Continuous, unobstructed, safe, and adequate pedestrian and vehicular access shall be provided to fire hydrants, commercial and industrial establishments, private residences, churches, schools, parking lots, service stations, motels, fire and police stations, and hospitals. Safe and adequate public transportation stops and pedestrian crossings at intervals not exceeding 200 feet shall be provided. The CONTRACTOR shall cooperate with parties involved in the delivery of mail and removal of trash and garbage so as to maintain existing schedules for such services. Vehicular access to residential driveways shall be maintained to the property line except when necessary construction precludes such access for reasonable periods of time, as approved by the ENGINEER.

B. Temporary Bridges. Wherever necessary, the CONTRACTOR shall provide suitable temporary bridges or steel plates over unfilled excavations, except in such cases as the CONTRACTOR shall secure the written consent of the individuals or authorities concerned to omit such temporary bridges or steel plates, which written consent shall be delivered to the ENGINEER prior to excavation. All such bridges or steel plates shall be maintained in service until access is provided across the backfilled excavation. Temporary bridges or steel plates for street and highway crossing shall conform to the requirements of the authority having jurisdiction in each case, and the CONTRACTOR shall adopt designs furnished by said authority for such bridges or steel plates, or shall submit designs to said authority for approval, as may be required.

1.3 MAINTENANCE OF TRAFFIC

A. General. Unless otherwise provided, the roadway undergoing improvements shall be kept open to all traffic by the CONTRACTOR. Nothing herein shall be construed to entitle the CONTRACTOR to the exclusive use of any public street, alleyway, or parking area during the performance of the WORK hereunder. The CONTRACTOR shall so conduct its operations as not to interfere unnecessarily with the authorized work of utility companies or other agencies in such streets, alleyways, or parking areas. The CONTRACTOR shall provide unimpeded access through the Project limits for emergency vehicles and make every effort to provide minimum delay to United States Postal Service vehicles and garbage collection vehicles.

B. The CONTRACTOR shall submit three (3) copies of a traffic control plan (TCP) to the ENGINEER for approval a minimum of two (2) weeks prior to construction. The ENGINEER reserves the right to observe these traffic control plans in use and to make

any changes as field conditions warrant. Any changes shall supersede these TCPs and be done solely at the CONTRACTOR's expense.

C. No street shall be closed to the public without first obtaining permission of the ENGINEER and proper governmental authority. Where so provided on the Drawings or otherwise approved by the ENGINEER, the CONTRACTOR may by-pass traffic over a detour route. When no longer required, the detour shall be removed and the approach obliterated.

D. Where excavation is being performed in primary streets or highways, one lane in each direction shall be kept open to traffic at all times unless otherwise indicated. Toe boards shall be provided to retain excavated material if required by the ENGINEER or the agency having jurisdiction over the street or highway. Fire hydrants on or adjacent to the WORK shall be kept accessible to fire-fighting equipment at all times. Temporary provisions shall be made by the CONTRACTOR to assure the use of sidewalks and the proper functioning of all gutters, storm drain inlets, and other drainage facilities.

E. The CONTRACTOR's equipment shall stop at all points of intersection with the traveling public unless satisfactory traffic control measures, approved in writing by the ENGINEER, are installed and maintained at the CONTRACTOR's expense.

F. When the CONTRACTOR is required to maintain traffic through grading, roadway excavation and embankment areas, the construction shall be conducted in such a manner as to provide a reasonably smooth and even surface satisfactory for use by public traffic at all times. The surface of the roadbed shall be properly crowned for drainage. In advance of other grading operations, sufficient fill shall be placed at culverts and bridges to permit traffic to cross unimpeded. Part width construction techniques shall be employed when the traffic is routed through roadway cuts or over embankments under construction. The material shall be excavated or placed in layers and the construction activities shall be alternated from one side to the other, with traffic routed over the side opposite the one under construction.

G. During the removal and laying of culvert pipe, a maximum time of one (1) hour of road closure may be permitted with the ENGINEER’s written approval, providing the removal and laying of the culvert pipe cannot be completed for one-half width of the roadway and provided that a detour cannot be constructed around the culvert being laid. Closure shall be scheduled so as not to delay buses and peak hour traffic. The CONTRACTOR shall post, at the site of the closure within view of the waiting public traffic, the time the closure started and the time the road will again be open to traffic. The CONTRACTOR shall notify the Fire and Police Departments of such closures prior to commencement of WORK.

H. At intervals of 48 hours and 24 hours prior to start up of construction operations, and at weekly intervals during the construction period, the CONTRACTOR shall advertise in the Juneau Empire and have broadcast on all local radio stations the precise location, time of commencement, and proposed completion date of the WORK scheduled for the following week which will require detouring or otherwise effect public traffic. Detours shall be described in sufficient detail to efficiently inform the traveling public of the modified traffic pattern. The cost of these advertisements shall be considered incidental

to other contract bid items. The CONTRACTOR will notify the property owners 24 hours prior to commencement of WORK.

I. When, in the opinion of the ENGINEER, conditions are such that the safety and/or convenience of the traveling public is adversely affected, the CONTRACTOR will be immediately notified in writing. The notice will state the defect(s) and the corrective action(s) required. In the event that the CONTRACTOR neglects to take immediate corrective action, the ENGINEER may suspend all WORK on the Project until satisfactory corrective action is performed. In the event the CONTRACTOR does not take corrective action within 24 hours, the ENGINEER may order such WORK as deemed necessary for public convenience and safety accomplished by outside forces. The cost of this WORK shall be deducted from any monies due or that may become due under the terms of the contract.

J. The CONTRACTOR shall bear all expense of maintaining the traffic over the section of road undergoing improvement, including dust control and snow plowing, and of constructing and maintaining such approaches, crossings, intersections, and other features as may be necessary, without direct compensation, except as provided below:

1. Special Detours. When the proposal contains a bid item for detours, the payment for such item shall cover all cost of constructing and maintaining such detour or detours, including the construction of any and all temporary bridges and accessory features and the removal of the same, and obliteration of the detour road. Right-of-way for temporary highways or bridges will be furnished by the OWNER.
2. Maintenance of Traffic During Suspension of WORK. The CONTRACTOR shall make passable and shall open to traffic such portions of the Project and temporary roadways as may be agreed upon between the CONTRACTOR and the ENGINEER for the temporary accommodation of necessary traffic during the anticipated period of suspension. If the suspension is seasonal (winter shutdown), thereafter, and until an issuance of an order for the resumption of construction operations, the maintenance of the temporary route of line of travel agreed upon will be the responsibility of the OWNER. Prior to the OWNER accepting the Project for winter shutdown, the CONTRACTOR shall do all WORK necessary to provide a roadway surface and subgrade that will not require the OWNER to perform additional maintenance WORK during the shutdown period, except for purpose of snow removal. If the WORK is suspended due to unfavorable weather, failure of the CONTRACTOR to correct conditions unsafe for the workers or the general public, failure to carry out provisions of the contract, or for failure to carry our orders of the ENGINEER, all costs for maintenance of traffic during the suspended period shall be borne by the CONTRACTOR. When WORK is resumed, the CONTRACTOR shall replace or renew any WORK or materials lost or damaged because of temporary use of the Project; shall remove, to the extent directed by the ENGINEER, any WORK or materials used in the temporary maintenance; and shall complete the Project as though its prosecution had been continuous and without interference.

K. Traffic Control. All locations requiring redirection or stopping of the traveling public shall be properly signed and/or flagged by the CONTRACTOR. For the protection of traffic in public or private streets and ways, the CONTRACTOR shall provide, flaggers

and provide, place, and maintain all necessary barricades, traffic cones, warning signs, lights, and other safety devices in accordance with the requirements of the "Manual of Uniform Traffic Control Devices, (MUTCD) published by U.S. Department of Transportation, Federal Highway Administration (ANSI D6.1) with the current State of Alaska supplement.

L. The CONTRACTOR shall take all necessary precautions for the protection of the WORK and the safety of the public. All barricades and obstructions shall be illuminated at night, and all lights shall be kept burning from sunset until sunrise. The CONTRACTOR shall station such guards or flaggers and shall conform to such special safety regulations relating to traffic control as may be required by the public authorities within their respective jurisdictions. All signs, signals, and barricades shall conform to the requirements of Subpart G, Part 1926, of the OSHA Safety and Health Standards for Construction.

M. Special pedestrian detours are often necessary in areas adjacent to new construction or demolition of existing structures. The ENGINEER shall determine when walkways are required. Plans for walkways must be approved by the ENGINEER.

N. The CONTRACTOR shall remove traffic control devices when no longer needed, repair all damage caused by installation of the devices, and shall remove post settings and backfill the resulting holes to match grade.

O. Temporary Street Closure. If closure of any street is required during construction, the CONTRACTOR shall apply in writing to the City Engineer and any other jurisdictional agency at least 30 days in advance of the required closure and again at 48 hours. A Detour and Traffic Control Plan shall accompany the application.

P. The CONTRACTOR shall notify the Police and Fire Departments and any other affected agency of all planned street closures. Notification shall consist of giving the time of commencement and proposed date of completion of WORK and names of streets, schedule of operations, and routes of detours. Such notification shall be given at least 48 hours before such closure is to take effect.

Q. Temporary Driveway Closure. The CONTRACTOR shall maintain access to all residential, commercial and street approaches. Any temporary closures shall require prior approval by the ENGINEER. The CONTRACTOR shall notify the owner or occupant (if not owner-occupied) of the closure of the driveways to be closed more than one (1) eight-hour work day at least three (3) working days prior to the closure. The CONTRACTOR shall minimize the inconvenience and minimize of the time period that the driveways will be closed. The CONTRACTOR shall fully explain to the owner/occupant how long the WORK will take and when closure is to start.

R. On-Site Cellular Phones. The CONTRACTOR shall maintain one (1) active cellular phone at the Project site at all times with the phone number provided to the CBJ Fire, Police and Engineering Departments. The cellular phone shall be carried by the person in charge of the field operations.

S. Street Closure Requirements. The following street closure allowances and limitations shall apply to this contract, and shall take precedence over any conflicting public access requirements and limitations given elsewhere in the Contract Documents.

1. The CONTRACTOR will not be permitted to obstruct vehicular traffic between the hours of 4:30pm and 8:00am, seven (7) days per week.
2. Emergency vehicle, pedestrian, garbage, and mail delivery access is required at all times. The CONTRACTOR shall contact Arrow Refuse, Inc. regarding any work affecting scheduled garbage pickup.
3. Street closure to vehicular traffic will not be permitted until all Project site residents or other users of Project site parking lots affected by the closure have been notified. This notification shall be given at least eight (8) hours prior to the closure.
4. At the time of each road closure, the CONTRACTOR shall contact the Fire and Police Departments and inform them of the planned period of closure. Further contact shall be made when the planned closure period is changed.

T. All CONTRACTOR WORK at Juneau International Airport must conform to the FAA approved “Safety and Operations” plan.

1.4 CONTRACTOR'S WORK AND STORAGE AREA

A. The CONTRACTOR shall make its own arrangements for any necessary off-site storage or shop areas necessary for the proper execution of the WORK.

B. Should the CONTRACTOR find it necessary to use any additional land for its camp or for other purposes during the construction of the WORK, it shall provide for the use of such lands at its own expense.

C. The CONTRACTOR shall construct and use a separate storage area for hazardous materials used in constructing the WORK.

1. For the purpose of this paragraph, hazardous materials to be stored in the separate area are all products labeled with any of the following terms: Warning, **Caution, Poisonous, Toxic, Flammable, Corrosive, Reactive, or Explosive**. In addition, whether or not so labeled, the following materials shall be stored in the separate area: diesel fuel, gasoline, new and used motor oil, hydraulic fluid, cement, paints, and paint thinners, two-part epoxy coatings, sealants, asphaltic products, glues, solvents, wood preservatives, sand blast materials, and spill absorbent.
2. The CONTRACTOR shall develop and submit to the ENGINEER a plan for storing and disposing of the materials above.
3. The separate storage area shall meet all the requirements of all authorities having jurisdiction over the storage of hazardous materials.
4. The separate storage area shall be inspected by the ENGINEER prior to construction of the area, upon completion of construction of the area, and upon clean-up and removal of the area.
5. All hazardous materials which are delivered in containers shall be stored in the original containers until use. Hazardous materials which are delivered in bulk shall be stored in containers which meet the requirements of authorities having jurisdiction.

1.5 PARKING

A. The CONTRACTOR shall direct its employees to park in areas as directed by the ENGINEER.

B. Traffic and parking areas shall be maintained in a sound condition, free of excavated material, construction equipment, mud, and construction materials. The CONTRACTOR shall repair breaks, potholes, low areas which collect standing water, and other deficiencies.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01560 - TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 - GENERAL

1.1 DUST ABATEMENT

A. The CONTRACTOR shall furnish all labor, equipment, and means required and shall carry out effective measures wherever and as often as necessary to prevent its operation from producing dust in amounts damaging to property, cultivated vegetation, or domestic animals, or causing a nuisance to persons living in or occupying buildings in the vicinity. The CONTRACTOR shall be responsible for any damage resulting from any dust originating from its operations. The dust abatement measures shall be continued until dust is no longer produced and the CONTRACTOR is relieved of further responsibility by the ENGINEER.

1.2 RUBBISH CONTROL

A. During the progress of the WORK, the CONTRACTOR shall keep the site of the WORK and other areas used by it in a neat and clean condition, and free from any accumulation of rubbish. The CONTRACTOR shall dispose of all rubbish and waste materials of any nature occurring at the WORK site, and shall establish regular intervals of collection and disposal of such materials and waste. The CONTRACTOR shall also keep its haul roads free from dirt, rubbish, and unnecessary obstructions resulting from its operations. Disposal of all rubbish and surplus materials shall be off the site of construction in accordance with local codes and ordinances governing locations and methods of disposal, and in conformance with all applicable safety laws, and to the particular requirements of Part 1926 of the OSHA Safety and Health Standards for Construction.

1.3 SANITATION

A. Toilet Facilities: Fixed or portable chemical toilets shall be provided wherever needed for the use of employees. Toilets at construction job sites shall conform to the requirements of Part 1926 of the OSHA Standards for Construction.

B. Sanitary and Other Organic Wastes: The CONTRACTOR shall establish a regular daily collection of sanitary and organic wastes. All wastes and refuse from sanitary facilities provided by the CONTRACTOR or organic material wastes from any other source related to the CONTRACTOR's operations shall be disposed of away from the site in a manner satisfactory to the ENGINEER and in accordance with all laws and regulations pertaining thereto.

1.4 CHEMICALS

A. All chemicals used during Project construction or furnished for Project operation, whether defoliant, soil sterilant, herbicide, pesticide, disinfectant, polymer, reactant or of other classification, shall show approval of either the U.S. Environmental Protection Agency or the U.S. Department of Agriculture. Use of all such chemicals and disposal of residues shall be in strict accordance with the printed instructions of the manufacturer. In addition, see the requirements set forth in paragraph 6.11 of the General Conditions.

1.5 CULTURAL RESOURCES

A. The CONTRACTOR's attention is directed to the National Historic Preservation Act of 1966 (16 U.S.C. 470) and 36 CFR 800 which provides for the preservation of potential historical architectural, archaeological, or cultural resources (hereinafter called "cultural resources").

B. The CONTRACTOR shall conform to the applicable requirements of the National Historic Preservation Act of 1966 as it relates to the preservation of cultural resources.

C. In the event potential cultural resources are discovered during subsurface excavations at the site of construction, stop WORK immediately and notify the ENGINEER.

1.6 EAGLE NESTING TREES

A. Eagle nesting trees are known to exist in the Juneau area although none are known to exist in the immediate vicinity of the Project site. The CONTRACTOR has the responsibility for adherence to the Bald Eagle Protection Act (16 U.S.C. 668-668d) which prohibits molesting or disturbing bald eagles, their nests, eggs, or young.

B. Guidelines for compliance to the Bald Eagle Protection Act are supervised by the U.S. Department of the Interior, Fish and Wildlife Service, Raptor Management Studies, 3000 Vintage Blvd, Suite 201, Juneau, Alaska 99801, phone (907) 586-7333 or (907) 586-7243. The contact person is Mike Jacobson, Eagle Management Specialist. The CONTRACTOR shall contact the Eagle Management Specialist for guidelines of the Bald Eagle Protection Act.

PART 2 - PRODUCTS (Not Used)

PART 3- EXECUTION (Not Used)

END OF SECTION

SECTION 01660 - EQUIPMENT TESTING AND PLANT START-UP

PART 1 - GENERAL

1.1 GENERAL

A. Equipment testing and plant start-up is requisite to satisfactory completion of the contract and, therefore, shall be completed within the Contract Time.

1.2 EQUIPMENT TESTING

A. The CONTRACTOR shall provide the services of an experienced and authorized representative of the manufacturer of each item of equipment indicated in the equipment schedules (excluding manually-operated valves smaller than 24 inches in size, injectors, tanks, batch-type disc meters, and rotameters, and any other minor items of equipment specifically exempted by the ENGINEER in writing), who shall visit the site of the WORK and inspect, check, adjust if necessary, and approve the equipment installation. In each case, the CONTRACTOR shall arrange to have the manufacturer's representative revisit the job site as often as necessary until any and all trouble is corrected and the equipment installation and operation are satisfactory to the ENGINEER.

B. The CONTRACTOR shall require that each manufacturer's representative furnish to the ENGINEER a written report addressed to the OWNER certifying that the equipment has been properly installed and lubricated, is in accurate alignment, is free from any undue stress imposed by connecting piping or anchor bolts, and has been operated satisfactorily under full-load conditions.

C. The CONTRACTOR shall be responsible for scheduling all operations testing. The CONTRACTOR is advised that the ENGINEER and the OWNER's operating personnel will witness operations testing and that the manufacturer's representative shall be required to instruct the OWNER's operating personnel in correct operation and maintenance procedures. Such instruction shall be scheduled at a time arranged with the OWNER at least two weeks in advance and shall be provided while the respective manufacturer's equipment is fully operational. On-site instruction shall be given by qualified persons who have been made familiar in advance with the equipment and systems in the plant. Prior to scheduling any operations testing, the CONTRACTOR shall have previously furnished the OWNER's Manuals required under Section 01300 - Contractor Submittals.

D. The CONTRACTOR shall notify the ENGINEER at least three (3) days in advance of each equipment test.

E. The CONTRACTOR shall furnish all personnel, power, water, chemicals, fuel, oil, grease, and all other necessary equipment, facilities, and services required for conducting the tests.

1.3 PLANT START-UP

A. The start-up of a treatment plant is a highly complex operation requiring the combined technical expertise of the CONTRACTOR, manufacturers, Subcontractors, the ENGINEER, and the OWNER. The CONTRACTOR shall provide the effective coordination of all parties necessary for the successful plant start-up.

B. It is not the intent of the ENGINEER to instruct the CONTRACTOR in the start-up of the plant; however, the ENGINEER will be available prior to and during start-up to provide technical support to the CONTRACTOR.

C. The CONTRACTOR shall be required to start-up the plant, under direction of the OWNER, operate it, and pass a seven (7) day test prior to acceptance. All equipment must properly run continuously 24 hours per day for the test period at rates indicated by the ENGINEER. If any item malfunctions during the test, the item shall be repaired and the test restarted at day zero with no credit given for the operating time before the aforementioned malfunction.

D. Not less than three (3) months prior to start-up, the COINTRACTOR shall submit to the ENGINEER for review, a detailed schedule of operations which will be necessary to effect a successful initial operation and sustained period of operation for the duration of the required start-up period.

E. The CONTRACTOR shall provide operating personnel for the duration of the start-up. Additionally, the CONTRACTOR shall provide all water, power, chemicals, and other consumables required for the test.

F. The start-up shall not be commenced until all required leakage tests and equipment tests have been completed to the satisfaction of the ENGINEER.

G. All defects in materials or quality of WORK which appear during this test period shall be immediately corrected by the CONTRACTOR. Time lost for equipment repairs, wiring corrections, control point settings, or other reasons which actually interrupt the start-up may, at the discretion of the ENGINEER, be justifiable cause for extending the start-up test duration.

H. During the start-up, the CONTRACTOR shall provide the services of authorized representatives of the manufacturers, in addition to those services required under operations testing, as necessary, to correct faulty equipment operation.

I. During the start-up, the CONTRACTOR shall keep records of the operations, in accordance with the instructions of the ENGINEER.

PART 2 - PRODUCTS (Not Used)

PART 3- EXECUTION (Not Used)

END OF SECTION

SECTION 01700 - PROJECT CLOSE-OUT

PART 1 - GENERAL

1.1 FINAL CLEAN UP

A. The CONTRACTOR shall promptly remove from the vicinity of the completed WORK, all rubbish, unused materials, concrete forms, construction equipment, and temporary structures and facilities used during construction. Final acceptance of the WORK by the OWNER will be withheld until the CONTRACTOR has satisfactorily compiled with the foregoing requirements for final clean up of the Project site.

1.2 CLOSEOUT TIMETABLE

A. The CONTRACTOR shall establish dates for equipment testing, acceptance periods, and on-site instructional periods as required under the contract. Such dates shall be established not less than one (1) week prior to beginning any of the foregoing items, to allow the OWNER, the ENGINEER, and their authorized representatives sufficient time to schedule attendance at such activities.

1.3 FINAL SUBMITTALS

A. The CONTRACTOR, prior to requesting final payment, shall obtain and submit the following items to the ENGINEER for transmittal to the OWNER:

1. Written guarantees, where required
2. Maintenance stock items; spare parts; special tools, where required
3. Completed record Drawings
4. Certificates of inspection and acceptance by local governing agencies having jurisdiction
5. Releases from all parties who are entitled to claims against the subject Project, property, or improvement pursuant to the provisions of law
6. Compliance Certificate and Release form signed by the CONTRACTOR and all subcontractors shall be submitted to the Engineering Contract Administrator (blank attached to this Section.)

B. Before final payment can be made, the CONTRACTOR shall supply a copy of the "Notice of Completion of Public Works" form approved by Wage and Hour Administration of the Labor Standards and Safety Division of the Alaska Department of Labor and Workforce Development.

C. Before final payment, the CONTRACTOR shall provide the OWNER with clearance from the Alaska Department of Labor and Workforce Development for the CONTRACTOR and all Subcontractors that have worked on the Project. This clearance shall indicate that all Employment Security Taxes have been paid. A sample form for this purpose is at the end of Section 00800 – Supplementary General Conditions.

1.4 WARRANTY AND GUARANTEE

A. The CONTRACTOR shall comply with the warranty and guarantee requirements contained in Article 13 of the General Conditions.

B. Replacement of earth fill or backfill, where it has settled below the required finish elevations, shall be considered as part of such required repair WORK, and any repair or resurfacing constructed by the CONTRACTOR which becomes necessary by reason of such settlement shall likewise be considered as part of such required repair WORK unless the CONTRACTOR shall have obtained a statement in writing from the affected private owner or public agency releasing the OWNER from further responsibility in connection with such repair or resurfacing.

C. The CONTRACTOR shall make all repairs and replacements promptly upon receipt of written order from the OWNER. If the CONTRACTOR fails to make such repairs or replacements promptly, the OWNER reserves the right to do the WORK and the CONTRACTOR and the CONTRACTOR's surety shall be liable to the OWNER for the cost thereof.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

SECTION 01700 - PROJECT CLOSE-OUT

COMPLIANCE CERTIFICATE AND RELEASE FORM

PROJECT: _____
CONTRACT NO: E_____

The **CONTRACTOR** must complete and submit this to the Contract Administrator with respect to the entire contract.

Completed forms may be submitted upon completion of the Project. All requirements and submittals must be met before final payment will be made to the CONTRACTOR.

I certify that the following and any referenced attachments are true:

- All WORK has been performed, materials supplied, and requirements met in accordance with the applicable Drawings, Specifications, and Contract Documents.
- All Suppliers and Subcontractors have been paid in full with no claims for labor, materials or other services outstanding. If all Subcontractors and suppliers are not paid in full, please explain on a separate sheet.
- All employees have been paid not less that the current prevailing wage rates set by the State of Alaska (or U.S. Department of Labor, as applicable).
- All equal employment opportunity, certified payroll and other reports have been filed in accordance with the prime contract.
- The attached list of Subcontractors is complete (required from CONTRACTOR). The City Engineer was advised and approved of all Subcontractors before WORK was performed and has approved any substitutions of Subcontractors.
- All DBE firms listed as a precondition of the prime contract award must have performed a commercially useful function in order for the WORK to count to a DBE goal. All DBE firms performed the WORK stated and have received at least the amount claimed for credit in the Contract Documents.
- All DBE Subcontractors must attach a signed statement of the payment amount received, the nature of WORK performed, whether any balance is outstanding, and indicate that no rebates are involved.
- If the amount paid is less than the amount originally claimed for DBE credit, the CONTRACTOR has attached approval from the City Engineer for underutilization.

I understand it is unlawful to misrepresent information in order to receive a payment which would otherwise be withheld if these conditions were not met. I am an authorized agent of this firm and sign this freely and voluntarily. The foregoing statements are true and apply to the following project contractor.

_____ Capacity: CONTRACTOR
Firm Name

_____ _____ _____
Signed Printed Name and Title Date

Return completed form to: Engineering Contracts Division, City and Borough of Juneau, 155 South Seward Street, Juneau, AK 99801. Call (907) 586-0873 if we can be of further assistance or if you have any questions.

END OF SECTION

SECTION 02090 - BLASTING CONTROLS

PART 1 - GENERAL

1.1 DEFINITIONS

A. Air Blast: A transient air pressure impulse generated by explosions.

B. Blast Consultant: The Blast Consultant shall be a person with extensive knowledge of noise vibration, and visual impacts of blasting operations, and who is specialized in the detonation of explosives, particularly in the field of rock quarry operations. The Blast Consultant shall be provided by the CONTRACTOR.

1. The Blast Consultant must have at least 20 years of experience in construction blasting. They must be able to demonstrate involvement in at least five (5) projects with blasting within 200 feet of residential structures. The Blast Consultant must be able to demonstrate attendance in at least ten (10) short courses, seminars, conferences on blasting technology, or engineering class studies during the past 15 years. For the past five (5) years, the Blast Consultant must have derived their primary source of income from providing specialized blasting consulting services.

C. Blast Control Specialist: Person authorized to act on behalf of the CONTRACTOR and licensed by the state or local regulatory agency to possess, transport, and use explosives.

D. Fly Rock: Debris that is ejected or propelled through air by blast.

E. Frequency: Ground vibration oscillation at peak event, expressed in Hertz.

F. Peak Ground Particle Velocity (PGPV): Maximum of three (3) velocity components measured in three (3) mutually perpendicular directions at a point.

1.2 SUBMITTALS

A. Quality Control Submittals:

1. Qualifications of Blast Control Specialist: Submit at least 30 days prior to blasting WORK.
2. Rock excavation plan describing details for CONTRACTOR's proposed rock excavation methods. Submit at least 30 days prior to start of WORK.
3. Detailed blasting plan for each blast shall be submitted at least 48 hours prior to beginning any WORK for that blast.
4. Vibration and air-blast monitoring plan. Submit at least 30 days prior to blasting WORK.
5. Qualifications of Blast Consultant. Submit at least 30 days prior to blasting WORK.
6. Performance and Restoration Bond for all items of WORK.

B. Blasting Plan and Blasting Schedule.

1. One (1) week prior to commencing drilling and blasting operations, the CONTRACTOR shall submit a "Blasting Plan", reviewed and approved by the

Blasting Consultant, to the ENGINEER for review. The Blasting Plan shall contain the details of the drilling and blasting patterns and controls proposed for both the controlled and production blasting. The Blasting Plan shall contain the following minimum information:

a. Station limits of proposed shot, the number of blasts, time of each blast.
b. Plan and section views of proposed drill pattern indicating hole size, hole depths and angles, hole pattern and spacing and expected rock types.
c. Drill hole diameters (preshear, productions) and depth including subdrilling depths.
d. Drill steel diameter and bit types.
e. Stemming length and type of material used for stemming.
f. Loading details including trade names, types, sizes of explosives.
g. Average bench height.
h. Proposed initiation and delay sequence of blast holes.
i. Weight of explosives per hole and per delay and powder factors, including weight of explosives per square yard of finished backslope.
j. Anticipated vibration levels and peak particle velocities at locations specified by the ENGINEER.
k. Anticipated blasé decibel level at nearest dwelling.

2. At any time the CONTRACTOR proposes to change the drilling or blasting methods, the CONTRACTOR shall submit a revised Blasting Plan for the affected WORK not later than one (1) week prior to the proposed commencement of the change in the WORK.
3. The Blasting Plan submittal is for quality control and record-keeping purposes. Review of the Blasting Plan by the ENGINEER or Blasting Consultant shall not relieve the CONTRACTOR of their responsibility for the accuracy and adequacy of the plan when implemented in the field.

C. Project Closeout Submittals.

1. Summary Report: Submit within 30 days of completion of blasting.

1.3 QUALITY ASSURANCE

A. Blast Control Specialist: Must have a minimum of ten (10) years experience with blast design and vibration and air-blast monitoring, and significant involvement as the Blast Control Specialist in a minimum of ten (10) previous projects of similar nature. The Blast Control Specialist shall be a licensed blaster in the State of Alaska and shall be subject to the approval of the Blast Consultant.

1.4 SEQUENCING AND SCHEDULING

A. Blasting shall be restricted to the times given on the Rock Quarry Usage Plan.

B. Blast only with direct written approval for each blast by the Blast Consultant.

C. Warning signs and public notification are required to avoid all risks to the public that use the roadway. The CONTRACTOR shall provide to CBJ and to the State of Alaska

Department of Transportation and Public Facilities (AK DOT&PF) with its proposed traffic control plan for review and approval prior to any blasting or hauling.

D. The CONTRACTOR shall provide the Juneau Flight Service Station, the Juneau Police Department and the Juneau Fire Department with written notice of blasting a minimum of 24 hours in advance of each blast.

1.5 CONTROLLED BLASTING

A. Material which would classify as rock and which requires drilling and blasting to remove will be accomplished by controlled blasting. Controlled blasting is defined as the establishment of a free surface or shear plane in rock along the lines of the specified backslope by the controlled usage of explosives and blasting accessories in appropriately aligned and spaced drill holes.

B. The CONTRACTOR shall perform short test lines of holes consisting of presplit or cushion blasting if changes in conditions warrant, to determine the loading, spacing and depth or lift required to obtain desired PGPV, air blast pressures and excavation geometry. These tests will be monitored by the Blast Consultant using CONTRACTOR supplied seismographs. As part of the blasting plan, the CONTRACTOR shall prepare graphs depicting the PGPV as function of the distance from the detonation point, for each explosion loading. Explosive loading for production blasting will then be selected from the graph to limit PGPV to less than two inches per second measured next to the closest structure adjacent to the blast.

1.6 CBJ OVERSIGHT

A. The CONTRACTOR shall submit a copy of the Blast Consultant-approved general blast plan description and a copy of each Blast Consultant-approved individual blast plan to the ENGINEER and the CBJ Project Manager prior to blasting. The CONTRACTOR shall also submit a copy of their AK DOT&PF-approved traffic control plan to the ENGINEER and CBJ Project Manager prior to any blasting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 CONSTRUCTION

A. All explosives shall be of such character and in such amount as permitted by the state and local laws and ordinances and all respective agencies having jurisdiction over them.

B. The CONTRACTOR shall implement a blast notification program, as approved by the ENGINEER, and in accordance with applicable standards.

C. The CONTRACTOR shall use the utmost care so as not to endanger life or property, or disturb materials outside the limits of the excavation.

D. Explosives, including blasting caps, shall be transported and stored in a safe, secure manner in accordance with the requirements of the appropriate public body having

jurisdiction in such matters. Only persons experienced in the handling of explosives are to be allowed to use them on the WORK. Where state or local laws require, explosives are to be handled only by licensed personnel.

E. The CONTRACTOR shall provide all necessary approved types of tools and devices required for handling and using explosives, blasting caps, and accessories. The CONTRACTOR shall conform to and obey all federal, state and local laws that may be imposed by any public authority having legal jurisdiction.

F. When blasting, ample warning shall be given to all persons within the vicinity prior to blasting. Warning signs shall be erected a minimum of 24 hours prior to the blast time, and workers shall be stationed to warn people before firing any blasts. The warning signs will state the time and date of each blast.

G. After a blast has been fired, the Blast Control Specialist shall make a careful inspection to determine that all charges have exploded before employees are allowed to return to the operation. Misfires shall be corrected in accordance with the requirements of the applicable portions of the federal, state, or local safety codes for blasting. The CONTRACTOR shall be responsible for any and all damage to property or injury to persons resulting from blasting or accidental or premature explosions that may occur in connection with his use of explosives.

H. All rock that is loose, hanging or creating a dangerous situation shall be removed or stabilized, to the Blast Consultant's satisfaction, during or upon completion of the excavation in each lift as an integral sequence in each cycle of excavation. Drilling of the next lift will not be permitted until this WORK, and any rock stabilization that is necessary has been completed.

I. Material outside of the planned neatline slopes which, in the opinion of the Blast Consultant, is unstable and constitutes potential slides shall be excavated and removed.

J. No blast shall exceed an in-place volume of 5,000 cubic yards.

3.2 GENERAL

A. The CONTRACTOR shall be required to submit a description of the blast plan to the Blast Consultant no less than 21 days prior to the blasting operation. The proposed method shall be subject to the approval of the Blast Consultant. The description shall include at least the following:

1. Limits of cut or lift
2. Average bench height
3. Hole positions, including angle and depth
4. Blast hole diameters
5. Type and quantity of explosives (including manufacturer's data sheets)
6. Method of initiation and firing sequences
7. Powder factor
8. Depth and type of stemming

B. Review of the blast plan by the Blast Consultant shall not relieve the CONTRACTOR of responsibility for the accuracy and adequacy of the blast plan when implemented in the field. This includes, but is not limited to, obtaining adequate fragmentation, using proper detonation procedures and following proper safety procedures prior to and after the blast.

C. The WORK shall be conducted in such a manner that rock outside the excavation limits will be undisturbed, nearby structures will not be disturbed in any way, and the shape of the excavation will conform as nearly as possible to the lines and grades shown on the Drawings.

D. It is imperative that the blasting WORK does not disturb or impair the existing overhead electrical lines in any way. Any damage shall be immediately repaired. To help ensure against potential damage beyond the lines of intended excavation, the CONTRACTOR shall employ the best modern practice of controlled blasting methods.

E. The CONTRACTOR shall assign a supervisor of mature experience specialized in the use of explosives to the blasting operations, who shall be maintained on a full-time basis during the time that blasting is in progress.

F. The CONTRACTOR is forewarned that existing residential and commercial properties may be located in close proximity of the blast and that these properties shall be protected. The CONTRACTOR shall be responsible for all damage to these properties, including providing suitable temporary housing to residents or business occupants until repair WORK is completed.

G. Blasting shall be monitored by the Blast Consultant using CONTRACTOR-furnished monitoring devices. The Blast Consultant will be responsible for the location and placement of these monitoring devices. The CONTRACTOR will be responsible for the protection of these monitoring devices from its equipment and operations.

H. To ensure the accuracy of firing times of blasting caps, it is required that each cap period come from one lot number. Mixing lot numbers for any one cap period is prohibited.

3.3 CONTROLLED BLASTED SURFACES

A. For all rock slopes the CONTRACTOR shall use controlled blasting along the lines of the final rock cut slope face.

B. Controlled blasting refers to the controlled use of explosives and blasting accessories in carefully spaced and aligned drill holes to produce a free surface or shear plane in the rock along the specified excavation backslope. Controlled blasting techniques covered by this Specification includes pre-splitting and cushion (trim) blasting.

C. The purpose of controlled blasting is to ensure long-term rock slope stability by minimizing damage to the rock backslope. The ENGINEER may require the CONTRACTOR to use controlled blasting to form the faces of slopes, even if the main excavation can be ripped.

D. Cuts over 30 feet in height shall be drilled and blasted in more than one lift, with each lift being limited to a maximum of 30 feet. A maximum of a two foot offset between lifts

shall be permitted to allow for drill equipment clearances. The CONTRACTOR shall begin the control blast hole drilling at a point which will allow for necessary offsets and shall adjust, at the start of the lower lifts, to compensate for any drift which may have occurred in the upper lifts. The use of horizontal lifters will not be allowed.

E. The CONTRACOR will be required to drill from the top of the cut downward for rock cuts greater than ten (10) feet in height.

F. The diameter of the control blast holes shall not be smaller than two and one half inches or greater than three inches. The deviation of these drill holes either parallel or normal to the backslope shall not exceed eight inches. If greater than five percent of the controlled blast holes are misaligned in any one lift, the CONTRACTOR shall reduce the height of the lifts until the eight inch alignment tolerance is met.

G. Buffer holes shall be drilled three feet out from the controlled blast holes on four foot centers. The buffer holes shall be drilled parallel to the controlled blast holes. The load per buffer holes shall not exceed 50 percent of the average load per production hole next to the buffer line.

H. All drilling equipment used to drill the control blast shall have mechanical devices affixed to that equipment to accurately determine the precise angle at which the drill steel enters the rock. Control blast hole drilling will not be permitted if these devices are either missing or inoperative. Hand held devices, including levels, shall not be used.

I. Prior to drilling the control blast holes, all overburden and/or loose disintegrated rock shall be removed down to solid rock in the vicinity of the holes.

J. All rock backslope faces shall be scaled of loose fragments.

K. Blast holes for controlled blasting shall be drilled within three-inches of the staked collar location. If more than five percent of the holes are outside of the three inch tolerance, they shall be filled with crushed stone and re-drilled at the proper location.

3.4 LINE DRILLING, CUSHION BLASTING, PRESPLITTING

A. Methods such as line drilling, cushion blasting, or pre-splitting shall be used to control damage beyond the final cut faces shown on the Drawings. Methods such as line drilling and pre-splitting are used to ensure that a shear plane is established between the periphery holes, thus minimizing strain or cracks in the rock beyond the blasting perimeter. Except as otherwise directed by the Blast Consultant, pre-splitting and line-drilled holes shall not be larger than three inches in diameter, and spaced no more than two feet and six inches apart, center to center, respectively.

B. Cushion blasting is similar to pre-splitting, except that the detonation along the cut face shall be performed after the detonation of the production holes.

C. The CONTRACTOR shall line drill, perform cushion blasting, or pre-split all native, permanently exposed, or steeply inclined cut faces (1H to 1V, or steeper).

D. The line drilling, cushion blasting or pre-splitting blast holes shall be between two and one half and three inches in diameter.

E. Cuts with a vertical height greater than ten feet and an average horizontal thickness of greater than 25 feet as measured from the free face to the back row of blast holes shall be "Pre-split" blasted.

1. Pre-splitting shall be performed for all rock slopes over ten feet in height. It shall consist of drilling holes on the plane of the final backslope then loading the holes with a continuous or well disturbed explosive charge, and then firing the holes to create a crack along the line of the backslope. Ground vibration is a consideration. The CONTRACTOR shall delay the pre-split holes no more than 25 milliseconds along the pre-split line. The detonation of the pre-split line must precede the detonation of all other blasting in the cut. The pre-split line may be detonated in advance of the main production blasting or fired along with the production blasting, providing that the pre-split line is detonated a minimum of 25 milliseconds ahead of all other blasting.
2. The pre-split holes shall be drilled initially on 30-inch center spacing. Prior to loading these pre-split holes, each hole shall be inspected and tested for the entire length to determine that the hole is free and clear of obstructions. If the hole is obstructed, the hole shall be cleaned prior to loading. All necessary precautions shall be exercised so as to prevent debris from falling into the holes prior to loading, and that the placing of the charge shall not cause caving of materials from walls of the hole.
3. The maximum initial explosive charge used in these holes shall be no more the 0.14 pounds per square foot of rock surface of the final slope face. Ammonium nitrate and fuel oil (ANFO) shall not be allowed to be loaded in the pre-split hole.
4. Depending on the condition of the rock encountered and the smoothness of the final slope face, the explosive loads per square foot and the spacing of the pre-split holes may be altered, as required, after an inspection and evaluation by the ENGINEER.
5. The space in each pre-split hole not occupied by explosives may or may not be stemmed depending on the condition of the rock encountered. In all cases, the top three feet of the pre-split holes shall be stemmed.
6. The maximum diameter of the explosives used in pre-split holes shall not be greater than one-half the diameter of the pre-split hole.
7. Only standard explosives manufactured especially for pre-splitting shall be used in pre-split holes, unless otherwise approved by the ENGINEER.
8. If fractional portions of standard explosive cartridges are used, they shall be firmly affixed to the detonating cord in such a manner that the cartridges shall not slip down the detonating cord nor bridge across the holes. Spacing of fractional cartridges along the length of the detonating cord shall not exceed 30 inches center to center, and shall be adjusted to give the desired results.
9. Continuous column cartridge-type of explosives used with detonating cord shall be assembled and affixed to the detonating cord in accordance with the explosive manufacture's instructions; a copy of which shall be furnished to the ENGINEER. No detonating cord shall be used on the surface.
10. The bottom charge of a pre-split hole may be larger than the line charges, but shall not be large enough to cause overbreak. The top charge of the pre-splitting

hole shall be placed far enough below the collar, and reduced sufficiently, to avoid overbreaking and heaving.

F. Cuts with a vertical height greater than ten feet and an average horizontal thickness less than 25 feet as measured from the free face to the back row of blast holes shall be "cushion" blasting.

1. Where the horizontal distance from the cut face to the existing rock face is less than 25 feet, the CONTRACTOR may cushion blast in lieu of pre-splitting. Cushion blasting is similar to pre-splitting, except that the detonation along the cut face shall be performed after the detonation of all production holes. The difference in delay time between the trim line and the nearest production row shall not be greater than 75 milliseconds, nor less than 25 milliseconds. With the exception of the above criteria, requirements previously stated for preshearing shall also apply to cushion blasting.

3.5 SILVER CUTS

A. For silver cuts, pioneering the top of cuts and preparing a working platform to being the controlled blasting drilling operations may require unusual working methods and use of equipment. The CONTRACTOR may use angle drilled holes or fan drilled holes during the initial pioneering operations to obtain the desired rock face. The hole diameter requirements for controlled blasting are applicable for pioneering work. Hole spacing shall not exceed 30 inches.

3.6 PRODUCTION BLASTING

A. Production blasting, as covered herein, refers to the rock fragmentation blasts resulting from more widely spaced production holes drilled throughout the main excavation area, adjacent to the controlled blast line. Production holes shall be detonated in a controlled delay sequence.

B. All production blasting, including that carried out in conjunction with the blasting test section requirements, shall be performed in accordance with the following general requirements:

1. Production blast holes shall be drilled on the patterns submitted by the CONTRACTOR and approved by the ENGINEER. The production blast holes shall be drilled within two blast hole diameters of the staked collar location. If more than five percent of the holes are drilled outside of this tolerance, at the option of the ENGINEER, the CONTRACTOR may be required to refill these holes with crushed stone and re-rill them at the proper location.
2. The production holes shall not exceed four inches in diameter and shall be drilled to a depth that is below the finished surface elevation, such that unbroken rock does not extend above the finish surface.
3. The depth of individual horizontal lifts, the depth of blast holes, and the amount of explosive per hole and per delay shall vary depending on the average thickness of the lift as measured from the cut face to the existing rock face, and shall not exceed the following amounts:

Lift Thickness	Pounds of Explosive
0' to 20'	50
21' to 50'	Add 15 lbs. Per foot of thickness
Over 50'	500

4. If the blast holes are plugged or unable to be fully loaded, the CONTRACTOR shall be required to deepen or clean out those holes. The blast holes should all be checked and measured before any explosives are loaded into any of the holes to eliminate any safety hazard resulting from drilling near loaded holes.
5. All blast holes should reach their desired depth, and if more than five percent of the holes are short before loading, the CONTRACTOR may be required by the ENGINEER to re-drill the short holes to proper grade at the CONTRACTOR's expense.
6. In order to control blasting effects, the CONTRACTOR must maintain a burden distance that is not more than one-half the bench height.
7. Blast holes shall be covered after drilling to deep overburden from falling into the holes.
8. The row of blast holes immediately adjacent to the controlled blast line shall be drilled on a plane approximately parallel to the controlled blast line. Production blast holes shall not be drilled closer than three feet to the controlled blast line, unless approved by the ENGINEER. The bottom of the projection holes shall not be lower than the bottom of the controlled blast holes, or by approval of the ENGINEER may be lower than the controlled blast holes by the amount of subdrilling used on the production holes. Detonation of production holes shall be on a delay sequence towards a free face. Stemming material used in production holes shall be crushed stone and shale, not sand or drill cuttings.
9. It is the CONTRACTOR's responsibility to take all necessary precautions in the production blasting so as to minimize blast damage to the rock backslope.
10. Do not begin production blasting prior to the line drilling, pre-splitting, or as required to preserve the rock beyond the limits of the excavation.

3.7 CONTROL CRITERIA, MONITORING AND EXPLOSIVE PRODUCT REQUIREMENT

A. The CONTRACTOR shall submit for review the proposed methods and sequence of blasting for rock excavations. The CONTRACTOR shall identify the number, depth, and spacing of holes; stemming and number and type of delays; methods of controlling overbreak at excavation limits, procedures for monitoring the shots and recording information for each shot; and other data that may be required to control the blasting.

B. The CONTRACTOR shall submit to the Blast Consultant for review a completely detailed blasting plan of each blast at least 48 hours prior to preparing for, drilling or loading the holes. These details shall include the location of all holes relative to the excavation plans and sections, the size of all holes, the typical loading pattern of each hole, the distribution of charge within each hole, and the number of each delay.

C. The CONTRACTOR shall develop a trial blasting technique that identifies and limits the vibrations and damage at varying distances from each shot. This trial blasting information shall be collected and recorded by beginning the WORK at points farthest from areas to remain without damage. The CONTRACTOR can vary the hold spacing,

depths and orientations, explosive types and quantities, blasting sequence, and delay patterns to obtain useful information to safeguard against damage at critical areas.

1. If at any time during the progress of the WORK, the methods of drilling and blasting do not produce the desired result of a uniform slope and shear face, within the tolerance specified, the CONTRACTOR shall be required to drill, blast, and excavate in short sections, not exceeding 50 feet in length, until a technique is developed that shall produce the desired results.

D. Drilling logs shall be kept on each blast hole to show open bedding, jointing and open or mud filled seams, zones of soft or weathered rock, mud pockets, etc. These logs shall be provided to the ENGINEER before any blast holes are loaded. The logs shall be used to properly design and load blast holes and use stemming decks in weak zones to protect residents from blowout, fly rock and unusual or hazardous blasting effects.

E. The stemming decks shall be of crushed stone. The material used for stemming decks shall be well graded between one-eighth inch and three-eighth inches in diameter. Drill cuttings shall not be used.

F. Concentrated charges will not be permitted; only special, controlled blasting procedures will be permitted.

G. Bulk explosives such as ammonium nitrate and fuel oil that do not meet manufacturer's specifications, shall not be used on the Project. When in the opinion of the ENGINEER, any blasting product is either of excessive age or in what appears to be a deteriorated condition, all WORK shall cease until the product's age or quality can be determined.

H. No blasting product shall be brought to the job site if the date codes are missing. At the option of the ENGINEER, the product may be tested by an independent organization to determine its performance as compared to the manufacturer's data sheet. If product performance or composition deviated by more than ten percent in any manner from the manufacturer's data sheet, that lot number shall be rejected.

I. The CONTRACTOR shall submit manufacturer's certification for the blasting agents and explosives, and that the products sent to the job meet their specifications on the technical data sheet.

J. The CONTRACTOR shall videotape, take high-speed photographs or collect other print or other electronic images of each blast. The images, photographs, film and videotape shall become part of the Project records.

3.8 BLAST DESIGN

A. Design each blast to avoid damage to existing facilities, adjacent property and completed WORK. Consider effects of blast-induced vibrations and air blast, and fly rock potential in design of each blast.

B. Whenever peak particle velocity exceeds vibration limits change design of subsequent blasts, as necessary, to reduce peak particle velocity to within limits established by CONTRACTOR's Blast Control Specialist.

C. Whenever air blast exceeds limits, change design of subsequent blasts or provide controls necessary to reduce air blast to within specified limits.

3.9 PRE-BLAST CONDITION SURVEY

A. The CONTRACTOR shall arrange for a pre-blast survey of any nearby buildings, structure, or utilities that may potentially be at risk from blasting damage. The survey method used shall be acceptable to the CONTRACTOR's insurance company. The CONTRACTOR shall be responsible for any damage resulting from blasting. The pre-blast survey shall be made available to the ENGINEER for review two weeks before any blasting begins. Occupants of local buildings shall be notified by the CONTRACTOR prior to the commencement of blasting.

B. The pre-blast survey shall be done on all buildings and structures with 600 feet of the blasting area. The pre-blast survey shall product the following as a minimum requirement:

1. Diagrams and information as required to accurately show the building or structure existing conditions.
2. Photographs of existing damage.
3. Comprehensive video of the entire structure.

C. Pre-blast surveys shall be completed by a practicing civil engineer registered in the State of Alaska, who has experience in rock excavation, foundation design, and building design and construction.

3.10 VIBRATION LIMITS

A. Establish appropriate maximum limit for peak particle velocity for each structure or facility that is adjacent to, or near blast sites. Base maximum limits on expected sensitivity of each structure or facility to blast induced vibrations and federal, state, or local regulatory requirements, but not to exceed two-inches per second when frequency is 40-Hz or greater, and 0.75 inches per second when frequency is less than 40-Hz.

B. Allowable charge weights per delay shall be based on vibration levels that shall not cause damage. The allowable charge weights per delay shall be established by carrying out trial blasts and measuring vibration levels. The trial blasts shall be carried out in conformance with blasting test section requirements, modified as required to limit ground vibrations to a level which shall not cause damage. Regression analysis shall be performed by the CONTRACTOR's Blasting Consultant with the test blast data, and directional transmission characteristics shall be determined.

C. The CONTRACTOR shall monitor each blast with three approved seismographs located, as approved, between the blast area and the closet structures subject to blast damage. The seismograph used shall be capable of recording particle velocity for three mutually perpendicular components of vibration in the range generally found with controlled blasting as well as air overpressure. The seismographs must be capable of storing data in digital form, which can be electronically transferred into a computer. The type of

seismograph instrumentation, and the method of use, must conform to the general guidelines for proper use of seismographs.

D. Peak particle velocity of each component shall not be allowed to exceed the safe limits of the nearest structure subject to vibration damage. The CONTRACTOR shall employ an ENGINEER-approved qualified vibration specialist to establish the safe vibration limits. The vibration specialist shall also interpret the seismograph records to ensure that the seismograph data shall be effectively utilized in the control of the blasting operations with respect to the existing structures. The vibration specialist used shall be subject to the ENGINEER's approval. The vibration specialist shall supervise the placement and operation of the seismograph.

Data recorded for each shot shall be furnished to the ENGINEER prior to the next blast and shall include the following:

1. Identification of instrument used.
2. Name of qualified observer and interpreter.
3. Distance and direction of recording station from blast area.
4. Type of ground at recording station and material on which the instrument is sitting.
5. Maximum particle velocity in each component and frequency.
6. The time history of each component.
7. The time history of air overpressure.
8. A dated and signed copy of records of seismograph readings.
9. A regression analysis shall be done after every blast to determine if conditions are changing as a result of geology of blast design.
10. Blast vibration levels must conform to the alternative blasting level criteria in United States Bureau of Mines (USBM) Report of Investigation (RI) 8507.

3.11 AIR BLAST LIMITS

A. Three air blast-monitoring systems shall be installed between the main blasting area and the nearest structures subject to blast damage or annoyance. The equipment used to make the air blast measurements shall be the type specifically manufactured for that purpose.

B. Peak overpressure shall be held below 90 decibels (dB) linear peak method at the nearest structures or other designated location. Appropriate blast hole patterns, detonation systems, and stemming shall be used to prevent venting of blasts and to minimize air blast and noise levels produced by the blasting operations. The overpressure limit shall be lowered if it proves too high based on damage.

C. A permanent signed and dated record of the peak overpressure measurements shall be furnished to the ENGINEER immediately after each shot. Regression analysis shall be done by the CONTRACTOR's Blasting Consultant after each blast, and necessary adjustments made to ensure that air overpressure shall never exceed the 90 decibels (dB) linear peak method.

3.12 FLY ROCK CONTAINMENT

A. Before the firing of any blast, the rock to be blasted shall be covered with approved blasting mats, soil, or other equally serviceable material, to prevent fly rock that may result in damage to life or property.

B. The homeowners/renters determined to be in the design fly rock zone for a particular blast shall be notified 24 hours in advance of the pending blast, and at least two hours prior to the blast so that they may temporarily relocate during the blast. Signature along the roadway shall be used to supplement the notification process.

C. Suggested methods of protecting structures and utilities from the effects of the blasting, blast induced fly rock, vibration, and air blast overpressure include, but are not limited to the following:

1. New sisal rope blasting mats
2. Wire rope or tire blasting mats
3. Backfilling
4. Stemming full depth
5. Reduced explosive loads
6. Use of millisecond delays
7. Relocation of any or all existing utility lines

D. The CONTRACTOR shall protect all overhead and underground utilities prior to blasting and immediately repair or replace any damaged by the blasting operations. If the CONTRACTOR wishes to temporarily relocate any utility lines that lie near a blast zone, he shall have written approval from the governing utilities and pay all relocation costs.

E. If fly rock travels beyond the design fly rock zone limits, all blasting operations shall cease. The CONTRACTOR shall review the site and determine the cause and solution to the fly rock problem. Before any further blasting proceeds, a written report, prepared by the CONTRACTOR shall be submitted to the ENGINEER. In the event that the CONTRACTOR and the ENGINEERING cannot reach an agreement on the cause and solution to the fly rock problem, progress payments shall be suspended until an agreement is achieved.

F. If after review of the report, the ENGINEER determines that the design fly rock zone shall be re-established and additional residences notified, all new homeowners/renters shall be offered the same temporary relocation benefit of $250.00 for each blast event.

G. Failure to pay the temporary relocation benefits due or to resolve fly rock incidents in a timely manner, as indicated in the Specifications, will result in delay of progress payments.

H. Delays caused by fly rock incidents do not constitute grounds for extension of Contract Time.

I. If more than three fly rock incidents occur, at the option of the OWNER, the CONTRACTOR may be fined $10,000 for each additional occurrence. A fly rock incident is defined as any fly rock that hits private property.

3.13 VIBRATION AND AIR BLAST MONITORING

A. Monitor on, or at, structures or other facilities that are closest to point of blasting. Monitor more distant facilities that are expected to be sensitive to blast induced vibrations and air blast.

B. The CONTRACTOR's Blast Control Specialist shall supervise establishment of monitoring programs and initial operation of equipment, review interpretation of records and recommended revisions of blast designs.

3.14 BLASTING RECORDS

A. For each blast, document the following:

1. Location of blast in relation to the coordinate system and elevations
2. Date and time of loading and detonation of blast
3. Number of blasts
4. Name of person in responsible charge of loading and firing
5. Plan view and section view of each blast with notes indicating free face, burden, spacing height of lift, hole diameter, stemming depth, hole angle, hole depth, subdrill depth
6. Notes regarding conditions encountered in the drill holes, including soft or fractured zones, water table alignment problems
7. Loading diagram indicating types and amounts of explosives, primers, initiators, stemming depth, powder factors, trade names, and sizes of explosives, primers and initiators
8. Sequence plan of the shot, including surface delay times and initiator's delay times
9. Comments by blaster-in-charge regarding damage to existing facilities, adjacent property, or completed WORK, misfires, fly rock occurrences, unusual results, or unusual effects
10. Provide drilling logs as described in Article 3.7, D of this Section
11. The CONTRACTOR shall videotape, take high-speed photographs or collect other print or other electronic images of each blast. The images, photographs, film and videotape shall become part of the Project records.

3.15 DAILY EXPLOSIVE MATERIAL CONSUMPTION AND LOSS

A. The CONTRACTOR shall keep a daily record of transactions to be maintained at each storage magazine. Inventory records shall be updated at the close of every business day. The records shall show the class and quantities received and issued and total remaining on hand at the end of each day. Remaining explosive inventory shall be checked each day, and any discrepancies that would indicate a theft or loss of explosive material would be immediately reported.

B. Should a loss or theft of explosives occur, all circumstances and details of the loss or theft shall be immediately reported to the nearest office of Alcohol, Tobacco & Firearms, local law enforcement authorities and the ENGINEER.

3.16 SUSPENSION OF BLASTING

A. If damage to existing facilities or adjacent property occurs due to blasting, immediately suspend blasting and report damage to the Blast Consultant, the ENGINEER, and the CBJ Project Manager.

B. Before resuming blasting operations, adjust design of subsequent blasts, or take other appropriate measures to control effects of blasting and submit complete description of proposed changes for reducing potential for future damage to the Blast Consultant.

C. Do not resume blasting until authorized by the Blast Consultant.

3.17 SCALING AND STABILIZATION

A. All rock on the cut face that is loose, hanging, or creates a potentially dangerous situation, shall be removed or stabilized to the ENGINEER's satisfaction during or upon completion of the excavation in each lift. Drilling of the next lift or WORK of any sort on the remaining rock cuts shall not be allowed until this WORK has been completed.

B. The slopes shall be scaled throughout the span of the contract and at such frequency as required to remove all hazardous loose rock or overhangs. The slopes shall be hand scaled using a suitable standard steel mine scaling rod. Subject to the ENGINEER's approval, or other methods, such as machine scaling and hydraulic splitters, may be used in lieu of or to supplement hand scaling. Payment for scaling shall be incidental to the contract unit price for rock excavation.

C. If in-place stabilization is required, as determined by the ENGINEER, rock bolting or other ENGINEER approved stabilization techniques shall be used. Stabilization necessitated, in the opinion of the ENGINEER, by the CONTRACTOR's blasting operations, shall be performed at the CONTRACTOR's expense.

D. Material outside the planned neatline slope which, in the opinion of the ENGINEER, is unstable and constitutes potential slides, shall be excavated and removed. Such material shall be used in the construction of the embankment or disposed of as directed by the ENGINEER. The removal and disposal of this material shall be paid for at the contract unit price for rock excavation if WORK does not require blasting.

3.18 SAFETY PROCEDURES - WARNINGS AND SIGNALS

A. The CONTRACTOR shall establish a method or warning all employees on the job site of an impending blast. The signal should consist of a five minute warning signal to notify all in the area that a blast shall be fired within a five minute period. A second warning signal shall be sounded one minute before the blast. After the blast is over, there shall be an "all clear" signal sounded so all in the area understand that all blasting operations are finished.

B. Five minutes prior to the blast, five long signals on an air horn or siren shall be sounded. One minute prior to the blast, five short signals on an air horn or siren shall be sounded. The "all clear" shall be one long signal of at least 30 seconds in duration to indicate that all blasting has ceased.

3.19 CHECK FOR MISFIRES

A. The CONTRACTOR shall observe the entire blast area for a minimum of five minutes following a blast to guard against rock fall before commencing WORK in the cut. The five minute delay between blasting and allowing anyone but the Blast Control Specialist to enter the area is needed to make sure that no misfires have occurred.

B. During the five minute delay, it is the Blast Control Specialist's responsibility to go into the shot area and check all holes to make sure that they have detonated. If any holes have not fired, the Blast Control Specialist shall handle these misfires before others enter the WORK area.

C. The ENGINEER shall, at all times, have the authority to prohibit or halt the CONTRACTOR's blasting operations, if it is apparent that through the methods being employed, the required slopes are not being obtained in a stable condition or the safety and convenience of the public is being jeopardized.

3.20 MISFIRE HANDLING PROCEDURES

A. Should a visual inspection indicate that complete detonation of all charges did not take place, the following procedures shall be followed:

1. If the system was energized and no charges fired for electric systems, the lead wire shall be tested for continuity prior to inspection of the remainder of the blast. For non-electric systems, the lead-in or tube shall be checked to make sure that detonation has entered the blast area.
2. Should an inspection of the electrical trunkline or lead-in tubing line indicate that there is a break in the line or if the tubing did not fire, then the system shall be repaired and the blast re-fired. If the inspection indicates that the trunkline has fired, and misfired charges remain, the Blast Control Specialist shall perform the following:

    a. The Blast Control Specialist shall exclude all employees except those necessary to rectify the problem
    b. Traffic shall be closed if a premature explosion could be a hazard to nearby traffic
    c. The Blasting Consultant shall correct the misfire in a safe manner. If the misfire poses a problem that cannot be safely corrected by the Blasting Consultant, then an explosive company representative skilled in the art of correcting misfires shall be called to rectify the problem.

3.21 PUBLIC MEETINGS

A. The CONTRACTOR shall make their qualified vibration and air blast specialists and Blasting Consultant available for one (1) day to conduct a public meeting to better inform the public about anticipated drilling and blasting operations. The specialists shall be prepared to answer any questions dealing with the magnitude of seismic motion, air blast overpressure, and fly rock expected to impact the public.

END OF SECTION

SECTION 02201 – CLEARING AND GRUBBING

PART 1 – GENERAL

1.1 GENERAL

A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary for clearing, grubbing, removing and disposing of all vegetation and debris (including earthen materials incidentally removed with vegetation and debris), and removing structures and obstructions located within the limits shown on the Drawings or designated by the ENGINEER, except such objects as are designated to remain in place or are to be removed in accordance with other sections of these Specifications. The WORK shall also include the preservation from injury or defacement of all vegetation and objects designated to remain.

PART 2 – PROJECTS (Not Used)

PART 3 – EXECUTION

3.1 GENERAL

A. The ENGINEER will establish the limits of the WORK and will designate all trees, plants, shrubs and other items to remain. The CONTRACTOR shall protect and preserve all items designated to remain.

B. Miscellaneous trimming of trees or shrubs designated to remain shall be conducted when directed by the ENGINEER. Trimming shall be in accordance with good tree surgery practice.

C. All vegetation and debris to be removed shall be disposed of by the CONTRACTOR within areas indicated on the Drawings or areas approved by the ENGINEER. When burning is permitted, it shall be under the constant care of competent employees. Burning shall be performed in a manner such that anything designated to remain on the right-of-way, the surrounding forest cover, or other adjacent property will not be jeopardized. Burning shall be done in accordance with all applicable laws and ordinances. The CONTRACTOR shall obtain all required permits.

D. The CONTRACTOR is responsible for:

1. Securing waste disposal sites,
2. Obtaining written permission of the owner of the disposal site and
3. Securing any required permits, if none is indicated on the Drawings.

The cost of securing such sites shall be borne by the CONTRACTOR. If requested by the ENGINEER, the CONTRACTOR shall furnish the permit numbers of all required permits for disposal sites.

E. Merchantable timber within the clearing limits will become the property of the CONTRACTOR, unless otherwise specified.

3.2 GRUBBING

A. All trees, stumps, roots and other objects not designated to remain shall be cleared and grubbed. If the area is not to be benched, the removal of undisturbed stumps and roots and nonperishable solid objects that will be a minimum of four feet below the embankment surface and that do not extend more than six inches above the original ground line, will not be required.

B. In areas outside of the grading limits of cut and embankment areas and to the established limits of the WORK, all stumps and nonperishable solid objects permitted to remain in place shall be cut off not more than six inches above the ground line or low water level.

C. Except in areas to be excavated, stump holes and other holes from which obstructions are removed shall be backfilled with suitable materials and compacted in accordance with the Contract Documents.

3.3 HAND CLEARING

A. In areas where Hand Clearing is indicated on the Drawings or designated by the ENGINEER, no equipment on wheels or tacks shall be used. Care shall be taken to insure that the grass, moss cover, or the natural ground is not disturbed. Stumps shall be cut flush with the ground, except that in areas within four feet or more of embankment cover, stumps may be cut off six inches above the natural ground.

3.4 SELECTED TREE REMOVAL

A. Trees designated by the Engineer, outside of the normal clearing and grubbing and/or hand clearing limits, shall be removed and disposed of in accordance with this Section. Trees to be removed may be designated by the ENGINEER at any time during the performance of the contract, and may be subject to the conditions specified under Hand Clearing. Trees designated for selective removal shall be cut off within six inches of the ground.

3.5 REMOVE AND RELOCATE BUSH OR TREE

A. Bushes or trees shown on the Drawings for removal and relocation shall be removed and relocated as directed by the ENGINEER.

B. Bushes and trees designated for removal and relocation shall be carefully removed with enough of the root wad kept intact to ensure the survival of the bush or tree in its new locations. Bushes and trees designated for removal and relocation that are damaged, or that do not survive as a result of the transplanting, shall be replaced by the CONTRACTOR at its expense. The relocated bush or tree shall be placed to original depth at a location within 15 feet of the original location, as directed by the ENGINEER.

END OF SECTION

SECTION 02202 – EXCAVATION AND EMBANKMENT

PART 1 – GENERAL

1.1 DESCRIPTION

A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary for excavation and embankment construction to the lines, grades and cross sections indicated in the Drawings or as directed by the ENGINEER.

1.2 SUBMITTALS

A. Select Borrow – sample for gradation analysis.

B. Subbase Grading A – samples for gradation analysis.

C. Shot Rock Borrow – samples for gradation and/or visual analysis.

PART 2 – PRODUCTS

2.1 EXCAVATION

A. All excavation shall be unclassified excavation, and shall consist of excavation and disposal of all materials, of whatever character, encountered in the WORK.

2.2 EMBANKMENT

A. Material for embankment construction shall consist of non-frost-susceptible earth, sand, gravel, fractured rock or combination thereof containing no muck, peat, frozen materials, roots, sod or other deleterious materials, and shall be compactable to the density required by the Specifications.

2.3 SELECTED EMBANKMENT

A. Selected Embankment shall meet all the requirements for Embankment Material, and in addition, shall have a plasticity index not greater than 6 as determined by AASHTO T 90 and shall contain no more than 6% by weight of material passing the 200 mesh sieve. The percentage of material passing the 200 mesh sieve shall be determined using only the material which passes a 3 inch sieve.

2.4 SUBBASE, GRADING A

A. Subbase, Grading A shall conform to the following gradation:

SIEVE DESIGNATION	PERCENT PASSING BY WEIGHT
4-Inch	100
2-Inch	85 - 100
No. 4	30-70
No. 200*	6 Max.

**Gradation shall be determined on that portion passing the 3-inch screen*

B. The amount of No. 200 material shall have no more than 3% by weight less than the 0.02 mm size.

C. Subbase, Grading A, shall contain no muck, frozen material, roots, sod or other deleterious matter. It shall have a liquid limit not greater than 25 and plasticity index not greater than 6 as determined by AASHTO T 89 and T 90.

D. Subbase, Grading A, shall meet the quality requirements of AASHTO M 147 except that ATM T-1 and T-7 will be substituted for AASHTO T 11, T 27, and T 88.

2.5 BORROW

A. Borrow shall meet the requirements for Embankment above.

2.6 SELECTED BORROW

A. Selected Borrow shall meet the requirements for Selected Embankment above.

2.7 SHOT ROCK BORROW

A. Shot Rock Borrow shall conform to the following gradation:

SIEVE DESIGNATION	PERCENT PASSING BY WEIGHT
6 Inch	100
4 Inch	85 - 100
3 Inch	10 - 50
No. 200*	0 - 3

**Gradation shall be determined on that portion passing the 3-inch screen*

B. At least 50% by weight of the particles retained on the 3/8-inch sieve shall have at least two fractured faces as determined by ATM T-4.

C. Elongation Specification
The length of the crushed stone backfill shall not be more than twice the designated screed diameters.

D. Sodium Sulfate Loss
Aggregate shall pass the percent sodium sulfate loss per AASHTO T 104 with 9% maximum.

E. LA Abrasion
Percent of wear per AASHTO T 96 shall be 45% maximum.

PART 3 – EXECUTION

3.1 EXCAVATION

A. Clearing and grubbing in excavation areas must be completed prior to beginning excavation operations.

B. Excavations shall be reasonably smooth and uniform to the lines, grades and cross sections shown in the Drawings or as directed by the ENGINEER. Excavations shall be conducted to ensure that material outside of excavation limits remains undisturbed.

C. Excavations shall be protected from erosion and maintained to drain freely at all times.

D. Excavation in rock shall be to a minimum depth of 12 inches below the top of the finished surface within the limits, unless otherwise shown in the Contract Documents. Undrained pockets shall not be left in the excavated surface of the rock.

E. When excavation to the limits indicated on the Drawings encounters unsuitable underlying material, the ENGINEER may require the CONTRACTOR to remove the unsuitable material and backfill with approved material. The CONTRACTOR shall take the necessary cross section measurements before backfill is placed in order to measure the amount of unsuitable material removed.

F. Excavated soils that do not meet the requirements for embankment material and surplus suitable excavation shall be disposed of by the CONTRACTOR at a location and in a manner approved by the ENGINEER. No material may be wasted without the prior approval of the ENGINEER.

G. The CONTRACTOR is responsible for securing a waste disposal site if none is indicated on the Drawings. The CONTRACTOR shall obtain the written permission of the landowner for use of all disposal sites, and shall either obtain any required permits or assure that they have been obtained by others. If required by the ENGINEER, the CONTRACTOR shall furnish the permit numbers of all required permits for the disposal sites. The costs of securing such sites shall be borne by the CONTRACTOR.

H. Waste areas shall be uniformly graded to drain, with the outer limits feathered to blend with the existing ground. Waste areas shall be seeded, capped with suitable material, or otherwise protected from long-term erosion.

I. All excavated soils that meet the requirements for embankment material shall be placed in the embankment up to a distance of 300-feet from the point of excavation, prior to importing borrow. If the CONTRACTOR places more borrow, or selected borrow than is required and thereby causes a waste of useable excavation, the amount of such waste shall be deducted from the borrow quantity for purposes of payment.

J. Temporary storage of useable or suitable excavation is the responsibility of the CONTRACTOR, and no additional payment will be made.

K. The CONTRACTOR shall conduct all operations to prevent contaminating useable excavation with unsuitable material.

L. When frozen material is excavated and meets all other requirements for embankment material, it shall be allowed to thaw and drain prior to placing in the embankment. This material will be considered useable excavation and no additional payment will be made.

M. All organic material shall be removed to a depth of five (5) feet within the road prism and pavement structure, unless otherwise shown in the Contract Documents, or as directed by the ENGINEER.

N. The CONTRACTOR shall provide added care when excavating adjacent to existing retaining walls, fences and houses. Damage caused to existing walls, fences and houses by the CONTRACTOR shall be repaired at the CONTRACTOR's expense.

O. After excavation to the subcut limit is complete and prior to placing separation and reinforcement fabric, if required, and backfilling with Borrow, Selected Borrow or Shot Rock Borrow, the bottom of the subcut shall be compacted with an excavator or backhoe-mounted vibrating compactor until a firm base for the backfill material is obtained.

3.2 EMBANKMENT

A. Embankments shall be constructed to a reasonably smooth and uniform shape conforming to the lines, grades and cross sections indicated on the Drawings or as directed by the ENGINEER.

B. The underlying ground shall be properly prepared prior to placing embankment material. Clearing and Grubbing in embankment areas must be completed prior to embankment operations. Debris shall be removed and surface depressions or holes shall be filled with suitable material to a level uniform surface and compacted before the embankment is constructed.

C. When embankment is to be placed on hillsides steeper than a 4:1 slope, new embankment is to be placed alongside existing embankments, or embankments are to be built half width at a time; the foundation shall first be prepared by constructing benches of sufficient width to accommodate placing and compacting equipment. Each bench shall begin at the intersection of the original ground and the vertical side of the pervious cut. Material so excavated and suitable for embankment construction shall be incorporated into the new embankment. Benching is incidental to other items in the contract and no direct payment will be made therefor.

D. Wherever an existing compacted roadway surface containing granular material lies within three (3) feet of the new embankment surface, such existing roadway shall be scarified to a depth of six (6) inches and incorporated into the first layer of embankment.

E. Rocks, broken concrete or other solid materials shall not be placed in embankment areas where piling is to be placed or driven, or where culvert placement is required.

F. When frozen soils are encountered in clearing or stripping operations preparatory to the placement of embankment, or in the excavation, or in undercuts in excavation areas, the ENGINEER shall require timely placement of the backfill or embankment materials, if such action is deemed essential to minimize deterioration or degradation of the

foundation material. Embankment shall not be placed over seasonally frozen ground except when written permission is received.

G. When excavation is performed at a season of the year when freezing weather is imminent, the CONTRACTOR shall place the specified backfill promptly, following the excavation WORK, at least up to a level which will allow the surface to adequately drain. In order to assume compliance, the ENGINEER may require that arrangements be made for the timely availability of such embankment or backfill materials prior to commencement of the stripping or excavation operations.

H. If embankment can be deposited on only one side of abutments, wing walls, piers or culvert headwalls, care shall be taken that the area immediately adjacent to the structure is not compacted to the extent that it will cause the overturning of, or excessive pressure against the structure.

I. When embankment is to be placed on both sides of a concrete wall or box-type structure, operations shall be so conduced that the embankment is always at approximately the same elevation on both sides of the structure.

J. The finish subgrade surface (bottom of base course level) shall not vary more than 0.05-foot when tested using a ten foot straightedge, nor vary more than 0.05-foot from the established grade. The bottom of subgrade surface shall not vary more than 0.10-foot from the established grade.

K. If continued hauling over a completed or partially completed embankment causes loss of stability as evidenced by pumping or rutting, or other damage, the CONTRACTOR shall repair the damaged embankment at its own expense and adjust its hauling equipment and procedures so as to avoid further damage.

3.3 EMBANKMENTS CONSTRUCTED WITH MOISTURE DENSITY CONTROL

A. Except for embankments constructed predominantly of rock fragments or boulders, all embankments shall be constructed with moisture density control. Embankments shall be placed in horizontal layers not to exceed eight inches in depth, loose measurement, for the full width of the embankment, except as required for traffic, and shall be compacted before the next layer is placed. A smaller depth will be required if the compaction equipment is considered by the ENGINEER to be insufficient to obtain the required densities. Embankments shall be compacted at the approximate optimum moisture content to not less than 95% of the maximum density as determined by AASHTO T 180 D or Alaska T-12. Embankment materials may require drying or moistening to bring the moisture content near to optimum. In place field densities will be determined by Alaska T-3 or T-11. Sufficient time shall be allowed between placement of layers to allow for field density tests.

3.4 EMBANKMENTS CONSTRUCTED FROM ROCK FRAGMENTS

A. When embankment material consists predominantly of rock fragments or boulders too large to be contained in the lift thickness specified without crushing or further fracturing, such material may be placed in lifts not exceeding in thickness the approximate average size of the larger rocks, or two feet, whichever is less.

B. This material shall not be dumped in final position but shall be deposited on the fill and distributed by blading or dozing so that voids, packets and bridging will be reduced to a minimum. Intervening spaces and interstices shall be filled with smaller stones and earth to form a dense, well compacted embankment. Hauling equipment shall be uniformly routed over the entire width of the embankment, and compaction equipment shall be utilized if necessary to assure that a well-compacted embankment is obtained.

3.5 OBLITERATION OF ROADWAYS

A. Obliteration of roadways shall include all grading operations necessary to incorporate the roadway into the new roadway and surroundings in order to provide a pleasing appearance from the new roadway. Ditches not required for drainage courses shall be filled and the roadway shall be rough graded so as to restore approximately the original contour of the ground.

END OF SECTION

SECTION 02203 - TRENCHING

PART 1 - GENERAL

1.1 DESCRIPTION

A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary for the excavation and backfill required for installation of pipelines, manholes, vaults, diversion structures, and other appurtenances; and for ground surface restoration, including pavement.

PART 2 - MATERIALS

2.1 TRENCH EXCAVATION

A. Trench excavation shall consist of all material, of whatever nature, excepting liquids, excavated from trenches within the limits described in Section 01025 - Measurement and Payment.

2.2 BEDDING

A. Bedding, Class A, shall be aggregate conforming to the following gradation:

Sieve Designation	Percent Passing by Weight
1-1/2"	100
No. 4	0-35
No. 200	0-8

B. Bedding, Class B, shall be three inch minus material, free of muck, frozen material, lumps, organic material, trash, lumber or other debris, with no more than eight percent passing the No. 200 screen.

C. Bedding material for pipe placement shall be non-frost susceptible material.

2.3 BACKFILL

A. Backfill is defined as material placed above the level of bedding material. Backfill material consists of native material excavated from the trench that is determined by the ENGINEER to be suitable as backfill. Backfill material used under asphalt or concrete pavement, as shown on the Drawings, shall be non-frost-susceptible, granular material that is free of rocks larger than six inches, much, frozen material, lumps, organic material, trash, lumber, or other debris. All backfill material available from trench excavation shall be utilized prior to the use of the imported backfill.

2.4 IMPORTED BACKFILL

A. Imported backfill shall be granular material, free draining, free of much, frozen material, lumps, or organic material and shall conform to the following gradation:

Sieve Designation	Percent Passing by Weight
3”	100
No. 4 *	20-70
No. 200 *	0-6

*Gradation shall be determined on that portion passing the three inch screen.

2.5 AGGREGATE BASE

A. Aggregate base shall conform to Grading D-1 of Section 02204 - Base Course.

2.6 ASPHALT CONCRETE PAVEMENT

A. Asphalt concrete pavement shall conform to that specified in Section 02801 - Asphalt Concrete Pavement. Aggregate gradation and asphalt cement percentages shall conform to Type II, Class B. Current safety and pollution controls shall be met.

2.7 PORTLAND CEMENT CONCRETE

A. Portland cement concrete shall conform to that specified in Section 03301 - Structural Concrete.

PART 3 - EXCECUTION

3.1 EXCAVATION

A. Prior to excavating trenches, all necessary clearing and grubbing shall be completed in accordance with the provisions of Section 02201 - Clearing and Grubbing.

B. Excavation for trenches shall conform to the lines and grades shown on the Drawings and to the limits depicted in the Standard Details. The CONTRACTOR shall also do any WORK necessary to prevent surface water from entering the trench.

C. Excavation of any and all material more than six inches below the invert of the pipe as shown on the Drawings shall be done only when ordered in writing by the ENGINEER. The material so excavated will be handled in the manner described below:

1. All excavated material suitable for use as backfill shall be piled in an orderly manner separately from unsuitable material, at a sufficient distance from the edge of the trench to prevent material from sloughing or sliding back into the trench. When the trench is in a traveled roadway the ENGINEER may require removal and temporary storage of excavated material elsewhere.
2. Materials unsuitable for use as backfill shall be hauled to a CONTRACTOR furnished disposal site off of the Project, unless otherwise directed in writing by the ENGINEER. The CONTRACTOR is responsible for securing waste disposal sites if none is indicated on the Drawings. The CONTRACTOR shall obtain the

written permission of the landowner for use of all disposal sites, and shall either obtain any required permits or assure that they have been obtained by others. If requested by the ENGINEER, the CONTRACTOR shall furnish the permit numbers of all required permits for the disposal sites. The cost of securing such sites shall be borne by the CONTRACTOR.

3. If the CONTRACTOR fails to comply with the provisions of any city ordinance or permit pertaining to waste disposal or disposal sites, the OWNER shall have the right, after giving 30 days written notice, to bring the disposal sites into compliance and collect the cost of the WORK from the CONTRACTOR, either directly or by withholding monies otherwise due under the contract.

D. No more than 150 feet of trench shall be open in advance of laying the pipe, and no more than ten feet of trench shall remain open at the end of each working period. When the trench is in a traveled roadway, it shall be completely backfilled, in accordance with the Specifications, and opened to traffic at the end of each working period, unless otherwise approved by the ENGINEER.

E. If explosives are used, the CONTRACTOR shall conduct the WORK in accordance with the requirements of Section 02090 - Blasting Controls.

F. The CONTRACTOR shall protect and preserve all existing pavement not designated for replacement, throughout the entire construction period. No tracked equipment may be operated on any pavement without first protecting the pavement with pavement pads approved by the ENGINEER. All pavement which is damaged in any manner by the CONTRACTOR's operations shall be restored to original or better condition at the CONTRACTOR's expense. Repair WORK to state highways shall be in all ways satisfactory to the Alaska Department of Transportation and Public Facilities.

G. Where required to prevent caving of the trench, or by any safety law or regulation such as OSHA, the CONTRACTOR shall furnish and install bracing and/or sheeting to protect the excavation. This bracing and/or sheeting shall be removed as trench backfill progresses.

H. The CONTRACTOR shall remove and dispose of all water entering the excavation. Disposal of water shall be done in a manner to prevent damage or nuisance to adjacent property, and in accordance with all applicable laws and regulations. Pumps shall be adequate to maintain a dry trench during the bedding, pipe installation, and initial backfill to an elevation at least one foot above the top of pipe. No backfill may be placed in standing water under any circumstances, except when the Drawings and/or Specifications specifically permit installation of HDPE water pipe in a wet trench.

I. Excavations for manholes and similar structures shall be large enough to provide proper working room. Any over depth excavation shall be backfilled with concrete or other approved material at the CONTRACTOR's expense.

J. The CONTRACTOR shall provide temporary support of existing structures, as necessary, to protect the structures from settlement or other disturbances caused by construction activities. All structures disturbed by the CONTRACTOR's activities shall be returned to original condition, or better.

3.2 BEDDING

A. Bedding shall be placed in conformance with the lines and grades shown on the Drawings and to the limits depicted in the Standard Details. Before placing any bedding material, the bottom of the trench shall be hand raked ahead of the pipe laying operation to remove stones and lumps which will interfere with smooth and complete bedding of the pipe. The specified bedding material shall then be placed in layer(s) the full width of the trench, each layer not exceeding eight inches in thickness loose measure, and compacted to 95% of maximum density as determined by AASHTO T 180 D, until the elevation of the plan grade for the pipe invert is attained. The pipe bed shall then be fine-graded by hand and compacted as above. Bell holes shall be hand dug at the location of joints and shall be of sufficient size to allow proper making of the joint and to prevent the collar or bell of the pipe from bearing on the bottom of the trench.

B. After the pipe has been laid and approved for covering, the specified bedding material shall be placed evenly on both sides of the pipe for the full width of the trench. Approval for covering does not imply final acceptance of the pipe, or relieve the CONTRACTOR in any way of responsibility to complete the Project in conformance with the Drawings and Specifications. Bedding material shall be placed in layers. The thickness, loose measure, or the first layer shall be either one-half the outside diameter of the pipe plus two inches or eight inches, whichever is least. This layer shall be compacted as specified above to provide solid support to the underside of the pipe.

C. The bedding material shall be placed and compacted in layers not more than eight inches in thickness, loose measure, up to a plane 12 inches above the top of the pipe.

D. The initial density test at any location will be paid for by the OWNER. If the initial test shows that the material compaction is not as specified, the CONTRACTOR shall modify the compaction methods used, as approved by the ENGINEER, and have the material re-tested until the tests show that the compaction method meets with the Specification requirements. If the CONTRACTOR's compaction methods are not consistent and/or do not meet the requirements of these Specifications, the OWNER reserves the right to undertake additional compaction tests as necessary to determine the extent of substandard compaction, and to charge the CONTRACTOR for all such tests.

3.3 BACKFILL

A. The trench shall be backfilled above the bedding material, as shown in the Standard Details, with approved material saved from trench excavation. If there is not sufficient approved material from the excavation, the backfilling of the trench shall be completed utilizing imported backfill. The backfill and/or imported backfill shall be compacted to 95% of optimum density within the street and sidewalk limits, as shown on the Drawings, and 90% elsewhere, as determined by AASHTO T 180 D. Lifts shall not exceed 12 inches in depth for loose material. After backfilling of the trench is completed, any excess material from trench excavation shall be hauled to a CONTRACTOR furnished disposal site off of the Project.

B. Where trenches cross roadways, streets or driveways, airport aprons, taxi lanes, etc., backfilling shall be done immediately following excavation and laying of the pipe. All crossings shall be backfilled, compacted, and open to traffic at the end of each working

period. Major road crossings shall be excavated and backfilled in half widths of the traveled way so that at least one-half of the roadway is open to controlled traffic at all times during the WORK. All WORK performed within a right-of-way shall be done in conformance with the appropriate permits issued by the respective agency having jurisdiction over the right-of-way.

C. At least 24 hours prior to commencing backfilling operations, the CONTRACTOR shall notify the ENGINEER of the proposed method of compaction. No method will be approved until the CONTRACTOR has demonstrated, under actual field conditions, that such method will produce the degree of compaction required.

D. The initial density test at any location will be paid for by the OWNER. If the initial test shows that the material compaction is not as specified, the CONTRACTOR shall modify the compaction methods used, as approved by the ENGINEER, and have the material re-tested until the tests show that the compaction meets the Specification requirements. If the CONTRACTOR's compaction methods are not consistent and/or do not meet the requirements of these Specifications, the OWNER reserves the right to undertake additional compaction tests as necessary to determine the extent of substandard compaction, and to charge the CONTRACTOR for all such tests.

3.4 AGGREGATE BASE

A. Aggregate base shall be placed in layers not exceeding six inches compacted depth, extending the full width of the trench and compacted to 95% of maximum density as determined by AASHTO T 180 D. The thickness of the top layer shall be such that, after compaction, the surface shall be at the elevation shown in the Drawings or Standard Details. Care shall be taken to assure proper compaction near the sides of the trench, and to avoid segregation.

3.5 ASPHALT CONCRETE PAVEMENT

A. Pavement to be removed shall be neatly saw cut full depth along straight lines. Only such pavement shall be removed as is necessary to excavate for the appurtenances, but the pavement shall be cut a sufficient distance outside the excavation to prevent damage to adjacent pavement by lifting or tearing the mat. All removed pavement shall be disposed of at the asphalt disposal stockpile in the CBJ/State Lemon Creek Gravel Pit.

B. After trench backfilling is complete, the edges of existing pavement shall be neatly saw cut vertically as shown in the Standard Details. All loose, cracked or undermined sections of existing pavement shall be removed. A tack coat shall be placed on the existing pavement edge just prior to placing new pavement.

C. Pavement shall be replaced in accordance with Section 02801 - Asphalt Concrete Pavement, and as shown on the Drawings and Standard Details. Pavement shall be placed in all streets and highways as soon as possible after completion of backfilling. All trenched highway crossings shall be patched within five days from the date each trench is first opened, unless otherwise shown in the Contract Documents, or approved by the ENGINEEER. When weather conditions, unavailability of material, or time preclude placing permanent pavement with five days, temporary pavement shall be installed. Temporary paving will consist of at least a two inch thick layer of a pre-mixed, asphaltic

surfacing material, and shall be installed and maintained flush with the existing surface until the permanent pavement is in place. Temporary pavement shall be removed prior to placing permanent pavement.

D. There shall be zero grade change perpendicular to the trench.

E. Permanently seal any cracks at joints with hot bitumenum after the permanent asphalt is in place. The CONTRACTOR shall repair all failed seals at joints during the 12 months after the date of final payment.

3.6 PORTLAND CEMENT CONCRETE

A. Portland cement concrete shall be replaced in accordance with Section 03301 - Structural Concrete, and the details shown on the Drawings and Standard Details.

END OF SECTION

SECTION 02204 - BASE COURSE

PART 1 - GENERAL

1.1 DESCRIPTION

A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary for furnishing and placing one or more layers of aggregate base or leveling course on a prepared surface to the lines and grades shown on the Drawings.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Aggregate base course shall consist of crushed gravel or crushed stone, conforming to the quality requirements of AASHTO M 147. The aggregate shall be free from lumps, balls of clay, or other objectionable matter, and shall be durable and sound.

B. Base course material shall conform to one of the following gradations as specified:

BASE COURSE GRADATIONS

(Percent passing by weight)

Sieve Design	A	B	C	C-1	D	D-1	E	E-1
4	100							
2	85-100	100						
1-1/2				100				
1			100	70-100	100	100		
3/4				60-90	100	70-100	100	
3/8				45-75		50-80		100
No. 4	30-70	30-70	40-75	30-60	45-80	35-65		45-80
No. 8				22-52		20-50		32-80
No. 10			25-55		30-65			
No. 40				8-30		8-30		
No. 200	0-10	3-10	4-10	0-6	4-12	0-6	0-6	0-6

C. For gradings C, D, and E, at least 50% by weight of the particles retained on the No. 4 sieve shall have at least one fractured face as determined by Alaska T-4.

D. For gradings C-1, D-1, and E-1, at least 70% by weight of the particles retained on a No. 4 sieve shall have at least one fractured face as determined by Alaska T-4.

PART 3 - EXECUTION

3.1 GENERAL

A. Prior to placement of the base course, the underlying surface shall be prepared by dressing, shaping, wetting or drying, and compacting of the underlying material to a minimum density of 95% as determined by AASHTO T 180-D. Surfaces shall be cleaned of all foreign substances and debris.

B. Any ruts or soft yielding spots that may appear shall be corrected by loosening and removing unsatisfactory material and adding approved material as required, reshaping, and recompacting the affected areas to the lines and grades indicated on the Drawings. If required by the ENGINEER, the CONTRACTOR shall proof load questionable areas with a loaded truck or other piece of equipment approved by the ENGINEER.

C. Blue-tops shall be set to the top of base course. They shall be set by the CONTRACTOR at breaks in grade and on even grade at intervals not to exceed 50 feet, with additional stakes at vertical curves.

D. Base course material shall be deposited and spread in a uniform layer to the required grades, and to such loose depth that when compacted to the density required, the thickness will be as indicated on the Drawings. Portions of the layer which become segregated shall be removed and replaced with a satisfactory mixture, or shall be remixed to the required gradation.

E. The maximum compacted thickness of any one layer shall not exceed six inches, except the compacted depth of a single layer may be increased to eight inches if compaction equipment capable of delivering sufficient compactive energy, as determined by the ENGINEER, is used. If the ENGINEER requires the compacted depth to exceed six inches, and if compaction equipment capable of delivering sufficient compactive energy, as determined by the ENGINEER is not used, the base shall be constructed in two or more layers of approximately equal thickness. Each layer shall be shaped and compacted before the succeeding layer is placed.

F. The base course shall be compacted to at least 95% of maximum density as determined by AASHTO T 180-D. In places not accessible to rolling equipment, the mixture shall be compacted with hand-tamping equipment.

G. Blading, rolling, and tamping shall continue until the surface is smooth and free from waves and irregularities. If at any time the mixture is excessively moistened, it shall be serrated by means of blade graders, harrows, or other approved equipment, until the moisture content is such that the surface can be recompacted and finished as above.

H. The grading operations shall be conducted in a manner that will remove any quarter crowns, or other humps in the cross section of the roadway. The cutting edges of the grading blade shall be replaced if they are found to be worn beyond the tolerances specified for the roadway surface. The finished surface shall not have humps or dips between blue-topped intervals along the roadway alignment that exceed the tolerances given in the following paragraph, I.

I. The surface of the base course, when testing using a ten foot straightedge shall not show any deviation in excess of 3/8 inch between two contact points. The finish surface shall not vary more than 1/2 inch from established grade. Additionally, the algebraic average of all deviations from established grade of the finish base course surface elevations taken at 50-foot intervals shall be less than 0.02 foot.

J. The initial density at any location will be paid for by the OWNER. If the initial test shows that the material compaction is not as specified, the CONTRACTOR shall modify the compaction methods used, as approved by the ENGINEER, and have the material

retested until the tests show that the compaction meets the Specification requirements. All tests, after the initial test at any given location, shall be paid for by the CONTRACTOR.

END OF SECTION

SECTION 02205 - RIPRAP

PART 1 - GENERAL

1.1 DESCRIPTION

A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary for furnishing and placing a protective covering of stone, as shown on the Drawings, or as directed by the ENGINEER.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stone for this WORK shall be hard angular quarry stones 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 1/4 its greatest dimension. Rounded boulders or cobbles shall not be used on slopes steeper than 2:1. Stones shall meet the following gradation requirement for the Class specified:

Class I
No more than 10% of the stones by total weight shall weigh more than 50 pounds per piece, and no more than 50% of the stones by total weight shall weigh less than 25 pounds per piece.

Class II
No more than ten percent of the stones by total weight shall weigh more than 400 pounds per piece, and no more than 15% of the stones by total weight shall weigh less than 25 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.

Class III
No more than 10% of the stones by total weight shall weigh more than 1,400 pounds per piece, and no more than 15% of the stones by total weight shall weigh less than 25 pounds per piece. The stones shall be evenly graded and a minimum of 50% by weight of the stones shall weigh 700 pounds or more per piece.

B. Filter cloth shall conform to the requirements of Section 02714 - Filter Cloth.

PART 3 - EXECUTION

3.1 CONSTRUCTION

A. Foundation or toe trenches and other necessary excavation shall be completed and approved by the ENGINEER before the placing of riprap is begun. Slopes to be protected with riprap shall be free of brush, trees, stumps and other objectionable material and shall be dressed to a reasonably smooth surface.

B. Filter cloth shall then be placed as provided for in Section 02714 - Filter Cloth, Article 3.1.

C. The stones shall be handled or placed with an excavator as to secure a stone mass of the thickness, height and length shown on the Drawings, or as staked, with a minimum of voids.

D. Undesirable voids shall be filled with small stones or spalls. The rock shall be manipulated sufficiently by means of a bulldozer, excavator, rock tongs, or other suitable equipment to secure a reasonably regular surface and mass stability.

E. Riprap protection shall be placed to its full course thickness at one operation and in such manner as to avoid damaging the filter cloth or 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.

F. All riprap shall be so placed and distributed that there will be no large accumulation or area composed mainly of either the larger or small sizes of stone.

G. 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 place filter cloth and to prevent mixture of embankment and riprap material.

H. The CONTRACTOR shall provide a level, compact area of sufficient size to dump and sort typical loads of riprap at an approved location; and shall dump loads, as specified, in this area; and shall assist the ENGINEER as needed to sort and measure the stones for the purpose of determining if the riprap is within Specifications. Mechanical equipment as needed to assist in this sorting shall be provided by the CONTRACTOR at no additional cost.

END OF SECTION

SECTION 02401 - SANITARY SEWER PIPE

PART 1 - GENERAL

1.1 DESCRIPTION

A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary for furnishing and installing sanitary sewer pipe, in accordance with these Specifications and in reasonably close conformity with the lines and grades shown on the Drawings or established by the ENGINEER.

B. This WORK includes furnishings and installing connecting bands, branch connections, elbows or other fittings, and all appurtenances required to complete the sanitary sewer.

1.2 SUBMITTALS

A. Sanitary Sewer Pipe: Material certifications stating conformance with the requirements of this Section.

PART 2 - PRODUCTS

2.1 DUCTILE IRON PIPE (GRAVITY AND PRESSURE SEWER)

A. Ductile Iron Pipe shall conform to ANSI A21.51. Pipe and fittings shall be cement mortar lined in conformance with ANSI A21.4 and shall have an exterior bituminous coating conforming to the requirements of ANSI A21.10. Pipe joints shall conform to ANSI A2.11 and shall be push-on type as manufactured by United States Pipe and Foundry Company for Tyton pipe, or equal.

B. Prior to the use of any pipe, the CONTRACTOR shall furnish a certification from the pipe manufacturer that all required tests have been made and that the pipe fully complies with the requirements of ANSI A21.51.

C. Nominal pipe diameter is shown on the Drawings. No change in pipe diameter shall be made unless approved by the ENGINEER. The minimum pipe strength shall be thickness Class 50. The pipe size and thickness class shall be clearly marked on each pipe.

D. Where special fittings are required, they shall be fabricated from steel pipe manufactured in accordance with AWWA Standard C200. The steel fitting shall be fabricated with spigot ends suitable for connection to the ductile iron pipe, with cast iron transition couplings as manufactured by Smith-Blair, Inc., or equal. Steel fittings shall be lined and coated with fusion epoxy system as supplied by Water Works Supply Company, Union City, California, or with hot applied coal tar in accordance with AWWA C203.

E. Connections between ductile iron pipe and PVC pipe shall be made with 'ROMAC" Stainless Steel Sleeve, or approved equal.

2.2 PVC SEWER PIPE

A. PVC Sewer Pipe, four inch through 15 inch in diameter, inclusive, shall have a standard dimension ratio (SDR) of 35, and conform to ASTM D 3034. Before any PVC pipe is used on this Project, the CONTRACTOR shall supply certifications, signed by an authorized agent of the seller or manufacturer, stating that the material has been sampled, tested, and inspected in accordance with ASTM D 3034.

B. PVC Sewer Pipe greater than 15 inch in diameter shall conform to ASTM F 679. Before any PVC pipe is used, the CONTRACTOR shall supply certifications, signed by an authorized agent of the seller or manufacturer, stating that the material has been sampled, tested, and inspected in accordance with ASTM F 679.

C. The pipe shall have integral wall bell and spigot joints conforming to ASTM D 3212. The bell shall consist of an integral wall section with a solid cross-section elastomeric ring, factory assembled, securely locked in place to prevent displacement.

D. Flexible water-tight connections, approved by the ENGINEER, shall be used at PVC pipe connections to manholes and other rigid structures.

2.3 PVC PRESSURE PIPE

A. PVC pressure pipe shall conform to the applicable requirements of ANSI/AWWA C900 and subject to additional requirements specified herein.

B. The pipe shall be pressure class 100, and shall be furnished complete with rubber gaskets.

C. Fittings for PVC pressure pipe shall be cement motor lined ductile iron in conformance with ANSI A21.4 and shall have an exterior bituminous coating conforming to the requirements of ANSI A21.10.

D. All joints for the buried PVC pipe shall be either an integral bell manufactured on the pipe or a separate coupling both employing a rubber ring joint. The bell and coupling shall be the same thickness as of the pipe barrel, or greater thickness. The sealing ring groove in the coupling shall be of the same design as the groove in cast iron fittings and valves available from local water works supply distributors.

E. Flexible water-tight connections, approved by the ENGINEER, shall be used at PVC connections to manholes and other rigid structures.

F. Connections between PVC Sewer Pipe and PVC Pressure Pipe (PVC (HP)), shall be made with "ROMAC" Stainless Steel Sleeve, or approved equal.

2.4 HDPE PRESSURE PIPE

A. High-Density Polyethylene (HDPE) pipe shall conform to ASTM D 3550 designation PE 3407 or PE 3408. The pipe shall have a minimum pressure rating of 100 pounds per square inch and a maximum Standard Dimension Ration (SDR) of 17.0. All HDPE shall have a standard iron pipe size (IPS) outside diameter.

B. The pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions or other injurious defects. It shall be uniform in color, opacity, density, and other physical properties.

C. HDPE pipe shall have an ASTM D-3350 material Cell Classification of no less than 335434C.

D. The pipe shall be marked at five foot intervals with a coded number which identifies the manufacturer, SDR size, PPI rating, manufacturing standard reference and production code from which data and place of manufacturer can be determined.

E. When HDPE pipe is connected to ductile iron pipe, a flange adapter shall be used. A flange-coupling adapter shall be used on the ductile iron pipe. HDPE flange adapters shall be manufactured by the same manufacturer as the pipe using the same resin as the pipe. Each flange adapter shall be furnished with a ductile iron convoluted back-up ring drilled to match the standard ANSI bolt pattern for the nominal diameter of pipe used.

F. Connection of the pipe and fittings shall be performed by the thermal butt fusion system. HDPE pipe lengths, fittings, and flange adapter connections to be fused shall be of the same type, grade and class of polyethylene compound and supplied by the same raw material supplier.

2.5 PVC PRESSURE PIPE WITH RESTRAINED JOINTS

A. Piping for PVC Pressure Pipe with Restrained Joints shall be PVC Pressure Pipe as specified above.

B. Pipe joints shall be restrained using Uniflange Series 1350 joint restraints or approved equal.

2.6 POLYETHYLENE PIPE

A. Polyethylene Pipe shall conform to the requirements of ASTM F 714, with SDR of 32.5.

B. Pipe shall be listed by the National Sanitation Foundation.

C. Joints shall be made by butt-fusion, with connections to dissimilar materials by stub ends and backing flanges or steel/HDPE transition couplings.

2.7 ACRYLONITRILE-BUTADIENE-STYRENE (ABS) PIPE

A. Acrylonitrile-Butadiene-Styrene (ABS) Pipe four inches in diameter shall conform to the requirements of ASTM D 2751. ABS Pipe six inches through 15 inches in diameter shall conform to the requirements of AASHTO M 264 (ASTM D 2680).

B. Joints shall be solvent welded using a primer and cement in accordance with the manufacturer's specifications. All joints shall be wiped clean and dry before applying the primer. All fittings shall be installed in accordance with the manufacturer's specifications.

C. Handling, storage, and installation of pipe shall conform to the recommendations of the manufacturer.

D. Truss pipe shall be used only with Fiberglass Reinforced Plastic (FRP) manholes using molded truss pipe connectors bonded to the barrel.

2.8 UNDERGROUND MARKING TAPE

A. Underground marking tape shall be green, at least four (4) inches wide, four mil thick, polyethylene tape, with a metallic backing capable of being traced with locators. The tape shall have black letters with the following wording: "Caution: Sewer Line Buried Below." The marking tape shall be installed 12 inches above the top of all sewer mains and services.

PART 3 - EXECUTION

3.1 CONSTRUCTION

A. Excavation, bedding, and backfill shall conform to the requirements of Section 02203 - Trenching. Underground marking tape shall be installed as shown on CBJ Standard Detail 125 - Pavement Resurfacing and Trench Detail.

B. Sheeting and bracing required for trenches shall be removed to the elevation of the conduit, but no sheeting will be allowed to be pulled, removed, or disturbed below the conduit. Sheeting and bracing shall meet OSHA requirements.

C. Before lowering into the trench, the pipe shall be inspected for defects. All cracked, chipped, or broken pipe shall be discarded. The ends and interior of the pipe shall be clean. Belled ends shall be laid upgrade. Handling of the pipe shall be accomplished in a manner that will not damage the pipe. The joint shall be made in the manner recommended by the manufacturer. Care shall be taken not to buckle or disturb previously laid pipe.

D. Pipe shall be laid accurately to the staked line and grade. All service connections shall be installed as indicated on the Drawings. Where existing service sewers are to be connected, suitable fittings and adapters shall be provided by the CONTRACTOR.

E. Pipe shall be cleaned of all foreign matter, and water shall be kept out of trenches until joints have been completed. When WORK is not in progress, open ends of pipe and fittings shall be securely closed to keep foreign matter and animals from entering.

F. Each joint shall be inspected to ensure that it is properly made before backfilling is done. Care shall be taken to prevent any dirt or foreign matter from entering the open end of the pipe. Where it is necessary to cut pipe, such cuts shall be neatly made in an approved manner. The laid pipe shall be true to line and grade and, when completed, the sewer shall have a smooth and uniform invert. No section of gravity sewer, including service connections shall have an adverse grade which would pond water in the invert of the sewer.

G. Connections to pipe stubs of a different pipe material shall be made with DFW/HPI non-shear-type connector, as shown in CBJ Standard Detail 218 - Coupling for Dissimilar Sanitary Sewer Pipes. Connectors must be approved by the ENGINEER prior to installation.

H. Connections to pipe stubs of a different pipe material, if made beyond the back of sidewalk or other concrete or paved surface, shall be made with a suitable connector. Connectors must be approved by the ENGINEER prior to installation. Connection of all piping, other than bell and spigot connections, within the roadway, street and sidewalk areas, shall be made per CBJ Standard Detail 218 - Coupling for Dissimilar Sanitary Sewer Pipes.

I. Connections to existing sewer mains, service connections, and manholes shall be made in such a manner so as to not damage the existing facility. Such connections shall be made so that no projections or rough surfaces occur within the pipe.

J. Locations of the sewer laterals are approximate and may be changed by the ENGINEER. Relocating of the sewer lateral will not add extra cost to the OWNER, unless either of the following conditions result:

1. The relocation results in a significant increase in the length of the lateral; or,
2. There are significant differences in the surface characteristics at the new lateral location which would result in substantial and foreseeable changes in construction methods and materials.

K. If the CONTRACTOR believes that the WORK at the new location(s) will result in a substantive change, the CONTRACTOR shall notify the ENGINEER prior to beginning the changed WORK. The ENGINEER will evaluate the request and if the relocation is warranted, the change in WORK shall be authorized.

L. Lateral connections to existing sewer mains shall not obstruct flow and shall be one of the following:

1. Approved remote tapping system
2. Polyethylene saddle strapped to line with two stainless steel bands and neoprene gaskets.
3. Sidewall fused to line as recommended by pipe manufacturer.
4. Manufactured saddle per CBJ Standard Detail 210 - Sanitary Sewer Saddle Tee.

M. Cleanouts shall be provided with a cast iron ring and cover which shall be locking-type Olympic Foundry No. M-1025, or approved equal. The cover shall be clearly marked with the word "SEWER" case into it.

N. Lateral connections to new sewer mains shall be made with a manufactured sanitary wye of the same material as the mainline pipe.

O. Locate Sewer Services shall require that the CONTRACTOR determine the location of the existing sewer services prior to installation of the mainline pipe in such a way that the

service wyes can be installed in the proper location as the mainline pipe is being installed. No service saddles will be permitted, unless approved by the ENGINEER.

P. Where gravity flow sanitary sewers cross above or less than 18 inches below waterlines, or approximately parallel water lines within ten feet horizontally, the sewer pipe shall meet the requirements of ductile iron pipe or PVC pressure pipe, as described in Part 2 of this Section.

Q. HDPE to HDPE connections shall be made by thermal butt fusion, in accordance with ASTM D2657. Fusion jointing shall utilize a pipe manufacturer approved fusion machine operated by experienced and qualified personnel. The CONTRACTOR shall provide three copies of a "Heat Fusion Qualification Guide," published by the HDPE manufacturer, that provides criteria for inspection of thermal fusion joints. The guide shall include criteria for operator training requirements and experience; visual inspection criteria (including photographs) for both intact thermal fusion joints and sample strips cut for thermal fusion joints. The thermal fusion machine operator shall perform a minimum of three test joints in the presence of the ENGINEER. The test joints will be examined from both exterior appearances and from appearance of the joint cross section once the samples have been cut into strips.

R. Bolted HDPE to HDPE connections shall include a polyethylene flange adapter (stub end) butt fused to the pipe, a backup flange ring, bolts, nuts and a gasket. Flange rings shall be Standard Steel ring Flanges, Class D, in accordance with AWWA C207. High strength bolts, nuts, washers and gaskets shall be in conformance with AWWA C207, Appendix A. Flange rings, bolts, nuts and washers shall be hot dip galvanized after fabrication per ASTM A153 and A386. Gasket dimensions and bolt lengths shall be per pipe manufacturer's recommendations.

3.2 TESTING

A. Prior to testing all manholes, all sections of pipe shall be cleaned using an inflatable rubber ball of a size that will inflate to fit snugly into the pipe. The ball may, at the option of the CONTRACTOR, be used without a tag line; or a rope or cord may be fastened to the ball to enable the CONTRACTOR to know and control its position at all times. The ball shall be placed in the last clean out or manhole on the pipe to be cleaned, and water shall be introduced behind it. The ball shall pass through the pipe with only the force of the water impelling it. All debris flushed out ahead of the ball shall be removed at the first manhole where its presence is noted. In the event cemented or wedged debris, or a damaged pipe, stops the ball, the CONTRACTOR shall remove the obstruction and make any necessary repairs in a manner that is acceptable to the ENGINEER. Any alternate methods of cleaning sewers shall be submitted to the ENGINEER for approval, and shall not be used unless approved.

B. Prior to testing, the sewer shall be complete with laterals, and trenches shall be fully backfilled and compacted to finish grade, or, if the sewer is under pavement, finish pavement subgrade.

C. For WORK involving placement of new sanitary sewer collection systems, all sections of pipe shall be tested for leakage using the Exfiltration Test for either air or water as specified hereafter; or, at the sole direction of the ENGINEER, when the normal water

table is above the sewer throughout the section under test, the ENGINEER may permit use of the Infiltration Test procedure specified hereafter. Where leakage is in excess of the specified rate, the sewer shall be repaired by the CONTRACTOR as required to comply with the leakage test requirements. The ENGINEER may require the CONTRACTOR to repair obvious leaks even though the total length of the test section falls within the maximum allowable leakage for the test used.

D. For WORK involving replacement of existing, active sanitary sewer collection systems, and the new system is not put into service during the same work shift, no Exfiltration/ or Infiltration Tests will be required. TV inspection of the new pipes by the ENGINEER shall be used to determine system acceptance.

E. Defective pipe joints shall be repaired in a manner that the repaired pipe joint will have some flexibility and the effectiveness of the repair will not be affected by differential movement of the adjoining pipes. A "CSSI" or DFW/HPI non-shear coupling, as per CBJ Standard Detail 218 - Coupling for Dissimilar Sanitary Sewer Pipes, or approved equal, will be acceptable in making such repairs.

F. The ENGINEER will make one complete TV inspection after all sewers have passed the specified watertightness test. All defects regarding sewer alignment and grade, damaged pipe, and visible leaks observed during this inspection, shall be corrected by the CONTRACTOR. The CONTRACTOR shall de-water the sewers as required for the performance of the TV inspection work by the ENGINEER. The CONTRACTOR shall be responsible for all costs associated with any TV inspection required following the initial TV inspection, if any defects were observed during this or any subsequent TV inspections.

G. The hydrostatic test procedure for HDPE Pipe shall consist of two (2) steps: the initial expansion phase and the test period. In order to accommodate the initial expansion of the pipe under test, sufficient make-up water shall be added to the system at hourly intervals for three hours to return to the test pressure. The test period begins after the final addition of make-up water in the expansion phase of the test procedure. The test period is three (3) hours. After this test period, a measured amount of make-up water shall be added to return to test pressure. The amount of make-up water shall not exceed the allowable expansion in U.S. gallons shown in the following table:

THREE HOUR TEST

Nominal Pipe Size (Inches)	Allowance for Expansion (U.S. Gal. Per 100 feet of pipe)
8	1.5
10	2.1
12	3.4
16	5.0
18	6.5

Under no circumstances shall the total test procedure exceed eight hours at 1.5 times the pipe pressure rating. If the test is not completed within eight hours, the test section shall not be re-tested for eight more hours. Repair and re-testing shall continue until a passing test is obtained.

3.3 FILTRATION TEST (USING AIR)

A. The CONTRACTOR shall furnish all facilities and personnel for conducting the test under the observation of the ENGINEER. The equipment and personnel shall be subject to the approval of the ENGINEER. Joints only may be tested in pipe 36 inches in diameter or larger, at the option of the CONTRACTOR.

B. Immediately following the pipe cleaning, the pipe installation shall be tested with low pressure air. Air shall be slowly supplied to the plugged pipe installation until the internal air pressure reaches five pounds per square inch greater than the average back pressure of any ground water that may submerge the pipe. At least two minutes shall be allowed for temperature stabilization before proceeding further.

C. The pipeline shall be considered acceptable when tested at an average pressure of four psi greater than the average pressure of any ground water that may submerge the pipe if the section under test does not lose air at a rate greater than 0.0030 cubic feet per minute per square foot of internal surface.

D. The requirements of this Specification shall be considered satisfied if the time required for the pressure to decrease from 4.5 psi to 3.5 psi above average ground water pressure is greater than that shown on the following table:

TIME FOR PRESSURE TO DROP FROM
4.5 TO 3.5 PSI ABOVE AVERAGE GROUND WATER PRESSURE

Pipe Diameter	Minutes	Seconds
8 "	3	57
10"	4	43
12"	5	40
15"	7	5
18"	8	30
24"	11	20
30"	14	10

E. For other sizes, determine test time using the following formula:

$$T = 28.33\ D$$

Where T = time in seconds
D = pipe diameter in inches

F. For pipes 36 inches in diameter, or larger, if individual joints are tested, they shall hold six psi air pressure over the average back pressure of any ground water for a minimum time of 15 seconds.

G. Pressure gauges should be incremented in not more than one-half pound increments for accurate tests.

H. Braces shall be required to hold plugs in place and to prevent the sudden release of the compressed air. Due to the large forces that could be exerted by an escaping plug during the testing of the pipe, no one shall be allowed in the manholes in which plugs have been placed while tests are being conducted. The CONTRACTOR's testing equipment shall have a pressure relief device that will prohibit the pressure in the pipeline from exceeding ten pounds per square inch.

3.4 EXFILTRATION TEST (USING WATER)

A. Where groundwater is below the pipe to be tested, a minimum of head of eight feet of water above the crown at the upper end of the test section shall be maintained for a period of four hours, during which time it will be presumed that full absorption of the pipe body has taken place, and thereafter for a further period of one hour for the actual test of leakage. During this one hour period, the measured loss shall not exceed the rate given below:

Type of Pipe	Allowable Exfiltration Rate
PVC	E = 0.0004 DL
Ductile Iron	E = 0.00008 DL

E = Allowable leakage in gallons per hour
D = Nominal inside diameter of pipe in inches
L = Length of pipe being tested in feet

B. Where groundwater is above any pipe to be tested, the minimum head of the test will be raised to provide an elevation head of eight feet above the groundwater.

C. The maximum length of sewer in any test section shall be 500 feet.

3.5 INFILTRATION TEST

A. Infiltration testing may be allowed at the ENGINEER's option when the natural ground water table is above the crown of the higher end of the test section and the external water pressure exerted on the pipe is equivalent to the exfiltration test. The maximum allowable limit for infiltration shall be as determined by the formulas defined in the above section Exfiltration Test (Using Water).

3.6 PRESSURE SEWER TEST

A. The CONTRACTOR shall, in the presence of the ENGINEER, test all pressure sewer pipe to a test pressure of 100 pounds per square inch and maintain the pressure a minimum of one hour. The CONTRACTOR shall make all necessary arrangements to provide water for testing pipelines.

B. Leakage shall not be in excess of five gallons per inch of pipe diameter per one thousand (1,000) feet of pipe per day. Where leakage is in excess of the specified rate, the CONTRACTOR shall make all repairs necessary to reduce the amount of leakage to a quantity within the specified rate. The testing and repair process shall be repeated until the installation is accepted. In addition, the CONTRACTOR shall repair all visible leaks.

END OF SECTION

SECTION 02402 – SANITARY SEWER MANHOLES AND CLEANOUTS

PART 1 – GENERAL

1.1 DESCRIPTION

A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary for furnishing and installing sanitary sewer manholes and cleanouts complete, in place. It shall also include raising or lowering existing sanitary sewer manholes and cleanouts to conform to the final grade as shown on the Drawings and Standard Details.

1.2 SUBMITTALS

A. Manholes: Shop Drawings showing method of construction and reinforcement, invert elevations, and overall dimensions.

B. Frames and Grates: Catalogue cuts and materials certification.

PART 2 – PRODUCTS

2.1 MANHOLES

A. All manholes shall consist of precast concrete sections, including integral base section, riser sections, cones, and flat slab tops and shall conform to ASTM C 478 and the dimensions shown on the Drawings. All precast sections shall have joints sealed with "RAM-NEK" or "RUB-R-NEK" gasketing material, or approved equal, installed as specified by the manufacturer. Cones shall be eccentric. Manhole steps shall be cast in all precast manhole sections. Pipe penetration gaskets shall be cast into all precast manholes. Grade rings shall be standard product, manufactured particularly for use in manhole construction, sized to fit the cones on which they are placed, and the wall thickness shall be not less than that of the cones. Grade rings shall be not less than two inches high, nor more than four inches high. Grade rings shall be *Infra*-Riser® or approved equal.

B. Portland cement concrete cast in place shall conform to Section 03302 – Concrete Structures.

2.2 FRAMES, COVERS AND STEPS

A. Manhole frames and covers shall be watertight, of ductile iron, and conform to the design and dimensions shown on the Drawings and Standard Details. Ductile iron castings shall conform to the requirements of AASHTO M 103. Grade shall be optional unless otherwise designated. Contact surfaces between frames and covers shall be machined to provide a uniform contact surface. When watertight locking devices are specified, the CONTRACTOR shall submit Shop Drawings for approval by the ENGINEER.

B. All manhole covers shall have the word "SEWER" cast into the top in letters approximately three inches high.

C. Manhole steps shall be constructed of polypropylene conforming to ASTM D4101, and shall meet current state and federal safety standards.

D. Frames and covers shall be ductile iron, conforming to ASTM A 48, Class 30. The cover shall be designed for the appropriate classification of traffic and shall have the word "SEWER' cast into the top with prominent letters. Bearing surfaces between the frame and cover shall be machined to smooth, plane surfaces. Frames and covers shall be Inland Foundry No. 743, or approved equal.

2.3 MISCELLANEOUS

A. All pipes, bends and fittings used in cleanouts, drop connections, and pipe stubs for future connections to manholes shall conform to Section 02401 – Sanitary Sewer Pipe.

B. Bentonite-Cement sealing plaster shall consist of two parts bentonite, one part Type 3 cement, and one part sand, with sufficient water to obtain workable consistency.

C. Mortar shall consist of one part portland cement to two parts clean, well-graded sand which will pass a No. 4 screen. Admixtures may be used not exceeding the following percentages of weight of cement; hydrated lime, 10%; diatomaceous earth or other inert material, 5%. Consistency of mortar shall be such that it will readily adhere to the surface. Mortar mixed for longer than thirty minutes shall not be used. A non-shrink mortar may be submitted for approval as a substitute.

D. Grout shall be a non-shrink type approved by the ENGINEER.

E. Pipe penetration gasket through the manhole wall shall be cast-in-place Dura-Seal III, or approved equal, as manufactured by Dura-Tech, Inc., Kor-N-Seal Cavity O-Ring, or approved equal, as manufactured by NPC Inc. shall be used for filling the preformed void in the connection gasket.

F. 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.

PART 3 – EXECUTION

3.1 CONSTRUCTION

A. Portland cement concrete cast in place shall conform to the requirements of Division 3 – Concrete. Concrete shall not be placed under water. Running water shall not be permitted over newly poured concrete.

B. Manholes shall be constructed in a dry excavation on a six inch compacted (95%) base of D-1. The excavation shall be kept dry until the concrete or mortar has developed sufficient strength to prevent rupture by groundwater pressure.

C. Manhole inverts shall be formed as shown on the Drawings, either by laying pipe through and cutting out the top portion before completion of the base of the manholes, or by forming U-shaped channels in the concrete base section. Cut edges of pipe laid through

the manhole shall be fully covered by concrete when the manhole invert is complete. The finished invert shall be smooth and true to grade. No mortar or broken pieces of pipe shall be allowed to enter the sewers.

D. Precast bases sections shall be set on a level base of six inches of compacted D-1, as shown in the Standard Details. Provisions shall be made to prevent flotation of the manhole.

E. All lifting holes shall be plugged with Bentonite-Cement sealing plaster and sealed with a Miradri System patch, or approved equal, to a minimum of six inches from the edges of the opening, as required to prevent leakage.

F. After completion of the manhole, all plugs shall be completely removed from the sewers and all loose material shall be removed from the manhole.

G. Service connections shall not be installed into manholes unless otherwise shown on the Drawings or directed by the ENGINEER. Where service connections into manholes are allowed, the top of the service sewer pipe shall be 0.2 feet higher than the top of the downstream main sewer pipe. The manhole invert shall be channeled for the service connection sewers in the same manner as for main sewers.

H. Stubs for future construction shall consist of a section of pipe extending two feet outside the manhole wall, connected as shown on the Drawings and Standard Details. The manhole fillet shall be formed for future connection. The stubs shall be located as shown on the Drawings.

I. Connection to existing manholes shall be made in such a manner that the modified manhole is equal to a new manhole in appearance and performance. A channel, approximately two inches larger all around than the connecting pipe, shall be cut into the existing manhole base. The new pipe shall be connected as shown on the Drawings and Standard Details. The rough-cut channel shall be finished to its final smooth and uniform shape with mortar. The existing sewer(s) shall be maintained in service and the fresh concrete and mortar surface shall be protected from the flowing sewage for a minimum of 24 hours.

J. Drop construction at manholes shall be as shown on the Drawings and Standard Details.

K. The joint exterior waterproofing system shall be installed as recommended by the system manufacturer and as shown on the Drawings and Standard Details.

L. All manholes will be visually inspected by the ENGINEER; there shall be no evidence of leakage of water into any manhole from outside sources or any imperfections which may allow such leakage.

M. At least 25% of the completed manholes, as selected by the ENGINEER, shall be tested for water-tightness by the CONTRACTOR. The test shall be made, with all connecting pipes plugged, by filling the manhole with clean water to within two inches of the bottom of the cast iron frame. The leakage rate shall not exceed three gallons per day per foot of depth, or fifty gallons per day, whichever is less, over a test period of not less than two

hours when the water table is not an adverse factor. For every manhole that fails to meet the test, four additional manholes shall be tested.

N. If the water table is an adverse factor, the manhole shall be pumped completely dry, all pipes plugged, and then be checked for infiltration. The leakage rate shall not exceed three gallons per day per foot of depth, or fifty gallons per day, whichever is less, over a test period of not less than two hours.

O. Cleanouts shall be constructed as shown on the Drawings and Standard Details. The frame shall be jointed to the riser pipe so that groundwater will be prevented from entering the sewer. Cleanouts shall be tested for watertightness along with the sewers to which they are connected.

P. The CONTRACTOR shall repair all imperfections and leaks disclosed by either visual inspection or testing. The method of repair shall be subject to the ENGINEER's approval.

Q. ADJUST EXISTING FRAME AND COVER TO GRADE shall include adjusting the existing frame and cover to grade, and construction of a concrete collar in accordance with CBJ Standard Detail 126 – Concrete Collar, when the frame and cover is located within the paved street surface.

R. Construct a concrete collar around each manhole frame and cover within the roadway pavement limits. Sawcut through the total pavement depth following final paving and construct the concrete collar in accordance with CBJ Standard Detail 126 – Concrete Collar. No backfilling, except with concrete, will be permitted. Seal all sawcut grooves beyond the edge of concrete.

3.2 CONNECT TO EXISTING MANHOLE

A. CONTRACTOR shall remove or plug existing pipe as applicable, drill hole at new location required for installation of sewer under this contract, install pipe, seal the pipe penetration, form channeled inverts, install drop connections as required, and backfill as require.

END OF SECTION

SECTION 02403 – SANITARY SEWER ENCASEMENT

PART 1 – GENERAL

1.1 DESCRIPTION

A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary to

1. Install reinforced concrete for furnishing and installing sanitary sewer pipe (except laterals) that cross above the grade of water pipe, as shown on the Drawings and CBJ Standard Detail 215 – Sanitary Sewer Encasement, or as directed by the ENGINEER, or
2. Replace the length of sanitary sewer otherwise required to be encased with ductile iron pipe.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Materials shall be as specified in Section 2601 – Water Pipe, and Section 03302 – Concrete Structures.

PART 3 – EXECUTION

3.1 GENERAL

A. When a water pipe crosses a sanitary sewer pipe, services and laterals excluded, a minimum of 18 inches of vertical separation shall be provided. When the water pipe crosses below the sanitary sewer pipe, the sanitary sewer pipe shall be either placed in a reinforced concrete encasement, or replaced with ductile iron pipe with encased joints.

B. Reinforced concrete encasement of sanitary sewer pipe shall be poured monolithically and shall extend the full length of the sanitary sewer pipe between points ten feet each side of the water pipe, measured perpendicular to the water pipe, as shown in the CBJ Standard Detail 215 – Sanitary Sewer Encasement.

C. In lieu of paragraph 3.1A., the affected length of sanitary sewer pipe may be replaced with ductile iron or C900 PVC pipe of the same size, laid to the same line and grade.

END OF SECTION

SECTION 02501 – STORM SEWER PIPE

PART 1 – GENERAL

1.1 DESCRIPTION

A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary for furnishing and installing pipe culverts, storm drains and underdrains, in accordance with these Specifications and in reasonably close conformity with the lines and grades shown on the Drawings or established by the ENGINEER.

B. This WORK includes furnishing and installing connecting bands, branch connections, elbows and end sections required to complete the culvert or drain structure.

C. Special sections, such as elbows and branch connections shall be of the same material and coating as the culvert pipe to which they are attached, or be designed to be connected to the culvert pipe.

1.2 SUBMITTALS

A. Storm Sewer Pipe: Material certifications.

PART 2 – PRODUCTS

2.1 METALLIC-COATED STEEL CORRUGATED PIPE AND PIPE ARCHES

A. Metallic-coated steel corrugated pipe and pipe arches and specials sections (such as elbows, branch connections, and prefabricated flared end sections) shall conform to the applicable requirements of AASHTO M 36 and either AASHTO M 218 or AASHTO M 274 for the specified sectional dimensions and thickness.

B. Coupling bands shall conform to AASHTO M 36 except that the use of bands with projections (dimples) will be limited to attaching prefabricated flared end sections. Flat bands and smooth sleeve-type couplers will not be permitted.

C. Steel sheets of the required composition may be furnished with commercially produced corrugation dimensions other than those specified in ASSHTO M 36 if shown on the Drawings or approved by the ENGINEER.

2.2 ALUMINUM ALLOY CORRUGATED PIPE AND PIPE ARCHES

A. Aluminum alloy corrugated pipe and pipe arches and special sections (such as elbows, branch connections, and prefabricated flared end sections) shall conform to the applicable requirements of AASHTO M 196 for the specified sectional dimensions and thickness.

B. Coupling bands shall conform to AASHTO M 196 except that the use of bands with projections (dimples) will be limited to attaching prefabricated flared end sections.

C. Aluminum alloy sheets of the required composition may be furnished with commercially produced corrugation dimensions other than those specified in AASHTO M 196 if shown on the Drawings or approved by the ENGINEER.

2.3 POLYMER-COATED STEEL CULVERTS

A. Polymer-coated steel culverts and special sections (such as elbows and branch connections) shall conform to the applicable requirements of AASHTO M 245 and AASHTO M 246. Unless otherwise specified, the polymer coating shall be type B. The 0.010 inch thickness shall be on the inside surface of the pipe.

B. Coupling bands shall conform to AASHTO M 245 except the use of bands with projections (dimples) is not acceptable.

C. Steel sheets of the required composition may be furnished with commercially produced corrugation dimensions other than those specified in AASHTO M 245 if shown on the Drawings or approved by the ENGINEER.

2.4 REINFORCED CONCRETE PIPE

A. Concrete pipe shall be ASTM C 76, Class IV, with rubber gasket joint.

B. Rubber gasket joint shall meet the requirements of ASTM C 443

2.5 PVC PIPE CONDUIT

A. PVC Pipe Conduit shall have a standard dimension ration (SDR) of 35 and conform to ASTM D 3034. Before any PVC pipe is used on this Project, the CONTRACTOR shall supply certifications, signed by an authorized agent of the seller or manufacturer, stating that the material has been sampled, tested, and inspected in accordance with ASTM D 3034.

B. The pipe shall have integral wall bell and spigot joints conforming to ASTM D 3212. The bell shall consist of an integral wall section with a solid cross section elastomeric ring, factory assembled, securely locked in place to prevent displacement.

C. Flexible watertight connections, approved by the ENGINEER, shall be used at PVC pipe connections to manholes and other rigid structures.

2.6 CORRUGATED POLYETHYLENE PIPE

A. Corrugated polyethylene pipe (CPP) shall be high density corrugated polyethylene, smooth interior pipe, and shall be manufactured in conformity with the latest AASHTO M 294, Type S specification, and shall meet the requirements of ASTM D 3350 Cell Classification 324420C, or ASTM D 1248, Class C, Category 4, Grade P33.

B. Pipe shall be joined with “Hancor, Inc. Hi-Q Sure-Lok” (bell-and-spigot) joint, or approved equal, meeting the requirements of AASHTO M 294. The bell shall be an integral part of the pipe and provide a minimum pull-apart strength of 400 pounds.

C. The bell-and-spigot joint shall incorporate a gasket making it silt-tight. Gaskets shall be installed in the bell, or on the pipe, by the pipe manufacturer.

D. Fittings shall conform to AASHTO M 294. Fabricated fittings shall be welded on the interior and exterior at all junctions. All fittings shall connect to the pipe with a bell and spigot joint.

E. All cut corrugations on CPP pipe shall be cleared of all water and completely grouted to prevent the accumulation of water.

2.7 PIPE CULVERT w/UNDERDRAIN

A. Pipe Culvert shall be corrugated polyethylene pipe (CPP), high density corrugated polyethylene, smooth interior pipe, and shall be manufactured in conformity with the latest AASHTO M 294, Type S specification, and shall meet the requirements of ASTM D 3350 Cell Classification 324420C, or ASTM D 1248 Type III, Class C, Category 4, Grade P33.

B. Pipe for underdrain shall be CPP, high density smooth interior pipe with the size shown on the Drawings, and shall be manufactured in conformity with the latest AASHTO M 294, Type S Specifications, and shall meet the requirements of ASTM D 3350 Cell Classification 324420C, or ASTM D 1248 Type III, Class C, Category 4, Grade P33, or perforated PVC pipe conforming to Article 2.5 of this Section, with two rows of slots or perforations set at 60° from the invert position.

C. Pipe shall be joined with "Hancor, Inc. Hi-Q Sure-Lok" (bell-and-spigot) joint, or approved equal, meeting the requirements of AASHTO M 294. The bell shall be an integral part of the pipe and provide a minimum pull-apart strength of 400 lbs.

D. The bell-and-spigot joint shall incorporate a gasket making it silt-tight. Gaskets shall be installed in the bell, or on the pipe by the pipe manufacturer.

E. Fittings shall conform to AASHTO M 294. Fabricated fittings shall be welded on the interior and exterior at all junctions. All fittings shall connect to the pipe with a bell and spigot joint.

F. Washed coarse concrete aggregate shall meet the requirements of Section 03301 – Structural Concrete, Article 2.3.

G. Filter cloth shall meet the requirements of Section 02714 – Filter Cloth, and shall be Type A.

2.8 CPP SADDLE TEE

A. CPP saddle tees shall be manufactured saddle tees designed to connect to the corrugated polyethylene pipe.

B. Fittings shall conform to AASHTO M 294. Fabricated fittings shall be welded on the interior and exterior of all junctions.

C. A soil-tight seal shall be obtained with the coupling at the saddle tee stub to the storm service pipe.

PART 3 – EXECUTION

3.1 CONSTRUCTION

A. Excavation, Bedding, and Backfill shall conform to the requirements of Section 02203 – Trenching. All pipe shall have a minimum cover of 12 inches, unless otherwise shown on the Drawings or directed by the ENGINEER.

B. The pipe laying shall begin at the downstream end of the pipe. The lower segment of the pipe shall be in contact with the shaped bedding throughout its full length. Bell or groove ends of rigid pipe and outside circumferential laps of flexible pipe shall be placed facing upstream.

C. Paved or partially lined pipe shall be laid so that the longitudinal centerline of the paved segment coincides with the flow line. Elliptical and elliptically reinforced pipes shall be placed with the minor axis within five degrees of a vertical plane through the longitudinal axis of the pipe.

D. If the spelter coat or galvanized metal pipe is damaged during installation, the CONTRACTOR shall make necessary repairs to the spelter in accordance with AASHTO M 36, or replace the damaged section of pipe, at no additional cost to the OWNER.

E. Rigid conduits may be of bell and spigot or tongue and groove design unless one type is specified. Conduit sections shall be joined such that the inner surfaces are reasonably flush and even.

F. Joints shall be made with portland cement mortar, portland cement grout, rubber gaskets, plastic sealing compound, or by any combination of these types, or any other approved type, as may be specified.

G. Mortar joints shall be made with an excess of mortar to form a continuous bead around the outside of the conduit and finished smooth on the inside. For grouted joints, molds or runners shall be used to retain the poured grout. Rubber ring gaskets shall be installed to form a flexible, watertight seal. Joints in concrete pipe shall be thoroughly wetted before mortar or grout is applied.

H. Where portland cement mixtures are used, the completed joints shall be protected against rapid drying by a suitable curing method

I. Flexible conduits shall be firmly joined by approved coupling bands.

J. Conduit shall be inspected before any backfill is placed. Any pipe found to be substantially out of alignment, unduly settled, or damaged shall be taken up and relaid or replaced.

K. Installation of all pipes shall conform to the manufacturer's recommended procedures. These Specifications and the Drawings shall take precedence over the manufacturer’s recommendations in the event of conflict, if more restrictive.

L. Four and six inch pipe culvert shall be installed as shown on the Drawings, unless otherwise directed by the ENGINEER. Other service pipe connections may be necessary, depending on whether unknown existing drainage pipes or drainages are encountered. Additional saddle tees shall be provided, as necessary, for storm service piping required in addition to those services shown on the Drawings. All bends, couplings and other fittings as necessary to connect to existing pipes or flows and to maintain a minimum cover of 12 inches shall be proved.

M. All storm service pipes to be stubbed out shall be capped and marked with a pressure treated two inch or four inch post extending from the cap to one inch above ground surface with the top six inches painted green.

N. All cut corrugations on CPP pipe shall be cleared of all water and completely grouted to prevent the accumulation of water.

O. Pipe Culvert w/Underdrain shall be constructed with two pipes as shown on the Drawings. The flowlines of the two pipes shall be along the same gradeline, unless otherwise shown on the Drawings or if pipe laterals connected to the storm drain pipe would conflict with the underdrain pipe. Where the lateral pipe would conflict with the underdrain pipe, the underdrain pipe shall be graded to pass beneath the lateral pipe along a length that will provide a minimum flow rate of 0.4%.

END OF SECTION

SECTION 02502 – STORM SEWER MANHOLES, INLETS, AND CATCH BASINS

PART 1 – GENERAL

1.1 DESCRIPTION.

A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary for furnishing and installing manholes, inlets, and catch basins as shown on the Drawings and the Standard Details.

1.2 SUBMITTALS

A. Storm Sewer Manholes and Catch Basins

B. Frames and Grates: Catalogue cuts and material certifications.

PART 2 – PRODUCTS

2.1 JOINT MORTAR

A Joint mortar shall be non-shrink-type, and shall consist of one part Portland cement and two parts approved sand with water as necessary to obtain the required consistency. Mortar shall be used within 30 minutes after its preparation. If mortar is submerged and cannot be kept dry until cured, a substitute approved by the ENGINEER shall be used.

2.2 FRAMES, GRATES, COVERS, AND LADDER RUNGS

A. Frames, grates, covers and ladder rungs shall conform to the plan dimensions and to the following Specification requirements for the designated materials:

1. All frames, grates, and covers shall be ductile iron, conforming to ASTM A 48, Class 30, and shall be designed for heavy duty traffic.
2. Carbon-steel castings shall conform to the requirements of AASHTO M 103. Grade shall be optional unless otherwise designated.
3. All manhole covers shall have the words “STORM DRAIN” cast into the top in letters approximately three inches high.
4. Structural steel shall conform to the requirements of AASHTO M 183.
5. Manhole steps shall be constructed of polypropylene conforming to ASTM D 4101 and shall meet current state and federal safety standards.
6. Galvanizing, where specified for these units, shall conform to the requirements of AASHTO M 111.
7. Malleable iron castings shall conform to the requirements of ASTM A 47. Grade shall be optional unless otherwise designated.

2.3 REINFORCING STEEL

A. Reinforcing steel shall conform to the following applicable requirements:

Deformed Billet-Steel Bars	AASHTO M 31 (ASTM A 615, grade 60)
Welded Steel Wire Fabric	AASHTO M 55 (ASTM A 185)

Cold-Drawn Steel Wire	AASHTO M 32 (ASTM A 82)
Fabricated Steel Bar or Rod Mats	AASHTO M 54 (ASTM A 184)

2.4 CORRUGATED METAL UNITS

A. Corrugated metal units shall conform to plan dimensions. Steel units shall conform to AASHTO M 36 and aluminum units shall conform to AASHTO M 196. Polymer precoating shall conform to AASHTO M 245 for the type specified.

B. Branch stubs shall be corrugated pipe sections extending 12 inches from the inlet unit to match the connecting pipe size shown on the Drawings.

2.5 PRECAST CONCRETE UNITS

A. Precast concrete units shall conform to the requirements of AASHTO M 199, except that the absorption test will not be required.

B. Cracks in units will be cause for rejection. Honeycombed or patched areas in excess of 30 cumulative square inches will be cause for rejection.

C. Concrete shall conform to Section 03302 – Concrete Structures.

D. Manhole steps shall meet current state and federal safety standards.

2.6 CORRUGATED POLYETHYLENE PIPE UNITS

A. The pipe used for these units shall conform to the requirements of Section 02501 – Storm Sewer Pipe, Article 2.6.

B. The bottom plate shall be factory sealed to the barrel section, per pipe manufacturer's recommendations.

C. Branch stubs shall be corrugated polyethylene pipe sections extending 12 inches from the inlet unit to match the connecting pipe size shown on the Drawings and shall be factory connected to the barrel section.

2.7 CONFLICT MANHOLE UNITS

A. Conflict manholes shall consist of a precast concrete unit conforming to the requirements of Article 2.5 of this Section, with an insulated sanitary sewer pipe section installed in the manhole crossways to the storm drainage flow.

1. The conflict manhole shall conform to the requirements of CBJ Standard Detail 303 - Storm Drain Manhole Types I & II.
2. The frame and cover shall conform to CBJ Standard Detail 306 – Storm Drain Manhole Cover & Frame.
3. The insulated pipe shall consist of an inner (carrier) pipe and outer (protective) pipe, both of which shall be PVC pipe meeting the requirements of Section 02401 – Sanitary Sewer Pipe, Article 2.2. The outer pipe shall be seven inches

larger in nominal diameter than the inner pipe, or as shown on the Drawings, with the annular space between the two pipes filled with closed cell urethane foam. Ends of the insulation shall be covered and sealed with either a manufactured closure supplied by the manufacturer or with a manufactured cap with a hole neatly cut for the carrier pipe. The cap shall be sealed all around the carrier pipe with an approved sealant made for used with the type of pipe furnished, and shall be solvent welded to the outer pipe.

4. The insulated pipe shall have a minimum length of 12 feet and shall extend a minimum of 36 inches beyond the edge of the manhole.

PART 3 – EXECUTION

3.1 CONSTRUCTION

A. Concrete construction shall conform to the requirements of Section 03302 – Concrete Structures.

B. Welding shall be done in accordance with the best modern practice and the applicable requirements of AWS D1.1 except as modified by AASHTO "Standard Specifications for Welding of Structural Steel Highway Bridges."

C. Metal frames shall be set in full mortar bed.

D. Manholes and catch basins shall be constructed in accordance with the Drawings and Standard Details. There shall be a minimum 16 inch catch constructed in the invert of the manholes or catch basins, unless otherwise specified. After the mortar is set, holding the pipe in place, the pipe is to be cut off evenly so that neither more than two inches, nor less than one inch, of the pipe protrudes into the manhole or catch basin.

E. When a pipe enters the manhole through a wall of a precast unit, the CONTRACTOR shall perform the cutting of the concrete and steel reinforcement in a manner that will not loosen the reinforcement in the wall. The steel reinforcement shall be cut flush with the wall face. All joints and openings cut in the walls shall be grouted.

F. Where indicated on the Drawings, a stub shall be provided for future connections to the manhole. The stub shall be sized and positioned as indicated. The end of the stub shall be stopped with a wooden plug, concrete biscuit, or other adequate methods to prevent water, earth, or other substances from entering pipe.

G. In case of poured-in-place manhole construction, if the CONTRACTOR elects to accomplish the manhole construction utilizing more than one continuous concrete pour, a keyed construction joint shall be used. These manholes shall have poured-in-place bases.

H. Adjustment of Existing Frame Grates to Grade shall consist of raising or lowering the frame or ring casting one foot or less and providing the necessary adjusting rings, and mortar required to adjust the frame and grate to finish grade, as per CBJ Standard Detail 205 – Manhole Heights.

I. Replacing Frame and Covers shall consist of removal and disposal of the existing frame, cover and adjustment bricks, blocks and mortar and replacing with a new frame and

cover per the Drawings and CBJ Standard Details. The new frame and cover shall be adjusted to finish grade per CBJ Standard Detail 205 – Manhole Heights.

J. Reconstructing Manholes shall consist of one or more of the following:

1. The WORK necessary to bring the manhole frame and cover to grade when the cone and/or barrel section(s) must be removed for lowering.
2. The WORK necessary to raise the manhole frame and cover more than one foot.
3. The WORK necessary to reconstruct a portion of the manhole as specified with no change in line or grade.
4. The WORK necessary to tap one or more additional pipes into an existing manhole.

K. The manholes shall be reconstructed to the required elevation and to conform essentially to the details on the Drawings. This WORK shall conform to the requirements above specified for new construction except that material may be reused if of satisfactory quality and if approved by the ENGINEER.

L. Existing storm flow shall not be impeded during construction.

M. On resurfacing contracts, the metal frames and gratings shall be, unless otherwise permitted or directed, adjusted to grade prior to placing the surface course.

N. Excavation, bedding and backfilling shall conform to the requirements of Section 02203 – Trenching.

O. Manhole pipe connections shall be made as shown on the Drawings and as required by the manufacturer's recommendations. A snug, watertight seal shall be provided for each pipe connection.

P. All manholes shall be bedded in accordance with CBJ Standard Detail 303 – Storm Drain Manhole Types I & II.

END OF SECTION

SECTION 02601 – WATER PIPE

PART 1 – GENERAL

1.1 DESCRIPTION

A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary for furnishing and installing buried water pipe and fittings, thrust blocks, tie rods, electrical continuity, disinfection and testing. The CONTRACTOR shall install the water pipe and fittings to the horizontal and vertical alignment shown on the Drawings and shall complete all associated WORK described in this Section.

1.2 SUBMITTALS

A. Water Pipe: Material certifications.

PART 2 – PRODUCTS

2.1 PIPE

A. Water pipe shall be ductile-iron pipe (DIP) conforming to the requirements of AWWA C151, with cement mortar lining conforming to the requirements of AWWA C104. Standard Thickness Class 50 pipe shall be used unless otherwise shown on the Drawings. Water pipe shall have an exterior bituminous coating conforming to the requirements of AWWA C110. All water pipe shall be clearly marked with the manufacturer's name, type, class and/or thickness as applicable. Lettering shall be legible and permanent under normal conditions of handling and storage.

2.2 JOINTS

A. Unless otherwise shown on the Drawings, CBJ Standard Details, or as specified below, pipe joints shall be push-on rubber gasket type conforming to the requirements of AWWA C111.

B. DIP placed within pipe casings shall have restrained joint connections. Refer to CBJ Standard Detail 413 – Bored Encasement.

C. Restrained joint water pipe shall be U.S. Pipe TR FLEX, U.S. Pipe field Loc Gasket, EBBA IRON "Mega-lug System," Griffin Snap Lock, Pacific State Lock Mechanical type, or approved equal. Restrained push-on joints for pipe shall be designed for a water working pressure of 250 psi and shall be capable of being deflected a minimum of 3° per joint, for pipe sizes through 18 inches, after assembly.

2.3 FITTINGS

A. Fittings for all water pipe and restrained joint water pipe shall be U.S. Pipe TR FLEX, push-on gasket fittings compatible with U.S. Pipe Field Loc Gasket, mechanical joint fittings with EBBA IRON "Mega-lug System" Griffin Snap Lock, Pacific State Lock Mechanical Type, or approved equal.

B. For connecting to existing water mains, the CONTRACTOR shall use a mechanical joint tee and a mechanical joint cutting-in-sleeve similar to Clow F-1220 or Mueller H-843, or

a cast iron coupling similar to Rockwell 431, or approved equal. The length of all sleeves and couplings shall equal or exceed the diameter of the pipe.

C. All valve clusters consisting of a tee and one or more valves, including fire hydrant legs, shall be monolithically restrained with EBBA Iron "Mega-lug System," or approved equal.

2.4 THAW WIRE

A. Thaw wire and continuity straps shall be No. 2 copper wire, stranded, with THW insulation or equal. Exothermic welding to attach continuity straps on DIP and fittings shall be "Cadweld" or approved equal and coated with bituminous coating.

2.5 UNDERGROUND MARKING TAPE

A. Underground marking tape shall be blue, six inch wide, four mil thick, polyethylene tape with black lettering with the following wording: "Caution: Waterline Buried Below." Marking tape shall be installed 12 inches above the top of all water pipe.

2.6 TIE RODS

A. Tie rods shall be threaded black iron or mild steel with a 12-mil minimum asphaltic coating and shall be located symmetrically around the perimeter of the pipe using anchorage lugs of standard manufacture for attachment where required. Unless otherwise shown on the Drawings, the number and size of the rods shall be as shown on the table below:

PIPE SIZE	TIE ROD SIZE	NO. OF RODS
4" – 10"	¾"	2
12" – 16"	¾"	4
18" – 20"	¾"	6
22"	1"	4
24"	1"	6

2.7 CONCRETE

A. Concrete for thrust blocks shall conform to Section 03302 –Concrete Structures.

2.8 TEMPORARY WATER SYSTEM

A. All piping, including hoses used for water service, shall be NSF rated.

PART 3 – EXECUTION

3.1 GENERAL

A. The CONTRACTOR shall preserve and protect all existing utilities and other facilities including but not limited to: telephone, television, electrical, water and sewer utilities, surface or storm drainage, highway or street signs, mail boxes, and survey monuments.

The CONTRACTOR shall immediately repair or replace utilities or other facilities damaged during construction. The CONTRACTOR shall support and protect any underground utility conduits, pipes, or service lines where they cross the trench.

B. The CONTRACTOR shall give at least 24 hours notice to the CBJ Water and Wastewater Utility Divisions and the CBJ Engineering Department prior to:

1. needing water or sewer main line locates;
2. interruption of water service in any area; or
3. use of water from any fire hydrant.

Any water service disruption shall be restored as soon as possible. The CONTRACTOR shall comply with the current policy on "Water and Sewer Line Locates" of the CBJ Public Works Department, Water and Wastewater Utilities Divisions. The CONTRACTOR shall notify all local radio stations and any major customers who will be affected of a planned water service disruption.

3.2 INSTALLATION

A. Water pipe shall be installed in accordance with the manufacturer's printed specifications and instructions, and in conformance with AWWA C151.

B. The water pipe shall be handled carefully to prevent damage to the pipe, pipe lining, or coating. Water pipe and fittings shall be loaded and unloaded using hoists and slings to avoid shock or damage, and under no circumstances shall they be dropped, skidded, or rolled. If any part of the coating or lining is damaged, repair thereof shall be made in a manner satisfactory to the ENGINEER at the CONTRACTOR's expense.

C. All water pipe and fittings shall be inspected for defects. 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.

D. Whenever it becomes necessary to cut a length of water pipe, the cut shall be made by abrasive saw or by special pipe cutter.

E. All pipe ends shall be square with the longitudinal axis of the water pipe and shall be reamed and smoothed to assure a good connection.

F. The water pipe shall be laid to the horizontal and vertical alignment shown on the Drawings. A minimum five foot cover shall be maintained from finish grade to top of water pipe, unless otherwise shown on the Drawings. Fittings shall be installed at the location shown on the Drawings.

G. To prevent dirt and other foreign material from entering the pipe and fittings during handling and installation, the open end of the pipe shall be protected by a water-tight plug at all times except when joining the next section of pipe.

H. Under no circumstances shall pipe deflections, either horizontal or vertical, exceed the manufacturer's printed recommendations. Where deflections would exceed the manufacturer's recommendations, fittings shall be used.

I. Vertical deflections to avoid obstructions that exceed allowable water pipe joint deflections shall be accomplished by the use of fittings and either joint restraints or vertical thrust blocking conforming to the Standard Details. Additional fittings to those indicated on the Drawings will be required to accomplish these vertical deflections.

J. Concrete thrust blocks shall be furnished and installed in accordance with the Drawings and Standard Details.

K. Pressurized water pipe ends shall be plugged and thrust blocks installed. Volume and bearing area of thrust blocks for end plugs shall be equal to applicable standards for bends greater than 45°.

L. Existing water pipes and appurtenances to be removed or abandoned shall be as designated on the Drawings or directed by the ENGINEER. Abandoned water services shall be plugged at the cut ends. Abandoned water pipes shall be removed as shown on the Drawings, or mechanically plugged if not required to be removed.

M. All pipe fittings shall be restrained with EBBA Iron "Megalug System," or approved equal.

N. All joints within 50 feet of tees or bends equal to or greater than 45° shall be restrained joints.

O. Continuous water services shall be provided for all structures, except for interruptions necessary for connection of temporary or new piping to the existing service or mainline piping.

P. The CONTRACTOR is responsible for maintaining continuous water service at volume and pressure to match existing to all structures, with either existing, temporary or new piping, except as provided in this Section.

3.3 FLUSHING, TESTING AND DISINFECTION

A. Prior to acceptance, the CONTRACTOR shall "Open-Bore" flush the water pipe then perform hydrostatic tests, electrical continuity tests, and disinfection and coliform tests. Testing may be done in any sequence. However, in the event the disinfection, coliform and continuity tests have been performed and repairs are made to the water pipe system in order to pass the hydrostatic test, all previous tests and the "Open-Bore" flushing shall be repeated to the satisfaction of the ENGINEER.

3.4 OPEN-BORE FLUSHING

A. Open bore flushing is required of all installed water pipes to remove any foreign matter. The CONTRACTOR shall furnish, install and remove all pumps, fittings and pipes necessary to perform the flushing; shall provide all additional excavation and backfill; and shall dispose of all water and debris flushed from the water pipe. Flushing through fire hydrants, reduced outlets or fittings shall not be permitted unless specifically authorized in writing by the ENGINEER. The CONTRACTOR shall notify the

ENGINEER, in writing, 48 hours in advance of any flushing operation. All flushing shall be done between the hours of 1:00 a.m., and 5:00 a.m., unless otherwise authorized by the ENGINEER. A flushing scheme and schedule shall be submitted by the CONTRACTOR for review and approval by the ENGINEER prior to flushing. The schedule for flushing must be approved by the CBJ Water Utility Division. The CONTRACTOR shall be responsible for obtaining any permits necessary for flushing operations.

3.5 HYDROSTATIC TESTING

A. Hydrostatic testing will be conducted in the presence of the ENGINEER on newly installed water pipes after "Open-Bore" flushing, in accordance with the requirements of AWWA C600 and as stated hereafter. The CONTRACTOR shall furnish all assistance, equipment, labor, materials, and supplies necessary to complete the test to the satisfaction of the ENGINEER. The CONTRACTOR shall suitably valve-off or plug the outlet to existing or previously-tested water pipe prior to performing the required hydrostatic test. Prior to testing, all air shall be expelled from the water pipe. If permanent air vents are not available to accommodate testing, the CONTRACTOR shall install corporation stops and blow-off lines so the air can be expelled as the line is filled with water.

B. The hydrostatic pressure shall be a minimum of 150 psi or 1½ times the operating pressure of the water pipe (measured at the highest elevation of the newly-installed water pipe), whichever is greater, unless otherwise directed by the ENGINEER. Acceptance pressure testing shall be done with all service lines installed, corporation stops open, and pressure against the closed curb stops. The duration of each hydrostatic pressure test shall be one hour. Pumping will cease after the required test pressure has been reached. If the pressure remains constant for one hour without additional pumping, or pressure drop is less than five psi, that section of water pipe is acceptable.

C. If the pressure drops five (5) psi or more during the initial one hour hydrostatic pressure test, the CONTRACTOR shall conduct a leakage test. Leakage shall be determined by measuring "make-up" water necessary to restore the specified test pressure. The quantity of water lost from the water pipe shall not exceed the number of gallons per hour as determined by the following formula:

$$L = \frac{ND(P)^{0.5}}{7400}$$

L = Allowable leakage in gallons per hour
N = Summation of mechanical and push-on joints in length of water pipe tested
D = Diameter of water pipe in inches
P = Test pressure in pounds per square inch

D. Should the tested section fail to meet the pressure test as specified, the CONTRACTOR shall locate and repair the defects and then retest the water pipe as specified above. Any specific leakage point detected shall be corrected by the CONTRACTOR to the satisfaction of the ENGINEER regardless of the allowable leakage specified above.

E. All tests shall be made with the auxiliary gate valves open and pressure against the hydrant. After the hydrostatic test has been successfully completed, each valve shall be

tested by closing in turn and relieving the pressure beyond. This test of the valves will be acceptable if there is no immediate loss of pressure on the gauge when the pressure comes against the valve being checked. The CONTRACTOR shall verify that the pressure differential across the valve does not exceed the rated working pressure of the valve.

F. Sections to be tested shall be limited to 1,500 feet, unless otherwise approved in writing by the ENGINEER.

G. Defective materials or poor quality of WORK, discovered as a result of the hydrostatic tests, shall be replaced by the CONTRACTOR. Whenever it is necessary to replace defective material or correct the workmanship, the hydrostatic test shall be repeated until a satisfactory test is obtained.

H. The ENGINEER shall be present for all hydrostatic and leakage tests. The CONTRACTOR shall notify the ENGINEER at least 24 hours prior to any test and shall notify the ENGINEER at least two hours in advance of the scheduled time if the test is to be cancelled or postponed.

I. After completion of testing, all test and air vent pipe shall be removed and the corporation stop closed at the water pipe, in the presence of the ENGINEER.

3.6 ELECTRICAL CONTINUITY

A Electrical continuity is required for six inch or smaller water pipe and fire hydrant assemblies, and shall be provided by two electrical continuity straps installed on each side of the water pipe joint or fittings. Electrical continuity tests will be performed by the CBJ Water Utility Division staff with a “Hovey” water pipe thawing machine, unless scheduling conflicts or mechanical problems with the thawing machine prevent the CBJ Water Utility Division staff from performing the testing within the time period required by the CONTRACTOR. In those cases that the CBJ Water Utility Division staff is unable to conduct the testing, the CONTRACTOR shall conduct the testing with its own personnel and equipment. The testing shall be performed in a manner that is approved by the ENGINEER.

If the initial testing of an installation within any Project phase fails (the continuity testing will be conducted by the CBJ at one time for each Project phase, as shown on the Drawings, or as directed by the ENGINEER), the additional testing required shall be at the CONTRACTOR’s expense. The CBJ Water Utility Division staff will maintain a circuit of 300 amps DC current for a period of 90 seconds. Current loss, through the test circuit, shall not exceed 10%. Continuity test sections shall not exceed 500 lineal feet. All test leads brought up to the surface shall be removed to a depth of two feet below finish grade upon completion of the tests.

3.7 DISINFECTION

A. Disinfection by chlorination of all new water pipe shall be completed and a satisfactory bacteriological report obtained prior to placing the pipe in service. “Open-bore” flushing shall be completed before chlorination is begun.

B. Chlorine shall be applied by one of the following methods:

1. liquid chlorine gas-water mixture;
2. direct chlorine gas feed; or
3. hypochlorite commercial products such as HTH, Perchloren, Macho-chlor, or approved equal.

The chlorinating agent shall be applied at the beginning of the section adjacent to the feeder connection, insuring treatment of the entire water pipe. Water shall be fed slowly into the new water pipe with chlorine applied in amounts to produce a dosage of 50 ppm. Application of the chlorine solution shall continue until the required residual of not less than 50 ppm free chlorine is evident at all extremities of the newly constructed line.

C. The chlorine gas-water mixture shall be applied by means of a solution-feed chlorinating device. Chlorine gas shall be fed directly from a chlorine cylinder equipped with a suitable device for regulating the rate of flow and the effective diffusion of gas within the water pipe. Hypochlorite products shall be placed or injected into the water pipe. During the chlorination process, all intermediate valves and accessories shall be operated. Valves shall be manipulated so that the strong chlorine solution in the water pipe being treated will not flow back into the pipe supplying the water.

D. The following table is to be used as a guide for chlorinating pipes by the calcium hypochlorite and water mixture method. The given dosage per 100 feet results in a chlorine solution of 40 to 50 ppm. This dosage takes into account that CONTRACTORs most frequently use granular HTH, which is 65% pure. If another chlorinating agent is used, the dosage must be adjusted.

PIPE DIAMETER	DOSAGE PER 100 FEET
4”	.60 oz.
6”	1.35 oz.
8”	2.75 oz.
10”	4.30 oz.
12”	6.19 oz.
16”	11.00 oz.
20”	17.00 oz.

E. A residual of not less than 50 ppm free chlorine shall be produced in all parts of the water pipe. After 24 hours detention there shall be a minimum free chlorine residual of 25 ppm in all parts of the water pipe. This residual shall then be neutralized in the pipe by injecting an approved reducing agent such as sulfur dioxide, sodium bisulfate, sodium sulfite or sodium thiosulfate.

F. After the water pipe system has been thoroughly flushed, samples will be taken at representative locations in the system by the ENGINEER, placed in sterile bottles, and submitted to an approved laboratory for bacteriological examination. The presence of bacteria in any sample shall be verified with a second sample at the same location. If verified, the pipe disinfection procedure shall be repeated and additional samples taken for bacteriological examination. Pipe disinfection shall be repeated, at the CONTRACTOR’s expense, until satisfactory results are obtained. The first testing

sequence will be paid for by the OWNER. Any further testing and sampling required due to insufficient disinfection (positive coliform tests) will be paid for by the CONTRACTOR.

G. The water shall be flushed from the water pipe at its extremities, including all curb stops, until the replacement water chlorine residuals are equal to those of the permanent source of supply. The de-chlorinated water and water used for flushing shall be disposed of in a manner approved by the ENGINEER, and in conformance with current requirements of the Alaska Department of Fish and Game, and the Alaska Department of Environmental Conservation.

END OF SECTION

SECTION 02602 - VALVES

PART 1 – GENERAL

1.1 DESCRIPTION

A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary for furnishing and installing valves and valve boxes; thrust blocks; and for raising or lowering existing valve boxes to conform to the final grade, as shown on the Drawings and in conformance with the Standard Details.

1.2 SUBMITTALS

A. Gate Valves: Catalogue cuts.

B. Butterfly Valves: Catalogue cuts.

C. Valve Boxes: Catalogue cuts.

PART 2 – MATERIALS

2.1 GATE VALVES

A. Gate valves for water pipes 12 inches and smaller shall be of the iron body, non-rising bronze stem, resilient-seated wedge-type. Valve shall be American Flow Ductile, Clow, Kennedy, M & H, or Mueller and shall meet or exceed the requirements of AWWA C509 and the specific requirements outlined in these Specifications.

B. Gate valves shall open counter-clockwise and be provided with two inch square wrench nuts, except that when installed within vault structures a hand wheel shall be provided for each valve.

C. End connections shall be mechanical joint, unless otherwise indicated on the Drawings.

D. All internal ferrous metal surfaces shall be fully coated, holiday free, to a minimum thickness of four mils with a two part thermosetting epoxy coating. Said coating shall be non-toxic, impart no taste to water, protect all seating and adjacent surfaces from corrosion and prevent buildup of scale or tuberculation.

E. Gate valves, when attached to a restrained joint, shall have tie rods and one retainer gland for each joint. The size and number of tie rods shall conform to the requirements of Section 02601 – Water Pipe.

F. The CONTRACTOR shall provide four detailed repair manuals for the gate valves supplied; and a letter of certification from the supplier verifying that all requirements of AWWA C509 and these Specifications have been met.

G. The CONTRACTOR shall provide one standard packing kit for every group of ten (and fraction thereof) of each size of gate valve.

2.2 BUTTERFLY VALVES

A. Butterfly valves shall be used with water pipe sizes larger than 12 inches and shall be manufactured to equal or exceed the latest revision of AWWA C504 and the specific requirements outlined in these Specifications.

B. Butterfly valves shall open counter-clockwise and be provided with two inch square wrench nuts, except that when installed within vault structures, a hand wheel shall be provided for each valve.

C. End connections shall be mechanical joint, unless otherwise indicated on the Drawings.

D. All internal ferrous metal surfaces shall be fully coated, holiday free, with a minimum of two coats of asphalt varnish approved by the ENGINEER. Said coating shall be non-toxic, impart no taste to water, protect all seating and adjacent surfaces from corrosion and prevent build-up of scale or tuberculation.

E. Butterfly valves, when attached to a restrained joint, shall have tie rods and a retainer gland for each joint.

F. The CONTRACTOR shall provide four detailed repair manuals for the butterfly valves supplied; and a letter of certification from the supplier verifying that all requirements of AWWA C504 and the Specifications have been met.

2.3 VALVE BOXES

A. Valve boxes for valves four inches or larger shall be of cast iron and be not less than 5¼-inch diameter, with an extension piece adjustable for elevation and with a cover marked “Water” or “W.” The valve box shall be sufficient length to be adjusted and equal amount above and below the finished grade as shown on the Standard Details. Boxes shall be dipped in coal tar pitch. The valve box shall be Kejriwal Pacific 940 B 18” (top section) and Kejriwal Pacific D-24 (bottom section), or approved equal whose parts are demonstrated to be interchangeable with Kejriwal Series.

2.4 UTILITY MARKERS

A. Utility markers for water valves shall be “Utility Marker CUM-375” as manufactured by Carsonite Division of AMETEK, blue in color, six feet in length including anchor kits and decals with each marker. Decals shall denote “WATER VALVE.”

2.5 VALVE ACCESS PADS

A. Valve access pads shall consist of materials corresponding to those shown on the Drawings and as specified for Hydrant Access Pads.

PART 3 – EXECUTION

3.1 VALVES

A. Valves shall be inspected upon delivery in the field in both open and closed positions prior to installation. Careful inspection shall be made for injury to the outer protective coatings. At all places where the coating has been ruptured or scraped off, the damaged area shall be cleaned to expose the iron base, and then re-coated with two or more field coats of approved protective coating.

B. Valves shall be set on a firm base.

C. Valves shall be installed, in an open position, in the vertical plane passing through the pipe axis, in conformance with the manufacturer's recommendations and the AWWA Standards. Valve interiors shall be cleaned of all foreign matter.

D. After installation, all valves shall be subjected to field-testing and disinfected as outlined in Section 02601 – Water Pipe. Should defects in design, materials, or quality of work appear during these tests, the CONTRACTOR shall remove and replace the valve, or correct such defects, with the least possible delay, to the satisfaction of the ENGINEER.

E. All valve clusters consisting of a tee and one or more valves, including fire hydrant legs, shall be monolithically restrained with EBBA Iron "Mega-lug System" fittings, or approved equal. Each connecting pipe to the valve cluster or tee will be restrained to the cluster or tee.

3.2 VALVE BOXES

A. A valve box shall be installed over each valve, with the base section centered over the valve and resting on well-compacted backfill. The top section shall be set to allow equal movement of the telescoping section above and below finished grade, as shown on the Standard Details, unless otherwise directed by the ENGINEER. The top of the base section shall be on line with the nut at the top of the valve stem and the entire assembly shall be perpendicular to the water pipe.

B. Construct a concrete collar around each valve box within the roadway pavement limits. Sawcut through the total pavement depth following final paving and construct the concrete collar in accordance with CBJ Standard Detail 126 – Concrete Collar. No backfilling, except with concrete, will be permitted. Seal all sawcut grooves beyond the edge of concrete.

3.3 REPLACE VALVE BOXES

A. Replace Valve Boxes will include removal of the existing valve box down to the valve and replacing with a new valve box assembly conforming to Article 2.3 of this Section. The new valve box shall be installed in accordance with Article 3.2 of this Section.

3.4 ADJUST EXISTING VALVE BOXES

A. Adjust by raising or lowering to conform to the final grade, in accordance with the locations and details shown on the Drawings. The existing case iron valve box and cover shall be salvaged and reused. Where the valve box is of the adjustable-type construction, it shall be adjusted with adaptable extension pieces. Where the valve box is constructed with steel pipe, additional steel pipe shall be welded to the valve box to raise the cover; lowering shall be accomplished by cutting the existing steel pipe.

B. Where the existing valve box is tilted and/or far enough off center on the valve nut to make valve operation difficult, the CONTRACTOR shall plumb and center the valve box over the valve nut prior to strengthening or placement of base course material.

3.5 UTILITY MARKERS

A. Utility markers for water valves shall be installed at main line valve boxes at locations indicated on the plans and as directed by the ENGINEER. The position of the marker shall be as shown on the detail Drawing, or as directed by the ENGINEER.

END OF SECTION

SECTION 02603 – FIRE HYDRANTS

PART 1 – GENERAL

1.1 DESCRIPTION

A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary for furnishing and installing fire hydrant assemblies, including the hydrant leg, auxiliary gate valve, valve box, electrical thaw wire and continuity straps, tie rods, and fire hydrants; for installing guard posts to protect fire hydrants; for installing the hydrant access pads; for furnishing and installing barrel extensions on existing fire hydrants and for removing, inspecting, salvaging, and delivering existing fire hydrant assemblies to the CBJ, Public Works Utilities Division.

1.2 SUBMITTALS

A. Fire Hydrants: Catalogue cuts.

PART 2 – PRODUCTS

2.1 FIRE HYDRANTS

A. Fire hydrants shall conform to the requirements of AWWA C502 for Dry Barrel Fire Hydrants. Fire hydrants shall be:

1. Mueller Centurian A-423,
2. Waterous 5¼" Pacer or
3. Dresser M & H Style 929.

B. Fire hydrants shall be supplied with a 5¼ inch main valve opening, and a main valve seat ring threaded into a bronze bushing.

C. Fire hydrants shall be furnished with a six inch ASA Class 125 standard mechanical-joint inlet with two cast-on lugs for tie backs.

D. Fire hydrants shall be provided with a weathercap and an epoxy or bituminous-coated shoe.

E. Connections shall be mechanical joint with "Mega-lug" fittings, unless otherwise indicated on the Drawings.

F. Fire hydrants shall be three-way and furnished with two 2½-inch hose nozzles and one 4½ -inch pumper nozzle. Fire hydrants shall be left hand opening (counter clockwise). Operating and nozzle nuts shall be National Standard pentagonal with weather cap. Hose nozzle threading shall be in conformance with NFPA No. 194 for national (American) Standard Fire Hose Coupling Screw Threads.

G. Unless otherwise required by the Drawings, fire hydrants shall be furnished with a barrel length that will allow a five foot bury.

H. The main hydrant valves shall be of the compression type where water pressure holds the main valve closed permitting easy maintenance or repair of the entire barrel assembly

from above the ground without the need of a water shut-off. The main valve seat shall be an ether glycol urethane compound, or approved equal, that is abrasion and gravel resistant.

I. Fire hydrants shall be furnished with a breakaway traffic flange of the type which allows both barrel and stem to break clean upon impact from any angle. Traffic flange design must be such that repair and replacement can be accomplished above ground.

J. All working parts shall be bronze or non-corrosive metal in accordance with the requirements of AWWA C 502.

K. Painting and coating shall be in accordance with applicable AWWA specifications. After installation, the fire hydrant section from the traffic flange to the top of the operating nut shall be painted "OSHA Yellow," with wording stenciled in black. Refer to CBJ Standard Detail 403 – Fire Hydrant.

L. Gate valves and valve boxes shall be furnished and installed in accordance with Section 02602 – Valves.

M. Electrical thaw wire and continuity straps shall be No. 2 copper wire with THW insulation, and shall be connected with bolts with double nuts, to the tee at the main.

N. Flag assemblies shall be Flexi-Flag Assembly by Nordic fiberglass, Inc., or approved equal.

O. The CONTRACTOR shall provide the following spare parts for every group of ten (and fraction thereof) of Fire Hydrant Assemblies installed on the Project:

- Break Flange Repair Kit — One each
- Valve Seat Rubber — One each
- Cover Gasket — One each
- O-Rings — One set

2.2 HYDRANT ACCESS PADS

A. Hydrant access pads shall be constructed in conformance with the CBJ Standard Detail 405 – Hydrant Pad as shown, or as described in the Drawings.

B. Corrugated Metal Pipe (CMP) shall comply with the requirements of Section 02501 – Storm Sewer Pipe.

C. Rigid Board Insulation shall comply with Requirements of Section 02607 – Pipe Insulation.

D. Asphaltic concrete paving shall be furnished in accordance with Section 02801 – Asphalt Concrete Pavement.

2.3 BARREL EXTENSION

A. Barrel extensions shall conform to the requirements of AWWA C502 for Dry Barrel Fire Hydrants and shall include barrel extension, steel stem coupling, stainless steel clevis and cotter pins, solid flange, gasket, bolts and nuts, stem extension and lubricant.

PART 3 – EXECUTION

3.1 FIRE HYDRANTS

A. The CONTRACTOR shall install the fire hydrant assemblies in accordance with applicable AWWA Standards, the manufacturer's recommendations and the CBJ Standard Details. The interior components of the fire hydrant shall be cleaned of all foreign matter prior to installation. Fire hydrant legs shall be installed level and the barrel shall be installed plumb. Any adjustments to the traffic flange shall be accomplished with barrel extensions, in accordance with the fire hydrant manufacturer's recommendations. The extensions shall be made between existing barrel and hydrant. Fire hydrants shall be tied back to the water pipe using tie rods. The size and number of tie rods shall conform to Section 02601 – Water Pipe. Stuffing boxes shall be tightened and the fire hydrants shall be opened and closed in the presence of the ENGINEER to see that all parts are in working condition.

B. Remove the hydrant drain plugs, if any, prior to installation.

C. The top cap on fire hydrants serviced from the high-pressure system shall be painted yellow.

D. Fire hydrants installed, but not available for use, shall be covered with burlap or heavy plastic and security tied.

E. Electrical continuity is required for fire hydrant assemblies. Electrical continuity tests shall be performed in accordance with Section 02601 – Water Pipe.

F. After installation, all fire hydrant assemblies shall be flushed, field-tested, and disinfected as outlined in Section 02601 – Water Pipe. Each hydrant shall then be winterized by removing the water in the hydrant and barrel.

3.2 GUARD POSTS

A. Guard posts shall be installed where directed by the ENGINEER in accordance with the CBJ Standard Detail 404 – Hydrant Guard Posts. Guard posts shall not be installed in State of Alaska Department of Transportation and Public Facilities road right-of-ways.

3.3 HYDRANT ACCESS PADS

A. Hydrant access pads shall be installed where directed by the ENGINEER in accordance with the CBJ Standard Detail 405 – Hydrant Pad, and as shown or described on the Drawings. Culvert size shall be noted on the Drawings.

3.4 GRADE ADJUST EXISTING FIRE HYDRANTS

A. Grade adjustments to existing fire hydrants shall be accomplished with barrel extensions, in accordance with the fire hydrant manufacturer's recommendations. In addition, the existing fire hydrant shall be connected to the mainline water pipe with all necessary materials, including the tee at the mainline water pipe, thrust blocks, six inch gate valve, valve box, joint restraints, continuity wires, thaw wires, warning tapes, and any other required fittings, including pipe, to connect the hydrant leg to the mainline water pipe. After installation, the adjusted fire hydrant shall be flushed, field-tested, and disinfected as specified in Section 02601 – Water Pipe.

3.5 SALVAGE EXISTING FIRE HYDRANTS.

A. The CONTRACTOR shall contact the effected fire district at least 24 hours prior to removing or interrupting service to existing fire hydrants.

B. The components of the existing fire hydrant assemblies shall be carefully removed. Damage to the fire hydrant, valve, valve box, or barrel impairing re-use shall be determined by the ENGINEER. Damaged components shall be replaced by the CONTRACTOR using factory-supplied parts from the same manufacturer.

C. The ENGINEER will determine the usefulness of the removed fire hydrant assembly components. The CONTRACTOR shall deliver the useful components to the CBJ Public Works Department, Water Utility Division. The remaining components shall be disposed of by the CONTRACTOR.

D. If an existing fire hydrant assembly is removed at the tee, the tee shall be plugged in accordance with the CBJ Standard Details, and the existing water main shall be disinfected between isolating valves as specified in Section 02601 – Water Pipe.

E. At the discretion of the ENGINEER, a hydrostatic pressure test conforming to Section 02601 – Water Pipe shall be conducted between isolating valves along the existing water main.

F. The CONTRACTOR shall restore all surface features to preconstruction condition or better, including, but not limited to, sidewalks, curbs, gutters, mailboxes, culverts, and other facilities disturbed by the construction.

3.6 RELOCATE EXISTING FIRE HYDRANT

A. Relocation of existing fire hydrant shall conform to the requirements of Article 3.5 in this Section, except the fire hydrant piping shall be connected to the existing water valve, or to the piping on the street side of the water valve. If the fire hydrant is connected to the existing valve, this valve shall be fully opened with the existing valve box removed.

END OF SECTION

SECTION 02604 – AIR RELEASE VALVES

PART 1 – GENERAL

1.1 DESCRIPTION

A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary for furnishing and installing air release valves with appurtenances.

1.2 SUBMITTALS

A. Air Release Valve: Catalogue cut.

PART 2 – PRODUCTS

2.1 MANHOLES

A. The manhole shall be a storm drain, Type I shallow manhole, unless otherwise shown on the Drawings

B. Manhole covers shall be embossed with the word “WATER” in three inch high letters.

2.2 PIPE

A. Pipe shall be hot-dip galvanized steel conforming to ASTM A 53, Schedule 40.

2.3 FITTINGS

A. Fittings for steel pipe shall be malleable iron threaded type with a working pressure rating of 150 psi. Material shall conform to ASTM A 47, Grade 32510.

B. Fittings shall be hot-dip galvanized.

2.4 MISCELLANEOUS

A. The air release valve shall be a two inch APCO 200A, or approved equal.

B. The corporation stop shall be a Mueller H-10012 with lever handle, Ford F500 with lever handle, or approved equal.

C. The service saddle shall be a double strap, iron, I.P. thread, Rockwell 313, or approved equal.

D. Rigid Insulation shall be rigid board closed cell polystyrofoam material containing a flame retardant additive specifically designed for underground pipe or pavement installations, equivalent to Dow Chemical Company Styrofoam HI, and approved by the ENGINEER.

E. Sprayed-on urethane foam insulation material applied directly to the air release manhole interior with an elastomeric coating shall have demonstrated a satisfactory performance history in underground installation and shall have the following physical properties:

Density	2 pcf, Minimum
Compressive Strength (ASTM D 1621)	35 psi, Minimum at 5% Deflective or Yield
Water Absorption (ASTM C 177)	0.25% by Vol. Maximum
Thermal Conductivity (ASTM C 177)	$\frac{\text{Max. 0.23 BTU}}{\text{Hr. Ft.}^2\ ^\circ\text{F. In. Thickness}}$

PART 3 – EXECUTION

3.1 CONSTRUCTION

A. All construction activities shall meet the quality of WORK requirements set forth in the applicable portions of these Specifications.

B. All piping shall be sloped to permit escape of any entrained air.

C. After installation, the air release valve shall be subjected to field-testing and disinfection as outlined in Section 02601 – Water Pipe.

D. A field change in water pipe profile may require changing the location of the air release valve. Refer to CBJ Standard Details.

END OF SECTION

SECTION 02605 – WATER SERVICES

PART 1 – GENERAL

1.1 DESCRIPTION

A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary for furnishing and installing water services, including trenching, backfill, service saddles, corporation stops, service pipe, curb stops, curb boxes, thaw wire, warning tape, and marker posts; and for furnishing and installing blow-off hydrants, as shown on the Drawings and Standard Details.

1.2 SUBMITTALS

A. Service Saddles: Catalogue cut.

B. Corporation Stops: Catalogue cut.

C. Curb Stops: Catalogue cut.

D. Service Boxes: Catalogue cut.

E. Blow-Off Hydrant: Catalogue cut.

PART 2 – PRODUCTS

2.1 WATER SERVICES

A. Service Saddles shall be designed for a minimum 250 psi working pressure and shall conform to the following requirements:

PIPE SIZE	SERVICE SIZE	SERVICE SADDLE
6” and 8”	1”	Single Strap, Iron, I.P. Thread Rockwell 311 or approved equal
6” and 8”	1½” and 2”	Double Strap, Iron, I.P. Thread Rockwell 313 or approved equal
10” thru 18”	¾” thru 2”	Double Strap, Iron, I.P. Thread Rockwell 313 or approved equal

B. Corporation stops shall be Mueller No. B-25025, McDonald Brass 4704B, or approved equal. Corporation stops shall be attached to the water pipe with cast iron service saddles.

C. Service pipe and fittings shall be cold drawn, seamless annealed Type K Copper. Fittings shall be flared bronze fittings.

D. Curb stops shall be Mueller No. H-15201, McDonald Brass 6100, or approved equal.

E. Service boxes for curb stops shall be of cast iron and be not less than four (4) inch diameter with the extension piece adjustable for elevation and with cover marked “Water” or “W.” The service box shall be of sufficient length to be adjusted an equal amount above and below the finished grade as shown on the Standard Details. Boxes

shall be dipped in coal tar pitch. Service boxes shall be Tyler Pipe 6870 Series, 4¼-inch ID, Kejriwal Pacific 145R 49-62, or approved equal. Wood foundation components shall be treated in accordance with AWPA Standards.

F. Thaw wires shall be No. 2 copper wire, stranded, with THW insulation, or approved equal. Thaw wires shall be connected to the service saddle take-up with a solderless lug, Stak-On, or approved equal.

G. Underground marking tape shall be blue, six inch wide, four mil thick, polyethylene tape with black lettering with the following wording: "Caution: Waterline Buried Below." Marking tape shall be installed 12 inches above the top of the water service pipe and blow-off lines.

PART 3 – EXECUTION

3.1 CONSTRUCTION

A. The corporation stop shall be installed directly to the service saddle. Water services shall be installed in conformance with the Standard Details. All water services shall be completely exposed and inspected for leakage by the ENGINEER prior to covering, and shall be pressure tested as approved in Section 02601 – Water Pipe.

B. Service pipe shall be cut using a tool specifically designed to leave a smooth, even and square end on the pipe material. Cut ends shall be reamed to the full inside diameter of the pipe.

C. All service pipe and appurtenances shall be disinfected and flushed at the time of installation. The service line shall be activated at the corporation stop prior to backfilling and flushed through the curb stop. Electrical continuity tests shall be performed in accordance with Section 02601 – Water Pipe after backfilling, compaction, and final grading are completed. If electrical continuity is not obtained, the CONTRACTOR shall excavate the service and re-establish continuity. Retesting will continue until continuity is established. All WORK associated with electrical conductivity testing, retesting and performance is incidental to other items in this Section.

D. Relocate Existing Water Service is a contingency item. If relocation of the service pipe is required, as determined by the ENGINEER, the existing pipe shall be cut or disconnected at one point only, so the coupling is not located within two feet of the crossing or other conflicting structures.

END OF SECTION

SECTION 02702 – CONSTRUCTION SURVEYING

PART 1 – GENERAL

1.1 DESCRIPTION

A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary to perform all surveying and staking necessary for the completion of the Project in conformance with the Drawings and Specifications and standard engineering and surveying practices, including all calculations required to accomplish the WORK.

B. The WORK shall include the staking, referencing and all other actions as may be required to preserve and restore land monuments and property corners which are situated within the Project area, and to establish monuments as shown on the Drawings.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 CONSTRUCTION

A. All surveying involving property lines or monuments shall be done by, or under the direction of, a Registered Land Surveyor licensed in the State of Alaska.

B. The OWNER will supply information relative to the approximate locations of monuments and corners, but final responsibility for locations, referencing, and restoration shall rest with the CONTRACTOR.

C. In the event the CONTRACTOR does not replace the survey monuments and property corners disturbed by the CONTRACTOR’s operations, the OWNER may, after first notifying the CONTRACTOR, replace the monuments in question. The cost of such replacements shall be deducted from payments to the CONTRACTOR.

D. The CONTRACTOR shall provide the OWNER with a copy of all surveyors' notes, if requested by the ENGINEER, prior to each Pay Request payment for which payment for Pay Item No. 2702.1, Construction Surveying, is increased from the previous Pay Request payment.

E. The CONTRACTOR shall provide the OWNER with a copy of all surveyors' notes, prior to the request for final payment, and include the information on the record drawings.

F. The CONTRACTOR shall obtain all information necessary for as-built plan production, from actual measurements and observations made by its own personnel, including Subcontractors, and submit this information to the ENGINEER.

G. The CONTRACTOR shall use competent, qualified personnel and suitable equipment for the layout work required and shall furnish all stakes, templates, straightedges and other devices necessary for establishing, checking and maintaining the required points, lines and grades.

H. The CONTRACTOR shall perform all staking necessary to delineate clearing and/or grubbing limits; all cross sections necessary for determination of excavation and embankment quantities, including intermediate and/or remeasure cross sections as may be required; all slope staking; all staking of culverts and drainage structures, including the necessary checking to establish the proper location and grade to best fit the conditions on site; the setting of such finishing stakes as may be required; the staking of right-of-way; the staking, referencing and other actions as may be required to preserve or restore land monuments and property corners; and all other staking necessary to complete the project.

I. Field notes shall be kept in standard bound notebooks in a clear, orderly and neat manner, consistent with standard engineering and surveying practices. The CONTRACTOR's field books shall be available for inspection by the ENGINEER at any time.

J. All field survey notes, including those which become source documentations from which quantities for payment are computed, shall be recorded by a notekeeper furnished by the CONTRACTOR. The notekeeper shall be thoroughly familiar with generally accepted standards of good survey notekeeping practice.

K. The ENGINEER may randomly spot-check the CONTRACTOR's surveys, staking and computations at the ENGINEER's discretion. After the survey or staking has been completed, the CONTRACTOR shall provide the ENGINEER with a minimum of 72 hours notice prior to performing any WORK, and shall furnish the appropriate data as required, to allow for such random spot-checking; however, the OWNER assumes no responsibility for the accuracy of the WORK.

L. Within ten days of Notice to Proceed, unless otherwise approved by the ENGINEER, the CONTRACTOR shall stake the location of the new water, sewer, and/or storm drain service connections to each home. The stake shall be a surveyor'' lathe marked as to the type of service, and placed at the right-of-way line, at the location shown on the Drawings.

END OF SECTION

SECTION 02703 – MONUMENTS

PART 1 – GENERAL

1.1 DESCRIPTION

A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary for furnishing and installing survey monuments as shown on the Drawings.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Materials shall be as shown on Drawings.

PART 3 – EXECUTION

3.1 CONSTRUCTION

A. Monuments shall be set as shown on the Drawings by a Registered Land Surveyor, licensed in the State of Alaska. The holes shall be of sufficient size to permit thorough compaction of backfill after the units have been installed.

B. Primary monuments shall be permanently set according to the latest version of the Alaska Society of Professional Land Surveyors' *Standards of Practice Manual* and shall comply with AS 34.65.040.

END OF SECTION

SECTION 02707 - CHAIN LINK FENCE

PART 1 - GENERAL

1.1 DESCRIPTION

A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary for furnishing and installing chain link fencing, as shown on the Drawings.

PART 2- PRODUCTS

2.1 MATERIALS

A. Fencing materials shall conform to AASHTO M 181. Sizes of posts, gate frames, rails and braces shall conform to the dimensions and weights shown in Table No. 1. Portland cement concrete shall conform to Section 03301 – Structural Concrete.

TABLE NO. 1

USE	NOMINAL PIPE SIZE INCHES
End, corner and pull posts for fabric heights: five (5) feet or less	2
Interior bracing for fabric heights: five (5) feet or less	1
Rail and post braces	1-1/4
Intermediate posts for fabric heights: five (5) feet or less	1-1/2

B. Sizes of posts, gate frames, rails and braces for fabric heights over five feet shall be shown on the Drawings.

C. Post tops shall consist of ornamental tops. The post tops shall fit over the outside of the posts and shall exclude moisture from the tubular posts.

D. Stretcher bars shall not be less than 3/16" by 3/4", and shall be of lengths one-inch less than the full height of the fabric with which they are to be used. The stretcher bars shall be arranged for attaching the fabric to all terminal posts by threading through the fabric, by bands, or by other positive mechanical means. One stretcher bar shall be provided for each gate, and end post and two for each corner and pull post.

E. Ties or clips of adequate strength shall be provided in sufficient number for attaching the fabric and stretcher bars to all terminal posts at intervals not exceeding 15 inches.

F. Bands or clips of adequate strength shall be provided in sufficient number for attaching the fabric and stretcher bars to all terminal posts at intervals not exceeding 15 inches.

G. Posts. Interior posts shall be of the length required for a footing depth of three feet. End posts shall be of the length required for a footing depth of four feet. All posts shall be tubular.

H. Reinforcing Wires. Top reinforcing wire shall be provided. The reinforcing wires shall be of coiled spring wire not less than seven gauge plus, or minus 0.005-inch in diameter. Ties or clips shall be provided for attaching each wire to the fabric at intervals not exceeding two feet.

I. Portland cement concrete shall conform to Section 03302 - Concrete Structures.

J. Mesh and wire size shall be two-inch mesh, 0.148-inch in diameter.

PART 3 - EXECUTION

3.1 GENERAL

A. All trees, brush, and other obstacles that would interfere with the construction of the fence shall be removed and disposed of as directed by the ENGINEER.

B. Prior to installing the fence, the existing ground along the line of the fence location shall be graded to a smooth, uniform surface, to the extent that no abrupt changes in grade exist between adjacent fence posts.

C. All posts shall be set in Portland cement concrete footings. The tops of the footings shall be level with the ground, shall be crowned to provide drainage, and shall be troweled smooth. Concrete footings shall be eight inch diameter. The footings shall be allowed to cure for a period of at least seven days before any stress is applied.

D. The posts shall be set vertical and shall be of uniform and equal height above the ground, with a maximum horizontal spacing of ten feet, center-to-center. The chain link fabric shall be fastened to the top reinforcing wire, and the lower edge of the fabric shall be fastened to the bottom tension wire.

E. For fabric heights of six feet or more, a 1 1/4" inch top rail shall be provided. Top rails for fabric heights less than six feet, and intermediate brace rails shall be provided, if shown on the Drawings.

F. At each location where an electric transmission, distribution or secondary line crosses any of the types of fences covered by these Specifications, the CONTRACTOR shall furnish and install a ground rod and connection to the fence conforming to the requirements of Section Nine of the National Electric Safety Code.

G. Ground rods and connectors shall be placed at minimum intervals of 400 feet in length, one ground rod with connection to the fence shall be required.

H. Grading. The fence shall be constructed to follow a smooth profile. Nowhere, however, throughout the fence length shall be the distance between the ground surface and the bottom tension wire be greater than four inches, nor less than two inches. Where excavation is necessary to meet this requirement, the ground will be graded level not less

than one foot on either side of the fence. Grading for all specific conditions shall be such that water will not be allowed to pond in the immediate area of the fence.

I. General Appearance. All runs of fence shall present the same general appearance. The product of one manufacturer only will be accepted, except for items which do not influence the appearance of the completed fence. The fence shall be the product of a manufacturer who has demonstrated by actual installations of a similar nature, that its product is the type required. No used, re-rolled, or open seam steel will be permitted in posts, gate frames, rails or braces.

END OF SECTION

SECTION 02708 - GUARDRAIL

PART 1 - GENERAL

1.1 DESCRIPTION

A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary for furnishing and installing guardrail as shown on the Drawings.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Rail elements shall conform to AASHTO M 180, Class A, Type II, unless otherwise specified on the Drawings, or in the Special Provisions.

B. Bolts and nuts shall be galvanized steel conforming to ASTM A 153, Class C and ASTM A 307.

C. Wooden guardrail posts and blocks shall be construction grade (stress grade of 1,2000 psi or more) posts and timbers, or better, as rated by the West Coast Lumber Inspection Bureau, and shall be fabricated from on of the following timber species, Douglas Fir, Western Pine, Larch, or Hemlock. The length and cross section shall be as shown on the Drawings. Posts shall receive a preservative treatment in accordance with AASHTO M 133. Only one combination of post and block finish shall be used for any continuous length of guardrail.

D. Steel guardrail posts shall be of the section and length shown on the Drawings, and shall be of ASTM M-36 steel, galvanized in accordance with ASTM A-123.

E. All fittings, bolts, washers and other accessories shall be galvanized in accordance with the requirements of AASHTO M, or AASHTO M 232, whichever may apply. All galvanizing shall be done after fabrication.

F. Concrete for anchors shall meet the requirements of Section 03302 - Concrete Structures.

G. Paint for galvanized coating repair shall be "Zinc Clad II Ethyl Silicate" as manufactured by Sherwin Williams Ind. & Marine Coatings, or "Cold Galvanized Product No. 7002, 7007, 7008 & 7009 and Galva Bright Product No. 7707, 7708 & 7709," as manufactured by Crown North American Professional Products.

PART 3 - EXECUTION

3.1 CONSTRUCTION

A. Guardrail posts shall be set plumb. When the Drawings require that the ends of a section of guardrail be curved outward or downward, the posts shall be set to accommodate the curve. The posts shall be backfilled with acceptable material and thoroughly compacted to the satisfaction of the ENGINEER. Any damage to the posts, pavement, shoulders and adjacent slopes resulting from post driving shall be repaired at the CONTRACTOR's expense.

B. The rail element shall be erected according to the Drawings in a manner resulting in a smooth, continuous installation with laps in the direction of traffic flow.

C. All metal work shall be fabricated in the shop. No punching, cutting, or welding shall be done in the field, except that holes necessary when additional posts are required, or for special details in extraordinary cases, may be drilled in the field when approved by the ENGINEER. The rail shall be erected so that the bolts at expansion joints will be located at the centers of the slotted holes. Field-drilled holes shall be treated in accordance with AASHTO M 36.

D. Rails on curves with a radius of 150' or less shall be shop bent.

E. All bolts shall be drawn tight and extend at least one-fourth-inch beyond the nuts. Except where required for adjustments, bolts shall not extend more that one-half-inch beyond the nuts. Where the spelter coat on galvanized rail or post elements has been damaged, repairs to the spelter coat shall be made in accordance with AASHTO M 36.

F. It is the CONTRACTOR's option to use either wood or steel posts when allowed by the type of guardrail specified, subject to the following conditions:

1. Only one type of post on block shall be used on a Project, unless the WORK entails extending an existing run or guardrail;
2. When extending an existing run of guardrail, the post and block used shall be the same material as the existing post and block.

END OF SECTION

SECTION 02709 - TOPSOIL

PART 1 - GENERAL

1.1 DESCRIPTION

A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary for furnishing and placing topsoil at the locations shown on the Drawings.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil furnished by the CONTRACTOR shall consist of a natural friable surface soil without admixtures of undesirable subsoil, refuse, or foreign materials. It shall be reasonably free from roots, hard clay, coarse gravel, stones larger than one inch in any dimension, noxious weeds, tall grass, brush, sticks, stubble or other material which would be detrimental to the proper development of vegetative growth.

Topsoil shall be obtained from naturally well drained sites where topsoil occurs at least 4-inches deep. Topsoil shall not be obtained from bogs or marshes.

B. Topsoil shall conform to the following grading:

Sieve Sizes	Percentage Passing
1-inch	100%
1/2 inch	95% - 100%
No.4	75% - 100%
No.10	60% - 100%
No.200	10% - 60%

C. Topsoil shall contain not less than 3%, or more that 20% organic matter, by weight as determined by loss-on-ignition of oven-dried samples in accordance with ATM T-6. Organic material shall be decomposed and free of wood.

~~C.Topsoil shall contain not less than 3%, or more that 20% organic matter, by weight as determined by loss-on-ignition of oven-dried samples in accordance with ATM T-6. Organic material shall be decomposed and free of wood.~~

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~~C.~~D. The ENGINEER shall be notified on the location from which the CONTRACTOR proposes to furnish topsoil at least 30 calendar days prior to delivery of topsoil to the Project from that location. The topsoil and its source will be inspected and tested by the ENGINEER before approval will be granted for its use.

~~D.~~E. Topsoil sources lacking organic matter may be used if, prior to delivery to the Project, sufficient organic matter in the form of pulverized peat moss or rich organic soil from other sources is thoroughly mixed with the topsoil to provide a product meeting the above requirements.

~~E.~~F. Organic material for incorporation into topsoil, if required, shall be partially decomposed fibrous or cellular stems and leaves of any of several species of Sphagnum mosses, or rotted manure. Organic material may require chopping to shredding to insure thorough mixing with the topsoil.

~~F.~~G. All topsoil shall be fertilized as follows: the application rates of the fertilizer and limestone per 1,000 square feet of ground area of topsoil furnished by the CONTRACTOR shall be determined by the ENGINEER, based on soil analysis tests so that the total natural and applied chemical constituents are as follows:

Nitrogen	1.0 lb. minimum - 1.5 lb. maximum per 1,000 square feet
Phosphoric Acid	1.0 lb. minimum - 2.0 lb. maximum per 1,000 square feet
Potassium	1.0 lb. minimum - 2.0 lb. maximum per 1,000 square feet
Limestone	Limestone requirements shall conform to the following table:

LIMESTONE REQUIREMENTS

Soil pH	Limestone Tons per Acre
Above 6.0	0
5.0 - 6.0	1.5
Below 5.0	3.0

PART 3 - EXECUTION

3.1 CONSTRUCTION

A. All areas beyond the sidewalk or roadway shoulder that are disturbed during construction which are not covered with pavement, concrete, or base course, shall be graded to a neat, uniform gradeline and appearance, as determined by the ENGINEER, and covered with a neat uniform, three inch minimum thickness of topsoil and hydroseeded, unless otherwise shown on the Drawings, or directed by the ENGINEER.

B. The topsoil shall be evenly spread on the designated areas to a depth, which, after settlement and compaction, shall be three inches, unless otherwise directed by the ENGINEER. Spreading shall not be done when the ground or topsoil is frozen, excessively wet, or otherwise in a condition detrimental to the WORK, as determined by the ENGINEER. Roadway surfaces shall be kept clean during hauling and spreading operations.

C. After spreading has been completed, large clods, stones larger that one-inch in any dimension, roots stumps, and other litter shall be raked up and removed.

D. The final grading of the topsoil prior to hydroseeding shall be to a tolerance that will not permit ponding of water in excess of one inch in depth.

E. Topsoil Finish Grading, if a pay item will not be approved for start-up until the topsoil has been graded to within the tolerances given above.

1. The CONTRACTOR shall provide labor personnel experienced with landscaping work that involves fine grading of topsoil for residential or commercial lawns.
2. The ENGINEER will determine the location of those areas requiring finish grading and the time required to bring the graded topsoil to the desirable finish appearance.
3. The CONTRACTOR shall remove and dispose of all excess materials resulting form the finish grading of the topsoil. The WORK required to remove and dispose of this excess material from piles placed along the roadway will be considered incidental to other WORK under the contract.

END OF SECTION

SECTION 02710 - SEEDING

PART 1 - GENERAL

1.1 DESCRIPTION

A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary for preparing the ground and furnishing and applying seed, fertilizer, lime and mulch as called for in the Contract Documents, all in reasonably close conformity with these Specifications and at locations shown on the Drawings or established by the ENGINEER.

B. It is the intent of these Specifications that a living vegetative cover will be provided in the areas indicated on the Drawings.

C. Seed mix to be used will be as specified in the Bid Schedule.

PART 2 - PRODUCTS

2.1 SEED

A. Seed shall be furnished separately or in mixture in standard sealed containers clearly labeled with Seed name; lot number; net weight; percentages of purity and of germination and hard seed; and, percentage of maximum weed seed content. The CONTRACTOR shall furnish the ENGINEER duplicate signed copies of a statement by the vendor certifying that each lot of seed has been tested by a recognized laboratory for seed testing within six months of date of delivery. This statement shall include: Name and address of laboratory; date of test; lot number for each kind of seed; and results of tests as to name, percentages of purity and germination, and percentage of weed content, for each kind of seed furnished, and, in the case of a mixture, the proportions of each kind of seed.

B. Seed mixes shall conform to on of the following:

MIX PROPORTION				
TYPE	**VARIETY**	**TYPE I**	**TYPE II**	**TYPE III***
Red Fescue	Pennlawn Boreal Dawson	1/3	1/3	1/3
Tall Fescue		1/3		
Perennial Rye	Manhattan Derby Regal	1/3	1/3	1/3
Blue Grass	Nugget Newport Park		1/3	1/3

* Maximum weed seed content shall be one (1) %.

2.2 FERTILIZER

A. Fertilizer shall be a standard commercial grade fertilizer, supplied separately or in mixtures. Fertilizer shall conform to all State and Federal regulations and shall be 10-20-20. The fertilizer shall contain slow release nitrogen in the form of inorganic chemicals amounting to at least 75% of the available nitrogen specified.

B. Fertilizer shall be furnished in new, clean, sealed, moisture-proof, and properly labeled containers, clearly labeled with the name, weight, and guaranteed analysis of the contents.

C. Fertilizer for use in a hydraulic sprayer shall be soluble or ground to a fineness that will permit complete suspension of all insoluble particles in the water or slurry.

2.3 LIME

A. Lime shall be agricultural ground limestone containing not less that 85% dolomite, with 95% passing through a 100-mesh screen, delivered to the site in the original unopened containers labeled to show analysis.

B. Limestone for use in a hydraulic sprayer shall be soluble or ground to a fineness that will permit complete suspension of all insoluble particles in the water or slurry.

2.4 MULCH

A. Mulch shall be natural or cooked wood cellulose fiber which shall have the property of dispersing readily in water and shall have no toxic effect when combined with seed or other materials. The homogeneous slurry or mixture shall be capable of application with power spray equipment. A colored dye which is noninjurious to plant growth may be used when specified. Wood cellulose fiber shall be packaged in new, labeled containers, shall have an equilibrium air-dried moisture content of 12% plus or minus three percent at the time of manufacture, and shall have a pH range of 3.5 to 5.0.

PART 3 - EXECUTION

3.1 SOIL PREPARATION

A. After grading, and topsoiling if required, has been completed in conformity with the lines and grades shown on the Drawings or staked by the ENGINEER, and before start of seeding operations, the areas to be seeded shall be cultivated to provide a reasonably firm, but friable seedbed. Cultivation shall be carried to a depth of two-inches, except on slopes steeper than 3:1. Depth of cultivation may be reduced as directed by the ENGINEER. All cultivated areas shall be raked or cleared of stones one inch in diameter and larger. All weeds, plant growth, stick, stumps, and other debris or irregularities which might interfere with the seeding operation, growth of grass, or subsequent maintenance of the grass covered areas, shall be removed.

3.2 SEEDING SEASONS

A. All seeding shall be completed after May 1st and prior to August 15th, or the contract deadline, whichever is sooner. Seeding other than the specified dates will be allowed only with prior written permission of the ENGINEER and will be at the CONTRACTOR's own risk. If the seeding fails to produce a uniform and fecund growth, the seeding will be repeated until the required growth is achieved.

B. Seeding shall not be done during windy conditions, or when climactic conditions or ground conditions would hinder placement or proper growth.

3.3 APPLICATION METHODS

A. Seed, fertilizer, ground limestone and mulch material shall be placed by one of the following methods.

1. Hydraulic Method

a. Seeding by hydraulic methods shall consist of furnishing a slurry made of seed, fertilizer, ground limestone, wood cellulose fiber mulch, and water, and applying the slurry under pressure to the designated area.

b. A slurry unit shall consist of a mixture of the following proportionate quantities of water, mulch fiber, seed, fertilizer and ground limestone:

Water	1,000 gallons
Mulch Fiber	200 pounds
Seed	35 pounds
Fertilizer	120 pounds
Ground Limestone	500 pounds

c. An adequate scale shall be provided by the CONTRACTOR to weigh the mix proportions.

d. The mixing and application shall be as follows:

1) Fill the tank with water to one-third full and agitate at half speed. Add fertilizer, ground limestone and one-half the required mulch fiber.

2) Fill the tank to two-thirds full and agitate at full speed. Add the remaining mulch fiber.

3) Agitate at full speed and add water until the tank is full, then add the seed. Begin slurry distribution after five minutes of agitation.

e. After fertilizer and seed are placed in the hydraulic seeder, the mixture shall be completely applied within one hour. Seed remaining in contact with fertilizer for more than one hour shall be rejected and additional seed at the specified rate shall be added at no additional cost.

f. The slurry mixture shall be spread uniformly at the application rate, as directed by the ENGINEER, upon the areas designated. Application rates

shall be one slurry unit per 5,000 to 10,000 square feet, as directed by the ENGINEER

g. Hydraulic seeding equipment shall be capable of maintaining a continuous agitation so that a homogeneous mixture can be applied through a spray nozzle. The pump shall be capable of producing sufficient pressure to maintain a continuous, non-fluctuating spray capable of reaching the extremities of the seeding area with the pump unit located on the roadbed. Sufficient hose shall be provided to reach areas not practical to seed from the nozzle unit situated on the roadbed.

2. Dry Method

a. Mechanical spreaders, seed drills, landscape seeders, culitipacker seeders, fertilizer spreaders, or other mechanical spreading equipment approved by the ENGINEER may be used when seed and fertilizer are to be applied in dry form.

b. Fertilizer, and ground limestone if required, shall be spread separately at the specified rates and then incorporated in one operation to a minimum depth of two inches. Weather and soil conditions permitting, seeded areas shall be compacted, within 24 hours from the time the seeding is completed, by culitpacker, roller, or other equipment approved by the ENGINEER.

c. Compacting equipment shall be operated at right angles to the slope. Compaction shall not be performed when the soil is in such condition that it will be picked up by the compacting equipment, nor shall heavy soils be compacted at all if so directed by the ENGINEER.

d. Hand-operated seeding devices may be substituted provided that the rate of application for both seed and nutrient is twice that of dry mechanical methods, and that the end result required is attained. Hand-operated seeding devices may be used only upon prior written approval of the ENGINEER.

3.4 MAINTENANCE OF SEEDED AREAS

A. The CONTRACTOR shall protect seeded area against traffic by warning signs or barricades, as approved by the ENGINEER. Surfaces gullied or otherwise damaged following seeding shall be repaired by re-grading, re-seeding, and re-mulching, as directed by the ENGINEER, and the CONTRACTOR shall otherwise maintain seeded areas in a satisfactory condition until final inspection and acceptance of the WORK.

B. The seeded areas shall be watered by the CONTRACTOR as required for proper germination and growth. Equipment used in watering shall be capable of reaching all seeded areas from the traveled way.

3.5 INSPECTION AND ACCEPTANCE

A. Acceptance of seeded areas shall be based on a uniform stand of vegetation at the time of final inspection. Areas failing to show a uniform stand after germination shall be scarified and reseeded as herein specified.

END OF SECTION

SECTION 02711 - LANDSCAPE PLANTING

PART 1 - GENERAL

1.1 DESCRIPTION

A. The WORK under this Section includes providing all labor, materials, tools, and equipment necessary to furnish and install all trees and shrubs called for in the Contract Documents, all in reasonably close conformity with these Specifications and at locations shown on the Drawings or established by the ENGINEER.

PART 2 - PRODUCTS

2.1 PLANTS

A. Plants shall be nursery-grown unless otherwise specifically permitted in each instance. American Association of Nurserymen Standard ASA Z 60.1 shall apply.

B. Upon completion of the WORK and prior to the final acceptance invoices or written statements from the suppliers showing the name of materials received or shipped, shall be presented to the ENGINEER for a final check as to conformance to these Specifications.

C. Plant material shall conform to state and federal laws relating to inspection for diseases and insect infestation, and shall conform to the American Standard for Nursery Stock. Plant materials shall be firs class representatives of their species or variety.

D. Plants shall have normal, well-developed branches and be densely foliated when in leaf. Plants shall be vigorous and free from defects, disease, insect pests, eggs or larvae, sun-scaled, injuries and abrasions of the bark. Plants shall have well-developed root systems.

E. Plants shall be container grown or burlap balled. Freshly dug plants, heeled in plants or plants from cold storage shall not be accepted. Trees that have their leader cut, or are so damaged that cutting is necessary, shall not be accepted.

F. Plants shall not be pruned prior to delivery except upon written approval from the ENGINEER

2.2 TREES AND SHRUBS

A. Measurements of trees and shrubs shall be taken when their branches are in normal position. Height and spread dimensions specified refer to the main body of the plant, not from branch or root tip to tip. Caliper of trees shall be taken twelve inches above ground level.

2.3 GROUND COVER

A. Ground cover plants shall be furnished in pots. Unless otherwise specified. The plants shall be at least one year-old, and have been growing in post long enough to ensure sufficient root growth to hold soil in place when removed from the pot.

2.4 PLANT SIZE

A. Plant sizes shall conform to the measurements specified in the plant list. Exceptions are as follows:

1. Plants larger than specified in the plant list may be used if approved. Use of such plants shall not increase the Contract Price. If larger plants are approved, the spread of roots or ball of earth shall be increased in proportion to the increased size of the plant.
2. Up to 10% of undersized plants in any one variety or species may be used, provided that there are sufficient plants above size to make the average equal to or above specified grade. Acceptable undersize plants shall be larger than average size of the net smaller grade.

2.5 SUBSTITUTIONS

A. Substitutions will be permitted only if proof is submitted that specific plants or sizes are unobtainable. A proposal will be considered for the nearest equivalent size or variety with equitable adjustment of Contract Price.

2.6 BALLED AND BURLAPPED PLANTS

A. Balled and burlapped plants shall be contained in firm natural balls of earth, of sufficient diameter and depth to include all fibrous and feeding roots. Plants in which the ball has bee broken or cracked, either before or during planting operations, will not be accepted.

B. Balled and burlapped plants which cannot be planted immediately upon delivery shall be set on the ground and shall be well protected with soil, wet peat moss, wet sawdust, or wet ground bark.

C. Roots or balls of plants shall be protected from sun and drying winds.

D. Bundles of plants shall be opened and the plans separated before the roots are covered. Care shall be taken to prevent air pockets among the roots. During plating operations, bare roots shall be covered with canvas, hay, or other approved material.

2.7 PLANTING SOIL

A. Planting soil shall be composed of a mixture of one part topsoil and one part rotted manure or peat.

2.8 FERTILIZER

A. Fertilizer shall be a standard commercial grade of organic or inorganic fertilizer containing the following percentage of total nitrogen, available phosphoric acid and water soluble potash: 14-14-14, furnished in standard unopened containers with weight, name of plant nutrients, and manufacturer's guaranteed statement of analysis clearly marked in accordance with state and federal laws. Fertilizer shall be Osmocote 14-14-14, or approved equal.

2.9 MULCH

A. Mulch shall be ground fir, spruce, or hemlock, free from weed seeds, tannin, or other compounds detrimental to plant life. Mulch shall have a size range of one-fourth to one-inch, with a maximum of 50% passing a one-half-inch screen.

PART 3 -3 EXECUTION

3.1 PLANTING SEASONS

A. All planting shall be performed between May 1 and August 15, unless otherwise authorized in writing by the ENGINEER.

3.2 LAYOUT OF PLANT MATERIAL

A. The ENGINEER will stake the location of all planting pits.

3.3 INSPECTION OF PLANT MATERIAL.

A. Plants shall be subject to inspection and approval upon delivery as to size, quality, species, and variety. Approval shall not impair the right of inspection and rejection upon delivery at the site or during the progress of the WORK, for reasons of size, condition of ball or roots, diseases, insects, latent defects, or injuries. Plants that meet the measurements specified, but do not possess a normal balance between height and spread, shall be rejected. Rejected plants shall be removed from the site immediately.

3.4 PLANNTING PITS

A. Excavate circular pits with vertical sides to a diameter at least two feet greater than the rootball and at least one foot greater in depth. Before any planting is done, the ENGINEER shall be notified of any soil conditions detrimental to the growth of plant materials that are encountered when excavating planting pits.

3.5 PLACEMENT AND BACKFILL

A. Before plant placement, thoroughly mix fertilizer (Osmocote 14-14-14, or approved equal) with planting soil at the rate of one pound of fertilizer per ten cubic feet of planting soil. Backfill pit with one foot of planting soil or until original root crown soil line is flush with, or slightly above, finished grade when plant is set in pit. Place plant in center of pit in upright position. When pit has been backfilled approximately two thirds full, water thoroughly, saturating rootball and eliminating all air pockets. Complete backfill around rootball with soil mixture and bring to finish grade while flooding with water. After backfilling, apply fertilizer (Osmocote 14-14-14, or approved equal) to surface around periphery of plant rootballs at the rate of ten pounds per 1,000 square feet.

3.6 TREE STAKING

A. Stake all trees as recommended by the supplier.

3.7 PRUNING

A. Pruning shall be done in accordance with standard horticultural practice to preserve the natural character of the plant.

3.8 MULCHING

A. All planting pits shall be mulched to a two inch depth in a 30-inch circle. Mulch shall be applied within two days after planting.

3.9 MAINTENANCE

A. Maintenance of all plants shall be required from the time of planting until the initial acceptance. Maintenance shall include watering, weeding, tightening and repairing of guys, resetting plants to proper grades or upright position and removal of dead materials. No plants will be accepted unless they show a healthy growth and satisfactory foliage condition.

3.10 GUARANTEE

A. The CONTRACTOR shall provide 100% replacement guarantee for a period of one year, beginning at the date of initial acceptance by the ENGINEER. At the end of the guarantee period and upon written request from the CONTRACTOR, the ENGINEER will make final inspection. The ENGINEER will ensure the plants are health, showing satisfactory growth and, in general, show signs of developing into healthy, mature representatives of their species. The CONTRACTOR shall remove and replace promptly any plant material that is dead or not showing satisfactory growth.

B. Any necessary repairs under the guarantee shall be made within thirty days after receiving notice of need, weather permitting. In the event the CONTRACTOR does not make repairs accordingly, the OWNER, without further notice, may provide materials and labor to make such repairs at the expense of the CONTRACTOR. The replacement shall be on the same variety, size and character as specified for original planting. If approved by the ENGINEER, trees may be replanted at start of next year's planting season. In such cases, the CONTRACTOR shall remove dead trees immediately.

END OF SECTION

SECTION 02712 - JUTE MESH

PART 1 - GENERAL

1.1 DESCRIPTION

A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary for furnishing and placing and maintaining jute mesh for erosion control.

PART 2 - PRODUCTS

2.1 GENERAL

A. Jute mesh shall be a uniform, open, plain weave cloth of undyed and unbleached single jute yarn. The yarn shall be of a loosely twisted construction and it shall not vary in thickness more than one-half its normal diameter. Jute mesh shall be furnished in rolled strips and shall meet the following requirements:

Width - 48 inches, plus or minus one inch
78 warp - ends per width of cloth (minimum)
41 weft - ends per yard (minimum)
Weight shall average 1.22 pounds per linear yard with a tolerance of plus or minus 5%.

B. Staples shall be U-shaped and shall be approximately six inches long and one inch wide. Machine made staples shall be of No. 11 gauge or heavier steel wire. Handmade staples shall be made from 12-inch lengths of No. 9 gauge or heavier steel wire.

PART 3 - EXECUTION

3.1 GENERAL

A. Jute mesh shall be placed within 48 hours after finish grading or topsoiling of an area is completed. If seeding is specified, within 24 hours after seeding of an area is completed. The jute mesh shall be placed in a manner that will minimize disturbance of the underlying soil. All equipment and application processes shall be approved by the ENGINEER prior to use.

B. The surface shall be smoothed and all gullies and potholes backfilled prior to applying jute mesh. All rocks or clods larger than two inches in size and all sticks and other foreign material that will prevent contact of the jute mesh with the surface shall be removed. If the surface is extremely dry, the ENNGINEER may require watering prior to placement.

C. Jute mesh shall be placed uniformly, in contact wit the underlying soil, at the locations shown on the Drawings or directed by the ENGINEER. The top edge of each strip shall be anchored by placing a tight fold of mesh vertically in a six inch deep slot or trench in the soil and tamping and stapling in place. Edges of adjacent strips shall be lapped six inches with a row of staples at a maximum interval of three feet in the lapped area. Bottom edges shall be lapped 12 inches over the next lower strip, if applicable, or buried as specified for top edges.

D. Check slots shall consist of separate four foot strips of jute mesh placed at right angles to the direction of water flow immediately prior to placing the general covering of jute mesh. Check slots shall be anchored by burying the top edge of the strip as described above.

E. Check slots shall be spaced so that one check slot, or junction slot of the jute mesh occurs every 75 feet on gradients of less than 4% and every 50 feet on gradients of more than four percent. On slope drains, a check slot or an end slot shall occur every 25 feet unless otherwise specified.

F. Edges of jute mesh shall be buried around the edges of catch basins and other structures.

G. Jute mesh shall be held in place by wire staples driven vertically into the soil. The mesh shall be fastened at intervals not more than three feet apart in three rows for each strip of mesh, with one row along each edge and one row alternately spaced in the middle. All ends of the mesh and check slots shall be fastened at six inch intervals across their width.

H. The CONTRACTOR shall maintain the areas covered by jute mesh until final acceptance of the project. Prior to final acceptance, any damaged areas shall be reshaped as necessary, reseeded, if applicable; and the jute mesh satisfactorily repaired or replaced.

END OF SECTION

SECTION 02714 - FILTER CLOTH

PART 1 - GENERAL

1.1 DESCRIPTION

A. The WORK under this Section includes providing all labor, material, tools, and equipment necessary for furnishing and installing filter cloth in accordance with the Drawings and Standard Details, or as directed by the ENGINEER.

PART 2 - PRODUCTS

2.1 CLOTH

A. Filter cloth shall be composed of plastic yarn fabricated into a pervious sheet with distinct pores or openings.

B. The plastic yarn shall consist of a long-chain synthetic polymer composed of at least 85% by weight of propylene, ethylene, or vinylidene-chloride and shall contain stabilizers and/or inhibitors added to the base plastic to make the filaments resistant to deterioration due to ultraviolet and heat exposure. The cloth shall be calendared or otherwise finished so that the yarns will retain their relative position with respect to each other. The edges of the cloth shall be selvedged or otherwise finished to prevent the outer yarn from pulling away from the cloth.

C. Type A filter cloth, woven or non-woven, shall meet the following requirements:

Grab Tensile Strength (ASTM D 1682)	90 lbs. min.
Bursting Strength (ASTM D 751)	100 psi min.
Equivalent Opening Size (EOS)	40 minimum, 100 maximum

D. Type B filter cloth, woven or non-woven, shall meet the following requirements:

Grab Tensile Strength (ASTM D 1682)	200 lbs. min.
Bursting Strength (ASTM D 751)	500 psi min.

E. Type C filter cloth, woven or non-woven, shall meet the following requirements:

Grab Tensile Strength (ASTM D 1682)	200 lbs. min.
Grab Tensile Elongation (ASTM D 1682)	30% maximum
Bursting Strength (ASTM D 751)	290 psi min.
Trapezoid Tear Strength (ASTM D 1117)	50 lbs. min.
Puncture Strength (ASTM D 751)*	75 lbs. min.
Water Permeability (AASHTO M 288)**	0.001 cm/sec. min.

*Using 5/16" flat-tipped pod
**5 cm. Constant head

2.2 SEAMS

A. Seams, when required, shall be sewn with thread of material meeting the chemical requirements given above for plastic yarn. The sheets for filter cloth shall be sewn

together at the factory or another approved location to form sections not less than two feet wide. Seams shall be tested in accordance with ASTM D 1682, using one inch square jaws and 12 inches per minute constant rate of traverse. The strengths shall be not less than 90 pounds in any principal direction.

2.3 ACCEPTANCE REQUIREMENTS

A. All brands of plastic filter cloth and all seams to be used will be accepted on the basis of a certification. The CONTRACTOR shall furnish the ENGINEER a mill certificate or affidavit signed by a legally authorized official from the company manufacturing the cloth. The mill certificate or affidavit shall attest that the cloth meets the chemical, physical, and manufacturing requirements stated in this Section.

2.4 SHIPMENT AND STORAGE

A. During all periods of shipment and storage, the cloth shall be protected from direct sunlight, ultraviolet rays, temperatures greater than 140º F, mud, dirt, dust, and debris. To the extent possible, the cloth shall be wrapped in a heavy-duty protective covering.

PART 3 - EXECUTION

3.1 CONSTRUCTION

A. Filter cloth shall be placed in the manner and at the locations shown on the Drawings or as directed by the ENGINEER. At the time of installation, cloth shall be rejected if it has defects, rips, holes, flaws, deterioration, or damage incurred during manufacture, transportation, or storage.

B. The surface upon which the filter cloth is to be placed shall be free of projections or depressions, and rocks, roots, and other sharp objects which may cause the filter cloth to be punctured. The filter cloth shall be placed without stretching and shall lie smoothly in contact with the soil or wall surface. When overlapping of strips is necessary, the joints shall be overlapped a minimum of two feet. End overlaps shall be made in the direction of flow.

C. The cloth shall be protected at all times during construction from contamination or from damage during its installation or during placement of subsequent covering; contaminated or damaged cloth shall be replaced at the CONTRACTOR's expense, or if the ENGINEER permits, torn fabric may be patched. The aggregate material shall be cleaned from the fabric, and the torn area shall be overlain with fabric with a minimum three foot overlap around the edges of the torn area. Care shall be taken that the patch remains in place when material is placed over the affected area.

D. The WORK shall be scheduled so that not more than 30 Days elapse between the placement of the cloth and the time it is covered with specified material.

E. Type A filter cloth shall be utilized in all installations except under riprap or gabions, or for subgrade reinforcement.

F. Type B filter cloth shall be utilized under riprap or gabions.

G. Type C filter cloth shall be utilized for subgrade reinforcement.

H. Following placement of the fabric on the prepared surface, material of the type shown on the Drawings shall be back-dumped on the previously spread fabric or ground adjacent to the fabric and carefully pushed or spread onto the fabric by a dozer or other machinery. A minimum depth of one foot, or the depth shown on the Drawings, shall be maintained at all times between the fabric and the wheels or tracks of the construction equipment. At not time shall equipment operate on the unprotected fabric. The material shall be spread in the direction of the fabric overlap. Special care shall be taken to maintain a proper overlap and fabric continuity.

END OF SECTION

SECTION 02715 - UNDERDRAIN

PART 1- GENERAL

1.1 DESCRIPTION

A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary for furnishing and installing underdrain as shown on the Drawings and the Standard Details.

PART 2 - PRODUCTS

2.1 MATERIAL

A. The type and size of underdrain pipe to furnished shall be as specified on the Drawings.

B. Slotted or perforated and non-perforated corrugated steel pipe shall conform to the requirements of AASHTO M 36.

C. Slotted or perforated and non-perforated corrugated aluminum alloy pipe shall conform to the requirements of AASHTO M 196.

D. Slotted or perforated and non-perforated corrugated polyethylene (CPP) plastic pipe shall conform to the requirements of AASHTO M 252.

E. Slotted or perforated and non-perforated polyvinyl chloride (PVC) plastic pipe shall conform to the requirements of ASTM D 3034.

F. Slotted pipe shall have at least two rows of slots cut perpendicular to the axis of the pipe or at right angles to the pitch of corrugations and with the centerlines of the rows separated by one-third the circumference of the pipe. Slots shall have a width between one-sixteen inch and one-tenth inch and shall have a length, as measured along the inside circumference, of one inch to one and one-fourth- inch. Spacing of the slots shall be between three-fourth-inch and one and one-half-inch along the axis of the pipe. Slots shall be formed in such a way that inflow of water through the slots will not be impeded by excessive residual material from the slotting procedure.

G. Granular backfill material shall be placed to the dimensions as shown on the Drawings or the Standard Details, and shall meet the following gradation:

Sieve Designation	**Percent Passing**
2-inch	100
No. 4	0-10
No. 100	0-3

H. Filter cloth for underdrain trenches shall be Type A, as specified under Section 02714 - Filter Cloth.

PART 3 - EXECUTION

3.1 CONSTRUCTION

A. Trenches shall be excavated to the dimensions and grade shown on the Drawings or as directed by the ENGINEER. A nominal two inch layer of granular backfill material shall be placed and compacted in the bottom of the trench for its full width and length.

B. Filter cloth, if called for on the Drawings, shall be placed as shown on the Drawings and the Standard Details.

C. Perforated pipe shall be placed with the perforations down. The pipe sections shall be joined securely with the appropriate coupling bands or fittings.

D. After the pipe installation has been inspected and approved, granular backfill material shall be placed and compacted to a height of 12 inches above the top of pipe. The remainder of the granular backfill material shall then be placed and compacted in six inch maximum layers to the required height.

E. Any remaining portion of trench above the granular backfill shall be filled with either granular or impervious material, as may be specified, and thoroughly compacted. Compaction shall be a specified in Section 02203 - Trenching.

END OF SECTION

SECTION 02716 - REMOVE AND DISPOSE OF CULVERT PIPE

PART 1- GENERAL

1.1 DESCRIPTION

A. The WORK under this Section includes providing all labor, tools and equipment necessary for removal and disposal of all existing culverts and headwalls within the Project limits designated for removal.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 GENERAL

A. All culvert pipe shown on the Drawings for removal shall be removed and backfilled with suitable material to match the adjacent ground surface. This WORK will include removal and disposal of existing culvert headwalls. Usable material from Project trench excavation shall be used as backfill. Pipe to be disposed shall be removed from the Project and disposed in a legal manner.

END OF SECTION

SECTION 02717 - STORM AND SANITARY STRUCTURE REMOVAL

PART 1- GENERAL

1.1 DESCRIPTION

A. The WORK under this Section includes providing all labor, materials, tools, and equipment necessary for removal and disposal of existing storm manholes and catch basins and sanitary manhole structures.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 GENERAL

A. Storm and sanitary sewer structures designated on the Drawings to be removed, shall be removed and backfilled with suitable material to the excavation subcut limits. Structures to be disposed shall be removed from the Project and disposed in a legal manner.

A.

END OF SECTION

SECTION 02718 - SIGN ASSEMBLY

PART 1- GENERAL

1.1 DESCRIPTION

A. The WORK under this Section includes providing all labor, materials, tools, and equipment necessary for removing and installing sign assemblies as shown on the Drawings and Standard Details.

PART 2 - PRODUCTS

2.1 GENERAL

A. All material shall conform to the requirements of CBJ Standard Detail 127 - Sign Assembly.

B. Street name assemblies shall conform to the street name assemblies currently being used by the CBJ Streets Division.

1. The street names shall be on six-inch extruded sign panels.
2. The sign panels shall be between 12 inches and 36 inches in length in six inch increments.
3. The street name lettering shall be three-inches high, Series C-type for intersecting streets with 20 mph, or less speed limits.
4. The street name lettering shall be four-inches high, Series C type for intersection streets with a greater than 20 mph speed limit on either street.
5. The brackets for the extruded sign panels shall have a minimum span of 50 inches.

C. Stop sign speed limit and street name panels shall be constructed with 3M Diamond Grade sheeting, or approved equal.

D. School zone sign panels shall be constructed with 3 M Diamond Grade fluorescent green sheeting or approved equal.

E. All other sign panels shall be constructed of Engineer Grade sheeting, or better.

F. Stop sign panel shall be 30 inch.

G. The sign panel for the Project Sign Assembly will be supplied by the OWNER. The CONTRACTOR shall provide all other materials necessary for the complete installation.

PART 3 - EXECUTION

3.1 GENERAL

A. Sign assemblies shall be installed at locations shown on the Drawings. The exact sign location will be marked by the ENGINEER. The CONTRACTOR shall notify the ENGINEER a minimum of seven days prior to installation of the sign assemblies. The ENGINEER will not mark the sign assemblies until the street and sidewalk pavement has been placed, and the sideslopes are within four inches of final grade.

B. All sign assemblies to remain that are damaged by the CONTRACTOR shall be reconstructed to conform to CBJ Standard Detail 127 - Sign Assembly.

C. All "NO PARKING" signs shall be turned 30º to 45º with the line of traffic flow to be visible to approaching traffic.

D. A street name assembly shall be installed on each stop sign, as shown on the Drawings.

E. The CONTRACTOR will be notified by the ENGINEER when the Project sign panel is available for installation. The CONTRACTOR shall take delivery of the sign panel and the CBJ Engineering offices in downtown Juneau. The installation shall be completed within ten days after notification of the sign panel's availability. No progress payments will be made to the CONTRACTOR until after the Project Sign Assembly is satisfactorily installed.

F. The Project Sign Assembly shall be installed on a two-post support system at a height of between three to four feet to the bottom of the sign panel. The location of the sign assembly will be staked by the ENGINEER. The sign assembly shall remain in place from the beginning of construction activities at the Project site until final completion.

G. The Project Sign Assembly shall be removed at a time to be determined by the ENGINEER. The sign panel shall be carefully salvaged and delivered to the CBJ Engineering offices in downtown Juneau.

END OF SECTION

SECTION 02719 - MAILBOXES

PART 1- GENERAL

1.1 DESCRIPTION

A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary to remove, relocate, or reconstruct existing mailboxes; and/or construct new cantilever single, or cantilever gang-type mailboxes, as shown on the Drawings and CBJ Standard Details 116 - Cantilever Single Mailbox and 117 - Cantilever Gang Mailbox, or as directed by the ENGINEER.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials shall conform to the requirements of CBJ Standard Details 116 - Cantilever Single Mailbox and 117 - Cantilever Gang Mailbox.

B. The existing mailbox receptacle may be reused, if found to be in suitable condition, as determined by the ENGINEER. If the mailbox receptacle is determined by the ENGINEER to be unsuitable for reuse, or if the existing receptacle is damaged by the CONTRACTOR, a new receptacle of similar size and new lettering and/or numbers shall be provided at the CONTRACTORS's expense.

C. The length of the cantilever arm from the edge of the post to the end of the support arm may be reduced to 36 inches for those mailboxes located behind the sidewalk.

D. The face of the mailbox receptacle shall align with the traveled edge of shoulder, back edge of paved sidewalk, or back edge of curb if no sidewalk is present.

PART 3 - EXECUTION

3.1 GENERAL

A. Existing mailboxes in conflict with construction shall be reconstructed and relocated to satisfy the requirements of the CBJ Standard Details. The CONTRACTOR shall ensure that daily mail service will remain uninterrupted to all residents affected by the construction.

B. Only those mailboxes actually reconstructed will be considered for measurement for payment under this item. Mailboxes that conform to the CBJ Standard Details, but require only relocation, will not be measured for payment and will be considered incidental to other WORK.

C. Where two mailboxes are shown together on the Drawings, a single post assembly with two mail receptacles shall be constructed to conform to CBJ Standard Detail 117 - Cantilever Gang Mailbox.

END OF SECTION

SECTION 02720 – PAINTED TRAFFIC MARKINGS

PART 1 – GENERAL

1.1 DESCRIPTION

A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary for furnishing and placing painted traffic markings as shown on the Drawings.

B. Details not shown on the Drawings shall be in conformity with the latest edition of the Manual of Uniform Traffic Control Devices (MUTCD) and the Alaska Traffic Manual Supplement published by the Alaska Department of Transportation and Public Facilities.

C. This WORK shall also include re-striping all paint markings to their original conditions, if damaged by the CONTRACTOR's operations.

PART 2 – PRODUCTS

2.1 MATERIAL

A. White and yellow traffic marking paint shall be methyl methacrylate and conform to AASHTO M 248, Type F.

B. Blue marking paint shall match CBJ Street Department disability blue marking paint.

C. Glass spheres for reflectorizing traffic paint shall conform to AASHTO M 247, Type I, and shall be supplied by a moisture resistant coating

PART 3 – EXECUTION

3.1 GENERAL

A. Lines shall be applied as solid, dashed or dotted stripes, either singly or in combination, as shown on the Drawings. Dashed lines shall be applied in a 40 foot cycle consisting of a ten foot dash and a 30 foot gap between dashes, unless otherwise shown on the Drawings. The CONTRACTOR shall use an accurate dashing mechanism, which is capable of being easily adjusted to retrace existing dashed markings or to apply new materials at the correct spacing. Dashed lines which are to be applied over plainly visible existing dished lines shall begin within six inches of the beginning of the existing dash, unless otherwise directed by the ENGINEER.

B. Gaps not marked as a result of template use for spray-applied auxiliary markings shall be filled with marking material after template removal.

C. Pavement markings shall be free of uneven edges, overspray, or other readily visible defects which detract from the appearance or function of the pavement markings.

D. Lines shall be sharp, well defined, and uniformly retroreflective. The width of the applied shall be the width specified plus or minus ¼-inch. Fuzzy lines, excessive overspray, or non-uniform applications are unacceptable. Lines shall be inspected at night by the ENGINEER to verify effective light reflection. Pavement markings which are improperly

applied, located, or reflectorized shall be corrected. Lines applied with insufficient material quantities shall be properly reapplied. Improperly located lines shall be removed. New lines shall then be applied in the correct locations at the CONTRACTOR's expense, including the furnishing of approved materials.

E. Methods and equipment used for pavement preparation, marking removal shall be subject to the approval of the ENGINEER. Glass beads shall be kept dry during storage and prior to use.

F. Other construction WORK, such as shoulder paving, topsoil placement and grading, and seeding, shall be scheduled and performed in a manner to avoid damage to applied pavement markings.

G. Pavement marking materials shall not be applied to the reflector of a recessed pavement marker. The CONTRACTOR shall interrupt the application of the pavement marking line at each recessed pavement marker where marking material would otherwise be applied to the marker prismatic reflector. The maximum gap in the marked line at each marker shall be 18-inches. Pavement marking material applied to a prismatic reflector surface shall be removed by the CONTRACTOR, or the reflector shall be replaced a this expense the same working day. When the CONTRACTOR must most remove material from the reflector, the reflector's brightness shall be restored to its prior condition.

3.2 PAVEMENT PREPRARATION

A. The CONTRACTOR shall clean all visible loose or foreign material from the surface to be marked. The pavement marking equipment shall be equipped with an air jet to remove all debris from the pavement in advance of the applicator gun. The air jet shall operate when marking material is being applied and be synchronized with marking material application.

B. Pavement markings shall be applied only when the surface is clean and dry. The CONTRACTOR shall power broom clean all surfaces where edge lines are to be applied. When required by the ENGINEER, other surfaces shall also be power broom cleaned.

C. Marking shall not be applied to Portland cement concrete until the concrete in the areas to be marked is clean of membrane curing material and is dry.

3.3 LAYOUT AND PREMARKING

A. The CONTRACTOR shall lay out the locations of all lines, words and other symbols to assure their proper placement. The layout and premarking lines shall be approved by the ENGINEER before marking operations are started. When applying longitudinal or transverse lines, the CONTRACTOR shall use existing lines, construction joints or premarking to guide this marking equipment.

B. Premarking shall be located from survey data or reference points and offset so as to parallel the theoretical edge of the marking lines at a maximum distance of one inch. Templates are required for the layout of arrows, words and other symbols. Premarking for longitudinal lines shall be placed at 40-foot intervals, and shall not exceed two inches

in width or 12 inches in length. Premarking for auxiliary markings shall be located as shown on the Drawings or schematic forms provided by the ENGINEER.

3.4 LINE PLACEMENT TOLERANCE

A. Pavement marking lines shall be straight or smoothly curved, true to the alignment of the pavement, and shall not deviate laterally from the proper location at a rate of more than two inches in 100 feet. No deviation greater than three inches will be permitted.

3.5 LINE TYPES

A. Marking materials shall be applied at a minimum rate of 16.5 gallons per mile per four inch wide stripe, with a 20 mill minimum thickness, and shall, except for parking lot stall markings, be uniformly retroreflective. The minimum rate of application for broken traffic stripes shall be prorated.

B. Edge lines shall be continuous stripes, four inches in width. Center of stripe shall be located as shown on the Drawings.

C. Lane lines shall be four inch wide white stripes between contiguous lanes of pavement carrying traffic in the same direction. They shall be dashed unless specified solid. They shall be offset to the left of the longitudinal joint, if present, or the theoretical line lying between contiguous lanes, if a joint is not present. The nearer edge of the stripe shall be two inches to the left of the joint or line.

D. Centerlines shall be single or double yellow stripes between contiguous lanes of pavement carrying traffic in opposite directions. Centerline marking shall also include two way left-turn lane striping and the outline of left-turn island. Each stripe shall be four inches wide, sold or dashed.

E. Channelizing lines shall be continuous white stripes, eight inches wide.

F. Stop lines shall be solid white strips, 24-inches wide. Crosswalk lines shall be sold white strips, 24 inches wide.

G. Parking lot stall marking lines shall be continuous white stripes, four inches in width.

H. Lane arrows and letters shall be white markings, with a minimum rate of application of 0.01 gallon per square foot of markings.

3.6 EQUIPMENT AND APPLICATION OF PAINTED TRAFFIC MARKINGS

A. The markings shall be applied by machine methods acceptable to the ENGINEER. The paint machine shall be of the spray type capable of satisfactorily applying the paint under pressure with uniformity of feed through nozzles spraying directly upon the pavement. Each machine shall be capable of applying two separate stripes, either solid or skip, at the same time. Each paint tank shall be equipped with a mechanical agitator. Each nozzle shall be equipped with satisfactory cutoff valves which will apply broken or skip lines automatically. Each nozzle shall have a mechanical bead dispenser that will operate simultaneously with the spray nozzle and distribute the beads in a uniform pattern at the

rate specified. Each nozzle shall also be equipped with suitable line guides consisting of metallic shrouds or air blasts.

B. The paint shall be thoroughly mixed prior to application, and shall be applied when the air temperature is above 40° F and rising, to a clean and dry surface

C. Glass beads shall be applied at a minimum rate of 5.5 pounds of beads for each gallon of paint.

D. The painted area shall be protected from traffic until the paint is thoroughly dry.

3.7 REMOVAL OF PAVEMENT MARKINGS

A. When indicated on the Drawings, pavement markings shall be removed. The markings shall be removed by high-pressure water blast, sand blast, high temperature burning with excess oxygen, or other methods, with the approval of the ENGINEER. Care shall be exercised during marking removal not to scar, discolor or otherwise damage the pavement surface. Overpainting or other methods of covering markings in lieu of removal shall not be permitted.

END OF SECTION

SECTION 02801 – ASPHALT CONCRETE PAVEMENT

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PART 1 - GENERAL

1.1 DESCRIPTION

A. WORK consists of the furnishing and mixing of aggregate, asphalt cement, and additives at a mixing plant and the hauling, spreading, and compaction of the asphalt concrete mixture on a previously prepared surface, all as specified in the contract and in conformance with the lines, grades and thicknesses shown on the Drawing.

B. Asphaltic concrete mix for this Project shall be **Type I, II, IIA, or III, and either Class A or B.** See Table 02801.

TABLE 02801-1

ASPHALTIC CONCRETE MIX REQUIREMENTS		
DESIGN PARAMETERS	CLASS A	CLASS B
Stability, lbs.	1,800	1,800
Flow, 0.01 inch (0.25 mm)	8-14	8-14
Voids in total mix, percent	3-5	3-5
Compactions, number of blows each side of test specimen	75	50
Dust-asphalt ratio (1)	0.6-1.0	0.6-1.0
Percent oil content	5.3-6.2	5.3-6.2
Voids in the mineral aggregate (VMA) Minimum value		
Type I	13.0	12.0
Type II or IIA	14.0	13.0
Type III	15.0	14.0

(1) Dust-asphalt ratio is defined as the percent of material passing the U.S. No. 200 sieve divided by the percent of asphalt (calculated by weight of mix).

PART 2 - PRODUCTS

2.1 COMPOSITION OF ASPHALT CONCRETE MIXTURES - JOB MIX DESIGN

A. Asphalt concrete mixtures shall be composed of aggregate, asphalt cement, and required additives combined within the limits for the type and class specified in the contracts.

B. It is the CONTRACTOR's responsibility to insure that, in addition to the aggregate gradation requirements, the aggregate material meets all the requirements of this Section and asphalt concrete mixture meets the applicable design parameters, when tested according to ATM T-17.

C. At least 15 days prior to the production of asphalt concrete pavement the CONTRACTOR shall submit a current mix design. The mix design shall be performed within six (6) months of the construction season. The following related items shall be submitted with the mix design:

1. Notification that aggregate proposed for the asphalt concrete mixture is available for sampling.

2. A letter stating the proposed gradation for the Trial Job Mix Design, gradations for individual stockpiles, and blend ratio for each aggregate stockpile.
3. A minimum of three (3) one-gallon samples of the asphalt cement proposed for use in the mixture, including name of product, manufacturer, test results as required, manufacturer's certificate of compliance, and a temperature viscosity curve for the asphalt cement.
4. A 1/2 pint sample of the anti-strip additive proposed, including name of product, manufacturer, and manufacturer's data sheet, and current Materials Safety Data Sheet (MSDS).
5. The CONTRACTOR shall accompany the ENGINEER during sampling, and shall furnish all the assistance needed to assure that the ENGINEER obtains representative samples.
6. The mix design shall be **50 or 75** blow Marshall Method.

D. The ENGINEER will evaluate the gradation for the Trial Job Mix Design and suitability of the materials submitted. If the asphalt concrete mixture conforms to the design parameters specified in Table 02801-1 when tested according to ATM T-17, the ENGINEER will approve the Trial Job Mix Design and specify a target value for the asphalt cement content, mixing temperature and additives.

E. If the Trial Job Mix Design does not conform to the design parameters specified in Table 02801-1, when tested by the ENGINEER, the CONTRACTOR shall submit in writing to the ENGINEER another proposed gradation for a second Trial Job Mix Design. Samples of aggregate and additional asphalt cement shall be obtained in the same manner as for the original Trial Job Mix Design. The ENGINEER shall evaluate and test the second Trial Job Mix Design and either approve or disapprove the design based on the contract requirements. The above procedure shall be repeated until the Trial Job Mix Design is approved.

F. If the CONTRACTOR proposes a change in source of aggregate material, source of asphalt cement, or a change in the gradation target values after production has started, the CONTRACTOR shall submit in writing the proposed gradation target values to the ENGINEER and request a new Trial Job Mix Design be evaluated for approval. The CONTRACTOR shall accompany the ENGINEER during sampling and shall furnish all assistance needed to assure that the ENGINEER obtains representative samples. Approval of the new Trial Job Mix Design and/or aggregate material will require testing and evaluation. Trial Job Mix Design test results will be available within 15 calendar days of submittal. If the asphalt concrete mixture conforms to the design parameters specified in Table 02801-1 when tested in accordance with ATM T-17, the ENGINEER will develop a new target value for the asphalt cement content, mixing temperature and additives. The new target values for gradation and asphalt cement content will only be in effect on asphalt concrete mixture produced after the CONTRACTOR submittal of the new gradation target values for the Trial Job Mix Design.

G. The location and type of the mixing plant shall be included with the Trial Job Mix Design data. Asphalt concrete mixtures produced from different plants shall not be mixed.

H. All trial job mix designs as required will be assessed and paid for by the CONTRACTOR.

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2.2 ASPHALT AGGREGATES

A. Aggregate for Plant Mix Asphalt Pavement:

1. Coarse Aggregate: Coarse aggregate (that material retained on the No. 4 sieve) shall be crushed stone and shall consist of sound, tough, durable rock of uniform quality. Rock shall be free of schist that cleaves along preferred foliation planes. Rock shall be free of platy mineral grains. Metamorphosed rock shall be free of slaty cleavage. All material shall be free from clay balls, vegetable matter or other deleterious matters. Coarse aggregate shall not be coated with dirt or other finely divided mineral matter. All asphalt aggregates shall be fee of roots and wood. In addition, coarse aggregate shall meet the following requirements:

Nordic Abrasion Value	Nordic Abrasion Test Procedures[1]	16.0 Max.
Percent of Wear	AASHTO T 96	25 max.
Degradation Value	ATM T-13	30 min.
Percent Sodium Sulfate Loss	AASHTO T 104	10 max.
Percent Fracture	ATM T-4	100 min. single face/ 80 min. double face

1

2. Asphalt concrete aggregate shall not exceed eight percent thin - elongated pieces as determined by ATM T-9.
3. Fine Aggregate: Fine aggregate (passing the No. 4 sieve) shall meet the quality requirements of AASHTO M 29. Fine aggregate angularity shall be 40 minimum as determined by AASHTO T 304.
4. The several aggregate fractions for the mixture shall be sized, graded, and combined in such proportions that the resulting composite blend conforms to the grading requirements of Table 02801-2. Aggregates gradations shall be determined by ATM T-7, except when the sample is obtained by extraction.
5. Asphalt aggregate may be a blend but shall be 80% mechanically crushed with no more than 20% natural sand.
6. The material furnished shall conform to the approved Job Mix Design within the tolerances specified, except the limits given in Table 02801-2 may not be exceeded.

[1] Nordic Abrasion Test Procedures will apply to both the coarse and intermediate aggregate for asphalt aggregate. Test procedures for Nordic Abrasion are available at AKDOT&PF SE Region Materials Laboratory.

Sieve Size	Tolerance % Passing
¾ inch	100
½ inch	± 6
3/8 inch	± 6
No. 4	± 6
No. 8	± 6
No. 16	± 5
No. 30	± 4
No. 50	± 4
No. 100	± 3
No. 200	± 1

TABLE 02801-2

ASPHALT CONCRETE AGGREGATE Percent Passing by Weight				
Sieve Design	Type I	Type II	Type II-A	Type III
1-inch	100			
3/4 inch	80-95	100	100	
½ inch	60-88	80-95	86-98	100
3/8 inch	48-77	60-87	74-86	80-95
No. 4	28-63	36-48	46-58	44-81
No. 8	14-55	19-35	29-41	26-70
No. 16	9-46	10-25	18-28	16-59
No. 30	6-39	7-21	11-19	9-49
No. 50	5-29	5-20	6-14	6-36
No. 100	4-18	4-15	3-9	4-22
No. 200	2-6	2-6	2-6	2-6

2.3 ASPHALT MATERIALS

A. "The grade of asphalt cement material will be PG 58-22. The asphalt cement material shall conform to the applicable requirements of this Section and will be conditionally accepted at the source. If the material is to be conditionally accepted at the source, the CONTRACTOR shall provide a manufacture's certificate of compliance in accordance with this section and test results of the applicable quality requirements of this Section before the material is shipped. If there is a change in the source of the asphalt cement or if the kinematic viscosity (viscosity at 275°F) of the asphalt supplied for the Trial Job Mix Design by a

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factor of two (doubles or halves) or more, then operations shall be suspended while a new Trial Job Mix Design proposal is submitted for approval.

B. ASPHALT CEMENT

1. Asphalt cement shall be designated PG58-22 and conform to the requirements listed on the chart on the next page.

C. CUT-BACK ASPHALTS

1. Cut-back asphalts shall conform to the requirements of AASHTO M 81 and M 82 except as follows:

a. In Table 1 of M 82, reduce the minimum absolute viscosity on residue from distillation at 60ºC to 100, in the MC-30 and MC-250 columns, and revise the maximum distillate percentage by volume of total distillate at 225ºC for MC-30 to read: 35%.

TEST FOR	SPECIFICATIONS	AASHTO TEST METHOD	SPECIFICATIONS
Penetration	(4ºC [39.2ºF], 200g, 60s), dmm RTFO Aged Residue Note 1	T 49	15+
Ductility	(7.2ºC [45ºF], 1 cm/min), cm RTFO Aged Residue	T 51	10+
Absolute Viscosity	(60ºC [140ºF]), P Original Binders RFTO Aged Residue	T 202 T 202	1,100+ 1,500-6,000
Kinematic Viscosity	(60ºC [140ºF]), RTFO Viscosity/Orig. Viscosity	T 201	275+
Absolute Viscosity Ratio	(60ºC [140ºF]), RTFO Viscosity/Orig. Viscosity		4.0-
Flash Point, Cleveland Open Cup	C(F) Original Binder	T 48	232º+(450º+)
Solubility in Trichloroethylene	%, Original Binder	T 44	99.0+
Ductility	(25ºC [77ºF], 5 cm/min), cm RTFO Aged Residue	T 51	75+

Note 1 "RTFO Aged Residue" means the asphaltic residue obtained using the rolling thin film oven test (RTFO Test), AASHTO T 240.

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D. EMULSIFIED ASPHALTS

1. CCS-1 cationic emulsified asphalts shall comply with the requirements listed in Table 020801-3.
2. CCS-1 Cationic Emulsified Asphalt shall conform to the requirements of AASHTO M 208.

TABLE 02801-3

TESTS ON EMULSION	
Viscosity @ 77ºF., SSF	30 max.
Storage Stability, 1 day, %	1 Max.
Demulsibility 35 ml. 0.8% SDS, %	25 min.
Particle Charge	Positive*
Sieve, % retained	0.10 max.
Distillation Oil by Vol. of Emulsion, %	5 max.
Distillation Residue by Wt. of Emulsion, %	45 min.
TESTS ON RESIDUE	
Penetration @ 77ºF.	100-200
Ductility @ 77ºF., 5 cm/min., cm	40 min.
Solubility in TCE, %	97.5 min.

* If particle charge test is inconclusive, material having a max. Ph value of 6.7 will be acceptable.

E. STORAGE AND APPLICATION TEMPERATURES

1. Asphalt materials required by the Specifications shall be stored and applied within the temperatures ranges indicated below:

TABLE 02801-4
STORAGE AND APPLICATION TEMPERATURES

Type and Grade of Material	Spray ºF	Mix ºF	Storage ºF
MC-30	85+		140 Max
MC-250	165+	165-220	240 Max
RC-800	200+		200 Max
CRS-2	125-175		100-175
CMS-2	125-175	120-160*	100-175
CSS-1	90-120	90-160*	50-125
AC-2.5	270+	235-280**	325 Max
AC-5	280+	250-295**	325 Max
AC-10	280+	250-315**	325 Max
STE-1	70-140	70-150	50-125
PG58-22		350 max	275-325°F

* Temperature of the emulsified asphalt in the pugmill mixture.
** As required to achieve Kinematic viscosity of 150-300 centistokes.

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2.4 ANTI-STRIP ADDITIVES

A. Anti-strip agents shall be used in the proportions determined by ATM T-14 and shall be included in the approved Trial Job Mix Design. At least 70% of the aggregate shall remain coated when tested in accordance with ATM T-14.

2.5 PROCESS QUALITY CONTROL

A. The CBJ Engineering Department has the exclusive right and responsibility for determining the acceptability of all materials incorporated into the Project. It is expressly understood, however, that the CONTRACTOR is solely responsible for the sampling and testing of material for process control of the asphalt concrete mixture including screening, crushing, blending, stockpiling of the aggregate, production of the asphalt concrete mixture and monitoring compaction of the asphalt concrete mixture.

B. The results of the acceptance testing performed by the ENGINEER may not be available to the CONTRACTOR until a period of at least seven working days has elapsed from the date of sampling.

PART 3 - EXECUTION

3.1 WEATHER LIMITATIONS

A. The asphalt concrete mixture shall not be placed on a surface with standing water, on an unstable roadbed when the base material is frozen, or when weather conditions prevent the proper handling or finishing of the mixture. No asphalt concrete, Type II mixture shall be placed unless the surface temperature is 40ºF or warmer.

3.2 EQUIPMENT

A. All equipment shall be in good working order and free of asphalt concrete mix buildup. All equipment shall be available for inspection and demonstration 72 hours prior to placement of asphalt concrete.

B. Bituminous Mixing Plants:

1. Mixing plants shall conform to AASHTO M 156.
2. Proportioning (batch) scales shall not be used for weighing material for payment. Weigh scales used in conjunction with a storage silo may be used to weigh the final product for payment, provided the scales are certified.

C. Hauling Equipment:

1. Trucks used for hauling asphalt mixtures shall have tight, clean, smooth metal beds which have been thinly coated with a minimum amount of either paraffin oil, lime water solution approved by the ENGINEER. Diesel or fuel oil shall not be used.
2. Each truck shall have a watertight canvas cover of such size as to extend at least one foot over the sides and end of the truck bed and be adequately secured to

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protect the asphalt concrete mixture. The use of the canvas cover shall be at the ENGINEER's direction.

D. Asphalt Pavers:

1. Asphalt pavers shall be self-propelled units, provided with a heated vibratory screed. Grade and cross slope shall be controlled through the use of automatic grade and slope control devices. The paver screed control system shall be automatically actuated by the use of a string line, or minimum 30-foot long ski. The length of the string line shall be adjusted to produce the required surface smoothness.
2. The paver shall be equipped with a receiving hopper having sufficient capacity for a uniform spreading operation. The hopper shall be equipped with a distribution system to place the mixture uniformly in front of the screed.
3. The screed assembly shall produce a finished surface of the required smoothness, thickness, and texture without tearing, shoving, or displacing the asphalt concrete mixture. Screed extensions used for paving a constant width shall be heated and vibrated. Auger extensions shall be the same length as the rigid screed extensions.
4. The use of a pickup machine to transfer the asphalt mixture from a windrow to the paver hopper will be permitted, provided the pickup machine is capable of collection of the windrowed material without damage to the underlying course. The ENGINEER will not allow the continued use of the pickup machine if segregation, excessive temperature loss, or any detrimental effects are observed.
5. Paver hopper wings shall either be left in the top or down position throughout the paving operation. If the CONTRACTOR wishes to dump the wings during paving, the material on the wings and in the hopper shall not be incorporated into the finish mat or included in the quantity for payment.
6. The screed assembly shall have a joint compaction device and a joint edge restrainer.

E. Rollers

1. The CONTRACTOR shall supply a sufficient number and weight of rollers to compact the mixture to the required density while maintaining the pace of the paving operations. Rollers shall be of the static steel wheel, vibratory steel wheel, and pneumatic tire type, self propelled and capable of reversing without backlash. They shall be specifically designated to compact hot asphalt concrete mixtures. The use of equipment which results in crushing of the aggregate will not be permitted. Pneumatic tire rollers shall be fully skirted; shall be at least six (6) feet wide; and shall be configured so that the rear group of tires align to cover the spaces between the front group of tires. The roller shall have an operating weight per tire of at least 3,000 pounds. Tires shall be of equal size, a minimum of 20 inches in diameter, shall be inflated to at least 80 psi and maintained so that tire pressures do not vary more than 5 psi between any two (2) tires

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3.3 PREPARATION OF EXISTING SURFACE

A. The existing surface shall be prepared in conformance with the Drawings and Specifications. Existing paved surfaces shall be cleaned of loose material by sweeping with a power broom, supplemented by hand sweeping, if necessary.

B. Contact surfaces of curbing, gutters, manholes, and other structures shall be coated with a thin, uniform coating of tack coat material in conformance with Section 02802 - Tack Coat prior to the asphalt mixture being placed.

C. Surfaces which have received a prime coat shall be allowed to cure such that the prime coat is not picked up by the haul vehicles. Surfaces which have received an emulsion tack coat shall be allowed to break prior to placement of asphalt concrete mixture.

D. The grading, shaping, and strengthening where applicable, of the road surface shall be as specified in Section 02204 - Base Course.

E. A string line installed by the CONTRACTOR at the direction of the ENGINEER will be the edges of paving.

F. Prior to paving over any existing pavement, the surface shall be thoroughly cleaned and an application of tack coat applied that will provide a strong bond between the two layers.

3.4 PREPARATION OF ASPHALT

A. A continuous supply of the asphalt cement shall be supplied to the mixer at a uniform temperature, within 25ºF of the Job Mix Design mixing temperature.

3.5 PREPARATION OF AGGREGATES

A. The aggregate for the asphalt concrete mixture shall be heated and dried to a temperature compatible with the mix requirements specified. Flames used for drying and heating shall be properly adjusted to avoid damage to the aggregate and to avoid the presence of unburned fuel on the aggregate. Any asphalt concrete mixture in which soot or fuel is present shall be wasted and no payment made.

B. Drying operations shall reduce the aggregate moisture content to the extent that the moisture content of the asphalt concrete mixture, sampled at the point of acceptance for asphalt cement content, shall be no more than 0.5% (by total weight of mix), as determined by ATM T-25.

3.6 MIXING

A. The aggregate, asphalt cement additives shall be combined in the mixer in the amounts required by the Job Mix Design.

B. The materials shall be mixed such that a complete and uniform coating of the aggregate is obtained. For batch plants, dry aggregate shall be placed in motion immediately prior to the addition of asphalt cement. Wet mixing time shall be adequate to obtain 98% coated particles when tested in accordance with AASHTO T 195.

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C. The temperature of the asphalt concrete mixture at the time of the mixing shall be as determined by the Job Mix Design.

3.7 TEMPORARY STORAGE OF ASPHALT CONCRETE MIXTURE

A. Temporary storing or holding of hot asphalt concrete mixture in silo type storage bins will be permitted.

B. All the asphalt concrete mixture drawn from the silo type storage bins shall conform to all of the requirements for asphalt concrete mixtures as if loaded directly into hauling equipment from the mixing plant. Signs of visible segregation, heat loss, changes from the Job Mix Design, change in the characteristics of asphalt cement, lumpiness or stiffness of the mixture will be cause for rejection.

C. Unsuitable asphalt concrete mixture shall be disposed of by the CONTRACTOR at no cost to the OWNER.

3.8 SPREADING AND PLACING

A. The CONTRACTOR shall submit a Paving Plan for the ENGINEER's review a minimum of five (5) working days prior to initiating the paving operation. The Paving Plan shall consist of, but not be limited to, the following:

1. Paving schedule to include sequence of operations.
2. Paving schedule distributed to residents within the Project boundary.
3. Operational details to include:

    a. Plant operating capacity and target production rate.
    b. Number and capacity of trucks, cycle time, and delivery rate.
    c. The manufacturer and model of the paver and pickup machine, to include information on grade followers, sensors, operating speed and production rate of the pavers.
    d. Number, type, weight, and operating speed of rollers.
    e. Location of longitudinal joints.
    f. Method of constructing transverse joints.
    g. Construction plan for paving intersections and driveways.
    h. The manufacturers, model number, and the last certified calibration date for the CONTRACTOR's nuclear densometer gauge.

B. The asphalt concrete mixture shall be laid upon a surface approved by the ENGINEER, spread and struck off to the required compacted thickness. Asphalt pavers shall be used to distribute the asphalt concrete mixture in lanes of such widths as to hold to a practical minimum the number of longitudinal joints required, subject to the requirements of this Section.

C. When laying asphalt concrete mixtures, the paver shall be operated at uniform forward speeds consistent with the delivery of asphalt concrete mix to avoid unnecessary stopping and starting of the paver.

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D. On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impracticable, the asphalt concrete mixture shall be spread, raked and luted by hand tools. For such areas the asphalt concrete mixture shall be placed to the required compacted thickness.

E. Any asphalt concrete mixture which is observed to be contaminated or segregated will be rejected.

F. When the section of roadway being paved is open to traffic, adjacent traffic lanes shall be paved to the same elevation within 24 hours unless prevented by weather or other factors beyond the CONTRACTOR's control.

G. When multiple lifts are specified in the contract, the final lift shall not be placed until all other lower lift pavement throughout that section, as defined by the Paving Plan, has been placed and accepted. Paving shall not begin until all adjacent curb has been poured and cured for 72 hours or until satisfactory strength is achieved.

H. Manholes, cleanouts and water valve boxes shall be raised in accordance to CBJ Standard 126 - Concrete Collar. The manhole frames and lids shall be replaced with current CBJ Standard 206A - Sanitary Sewer Manhole Cover and Frame, or CBJ Standard 306 - Storm Drain Manhole Cover and Frame.

I. Paving shall be approximately 24 feet in width with the exception of cul-de-sac's and intersection radius returns. The ENGINEER shall determine the paving limits of the cul-de-sac's and intersection radius returns.

J. Unless waived by the ENGINEER both lanes shall be paved in a single day's operation.

3.9 COMPACTION

A. Immediately after the asphalt mixture has been spread, struck-off and surface irregularities adjusted, it shall be thoroughly and uniformly compacted by rolling.

B. Minimum compaction shall be 94% of AASHTO T 209. The target value for density will be 94 to 97% of the maximum specific gravity (MSG) as determined in accordance with AASHTO T 209 for the first sample from each lot of asphalt concrete mixture, as defined in this Section. Acceptance testing for field density will be determined in accordance with ATM T-18 or ASTM D-2950, as directed in writing by the ENGINEER.

C. The asphalt concrete mixture, including the leveling course, shall have a minimum of three (3) complete passes with a pneumatic-tired roller prior to cooling to 175ºF. A pass is defined as once over each point on the pavement surface.

D. Areas not accessible to the rollers shall be graded with rakes and lutes and compacted with mechanical tampers. For depressed areas a trench roller may be used to achieve the required compaction.

E. Any asphalt concrete mixture that becomes loose and broken segregated, mixed with dirt, or is any other way defective shall be removed and replaced with fresh hot asphalt

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concrete mixture, which shall be compacted to conform with the surrounding area. Any area showing an excess or deficiency of asphalt cement shall be removed and replaced.

F. Rollers or other vehicles shall not be parked or left standing on pavement that has not cooled sufficiently to prevent indentation by wheels.

3.10 JOINTS

A. Joints shall be made to ensure a continuous bond between old and new sections of the course. All joints shall present the same texture and smoothness as other sections of the course.

B. When joining old existing pavement and new pavement, the old pavement shall be cut in a neat line, with a power driven saw.

C. Improperly formed joints resulting in surface irregularities or rock segregation shall be removed, full road width, replaced with new material, and thoroughly compacted. Rolling of joints after the material has cooled below 160ºF shall not be allowed. All pavement removal shall be precut to a neat line using a power driven saw.

D. A thin tack coat of asphalt cement or asphalt emulsion shall be applied on all cold joints prior to placing any fresh asphalt concrete mixture against the joint. This WORK shall be completed by the CONTRACTOR just prior to paving.

E. Transverse joints shall be formed by cutting back on the previous run to expose the full depth of the course or by using a removable bulkhead.

F. The longitudinal joints in one layer shall offset those in the layer immediately below by at least six (6) inches. The joints in the top layer shall be at centerline or lane lines except where pre-formed marking tape striping is required, in which case the longitudinal joint in the top layer shall be offset not more than one (1) foot.

G. The density at the joints shall not be more than 2% lower than the density specified in the lanes away from the joint.

H. Rolling at the longitudinal joint should be done from the hot side with a vibratory roller as soon as possible. The hot side should always overlap the cold side by 1 to 1.5 inches at the joint.

I. The finished asphalt surface along the edge of curb and gutter shall be ¼ inch above the top edge of the gutter pan.

3.11 SURFACE TOLERANCE

A. The surface will be tested after final rolling at selected locations using a ten (10) foot straightedge. The variation of the surface from the testing edge of the straightedge between any two (2) contacts with the surface shall not exceed 3/16 inch. The asphalt concrete mixture in all defective areas shall be removed and replaced. All costs associated with removal and replacement of asphalt concrete mixture in the defective areas shall be borne by the CONTRACTOR.

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B. All asphalt surfaces segregated with single large stones void of intermediate aggregate on the surface shall be removed and replaced full lane width. The surface particles shall be consistent and conform to the contract gradation.

3.12 PATCHING DEFECTIVE AREAS

A. Any asphalt concrete mixture that becomes contaminated with wood or foreign material or is in any way defective shall be removed. Defective materials shall be removed for the full thickness of the course. The pavement shall be saw cut so that the sides are perpendicular and parallel to the direction of traffic and so that the edges are vertical. Edges shall be coated with a thin tack coat material in accordance with Section 02802 – Tack Coat. Fresh asphalt concrete mixture shall be placed in sufficient quantity so that the finished surface will conform to grade and smoothness requirements. The asphalt concrete mixture shall be compacted to the density specified. No payment shall be made for material replacing defective material. All costs associated with the patching of defective areas shall be borne by the CONTRACTOR.

3.13 ACCEPTANCE SAMPLING AND TESTING

A. Asphalt concrete pavement will be accepted for payment based on the ENGINEER's approval of: the Job Mix Design; the materials; the placement and compaction of the asphalt concrete pavement to the specified depth, finished surface requirements, tolerances, and densities. Any area of finished surfacing that is visibly segregated, fails to meet surface tolerance requirements or specified thickness or densities, or is in any way defective, shall be removed and replaced with new asphalt concrete pavement. Removal and replacement of defective pavement shall be at no additional cost to the OWNER. The full depth of the new asphalt concrete mixture will be replaced; surface patching will not be allowed.

B. Acceptance sampling and testing shall be performed by the ENGINEER. Acceptance testing will determine whether the materials, installation and compaction efforts used by the CONTRACTOR have met these specifications. The results of the acceptance testing performed by the ENGINEER may not be available to the CONTRACTOR until a period of at least seven working days has elapsed from the date of sampling.

C. A lot will be the total asphalt placed on the Project per season. A sublot will be one Day's production on the Project. Each sublot shall be randomly sampled and tested in accordance with this Subsection for asphalt cement content, maximum specific gravity using the Rice Method, density, and gradation.

D. Samples taken for the determination of asphalt cement content and gradation will be taken from behind the screed prior to initial compaction. Asphalt cement content shall be determined by ATM T-23. The cost of this sampling (one per sublot) will be borne by the ENGINEER. The CONTRACTOR shall pay for additional testing if not in compliance.

E. ASTM D-2950 will be used to measure density. A minimum of six (6) random tests in locations determined by the ENGINEER will be taken from each sublot. When using ASTM D-2950, the MSG or laboratory pounds per cubic feet shall be determined by

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using the Rice Method, AASHTO T 209. The Rice Method, for the purposes of nuclear gauge compaction testing, replaces the Marshal Method. Acceptance testing for density will be completed by the ENGINEER in the following sequence:

1. The ENGINEER will randomly sample the in-place asphalt concrete mixture with a nuclear densometer gauge. Random is defined as having no specific pattern. Frequency of this testing will be determined. by the ENGINEER. The CONTRACTOR may request a re-test of any nuclear densometer sample not within Specification limits. The ENGINEER will select the sample location for the re-test. Only one (1) re-test per sample will be allowed. This acceptance testing will be paid for by the OWNER.
2. If the random density acceptance testing indicates that the density specified has not been met, further sampling and testing will be required by the ENGINEER. At the direction of the ENGINEER, the CONTRACTOR shall cut at least one (1) full depth six (6) inch diameter core sample (per lot) from the finished mat. The samples shall be neatly cut by a core drill at the randomly selected locations. Core holes for sampling shall be backfilled and compacted with hot asphalt concrete mixture within two (2) hours of sampling. The core samples will be tested for compliance with these specifications at a certified laboratory specified by the ENGINEER. Any sampling and testing required beyond the nuclear densometer testing by the ENGINEER will be paid by the CONTRACTOR.

F. At the direction of the ENGINEER, samples taken for the determination of aggregate gradation may be obtained from one (1) of the following locations:

1. From the combined aggregate cold feed conveyor via a diversion chute, or from the stopped conveyor belt.
2. For dry batched aggregates, on batch plants, the pugmill shall be cleaned by dry batching at least two (2) dry batches or until no asphalt coating is found on the aggregate. One complete batch will be dropped in a loader bucket and hand mixed thoroughly with a shovel until a sample can be taken. The sample will be used for acceptance, gradation, control, and payment.

G. Additional materials testing will be required whenever a new Trial Job Mix Design is approved. The maximum specific gravity (MSG) for each lot will be determined from the first randomly selected sample from the first sublot. Materials testing includes, but is not limited to, gradations, extractions, density testing and core analysis.

H. If field density is determined in accordance with ASTM D-2950, additional core samples will be required whenever a new Trial Job Mix Design is approved or whenever there is a change in the typical section. The MSG for each lot will be determined from the first randomly selected sample from the first sublot. The CONTRACTOR shall reimburse the OWNER for all materials testing beyond the first $2,000.00. Materials testing includes but is not limited to gradations, extractions, density testing and core analysis.

I. All tests necessary to determine conformance with the requirements specified in this Section will be performed by the ENGINEER and paid for by the CONTRACTOR.

J. The frequency of materials testing for asphalt is determined by the CBJ Materials Frequency Guide. The CA/Inspector shall meet with the Project Manager prior to paving

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in order to determine the appropriate testing frequency. For testing frequency circumstances not covered by the CBJ Standard Specifications, the latest edition of the Alaska Department of Transportation and Public Facilities Standard Specifications for Highway Construction shall be used and incorporated by reference herein.

END OF SECTION

SECTION 02802 -TACK COAT

PART 1- GENERAL

1.1 DESCRIPTION

A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary for furnishing and applying bituminous material to an existing asphalt surface to provide bond for a new asphalt wearing surface.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Asphalt material used for tack coat shall be STE-1 or CCS-1 Cationic Emulsified Asphalt, conforming to the requirements of the following table:

CCS-1/STE-1 CATIONIC EMULSIFIED ASPHALT

TESTS ON EMULSION	
Viscosity @ 77ºF., SSF	30 max.
Storage Stability, One (1) day, %	One (1) max.
Demulsibility 35 ml. 0.8% SDS, %	25 min.
Particle Charge	Positive *
Sieve, % retained	0.10 max.
Distillation Oil by Vol. Of Emulsion, %	Five (5) max.
Distillation Residue by Wt. Of Emulsion, %	45 min.
TESTS ON RESIDUE	
Penetration @ 77º F.	100-200
Ductility @ 77ºF., 5cm/min., cm	40 min
Solubility in TCE, %	97.5 min.

* If particle charge test is inconclusive, material having a maximum pH value of 6.7 will be acceptable.

Storage/Application	Spray ºF	Mix ºF	Storage ºF
Limitations for STE-1	70-140	70-150	50-125
Limitations for CCS-1	70-140	70-160	50-125

PART 3 - EXEXUTION

3.1 EQUIPMENT

A. The CONTRACTOR shall provide equipment for heating and applying the Tack Coat.

3.2 CONSTRUCTION

A. The existing surface shall be patched, thoroughly cleaned, and free of irregularities to provide a reasonably smooth and uniform surface to receive the treatment. Unstable corrugated areas shall be removed and replaced with suitable patching materials. The

edges of existing pavements, which are to be adjacent to new pavement, shall be cleaned to permit the adhesion of asphalt materials.

B. Tack Coat shall not be applied to a wet surface. Tack Coat shall be applied only when the air temperature is above 40ºF.

C. CSS-1 emulsified asphalt for tack coat shall be diluted with an equal amount of potable water at a temperature of between 50ºF and 102ºF and mixed for a minimum of 15 minutes before using.

D. Diluted emulsion shall be used within 48 hours after the water is added.

E. The diluted emulsion shall be uniformly applied with a pressure distributor at a rate of 0.05 to 0.10 gallons per square yard, as directed.

F. The Tack Coat shall be applied in such a manner as to offer the least inconvenience to traffic and to permit one-way traffic without pick-up, or tracking of the asphalt material.

G. Existing improvements such as the rigid conduit, power supply cable, concrete encasement and centerline light shall be protected to prevent contact with bituminous material. The Tack Coat shall be allowed to dry until it is in a proper condition of tackiness to receive the next course. The Tack Coat shall be applied only as far in advance of the next course placement as is necessary to obtain this proper condition of tackiness. Until the next course is placed, the CONTRACTOR shall protect the Tack Coat from damage.

H. STE-1 cationic asphalt may not be diluted.

END OF SECTION

SECTION 02803 - FOG SEAL COAT

PART 1 - GENERAL

1.1 DESCRIPTION

A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary to apply a Fog Seal Coat to all new asphalt surfaces. This Fog Seal Coat shall be composed of a slow setting asphalt emulsion and diluted with water. Blotting the Fog Seal Coat with sand after the emulsion breaks is required.

PART 2 - PRODUCTS

2.1 MATERIALS

A. The type of asphalt material used for the Fog Seal Coat shall be CSS-1 cationic emulsified asphalt.

B. The asphalt material shall conform to the applicable requirements of Section 02801 - Asphalt Concrete Pavement and will be conditionally accepted at the source.

C. The blotter material shall be suitable clean sand.

PART 3 - EXECUTION

3.1 GENERAL

A. The CONTRACTOR shall provide equipment for heating and applying the asphalt emulsion and for applying blotter material and removing blotter material. The distributor equipment shall conform to the requirements set forth in Section 02801 - Asphalt Concrete Pavement. In addition, a self-propelled aggregate spreader of approved design, and a rotary paver broom, shall be provided by the CONTRACTOR.

B. The emulsion shall not be applied to wet surfaces, or when the air temperature is below 45° F, or when weather conditions appear to threaten precipitation.

C. The surface shall be clean and free from all loose material.

D. The rate of application shall be between 0.08 and 0.15 gallons per square yard, or as directed by the ENGINEER. Building paper shall be placed over the end of the previous applications and the joining application shall start on the building paper. Building paper shall be permitted on the untreated portion of the roadbed. As soon as the asphalt material has been blotted and will not pick up, traffic may be transferred to the treated portion and the remaining width of the section fogged.

E. After application of the Fog Seal Coat, blotter sand shall be applied by a ten (10) yard capacity truck with a rear-mounted spreader at a rate of three (3) to five (5) pounds per square yard.

F. Blotting sand shall be removed by means of a rotary broom and vacuum truck within ten (10) days after application of the Fog Seal Coat. The road surface shall be less than 65°F when sweeping.

G. The Fog Seal Coat and sand blotters shall commence prior to the addition of base course to the shoulder to assure a fresh, clean asphalt-bonding surface.

END OF SECTION

SECTION 02806 - REMOVE EXISTING ASPHALT SURFACING

PART 1 - GENERAL

1.1 DESCRIPTION

A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary to remove existing asphalt surfacing as shown on the Drawings and Standard Details or as directed by the ENGINEER.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All materials shall conform to the requirements of the Specifications or to the requirements of the agency having jurisdiction over the pavement being replaced.

PART 3 – EXECUTION

3.1 GENERAL

A. Asphalt Pavement to be removed shall be neatly saw cut full depth along straight lines, with a tolerance of 0.1 feet in 50 feet and 0.2 feet in 100 feet. Only such pavement shall be removed as is necessary to excavate for the appurtenances, but the pavement shall be cut a sufficient distance outside the excavation to prevent damage to adjacent pavement by lifting or tearing the mat. All removed pavement shall be disposed off of the Project at an approved disposal site.

B. The CONTRACTOR shall deliver the removed asphalt surfacing material to the asphalt disposal stockpile in the CBJ/State Lemon Creek Gravel Pit. The CONTRACTOR shall stack the material with a loader if required by the ENGINEER.

C. If the CONTRACTOR fails to comply with the provisions of any CBJ ordinance or permit pertaining to waste disposal or disposal sites; the CBJ shall have the right, after giving 30 days written notice, to bring the disposal sites into compliance and collect the cost of the WORK from the CONTRACTOR, either directly or by withholding monies otherwise due under the contract.

END OF SECTION

SECTION 03301-STRUCTURAL CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION

A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary for furnishing and installing portland cement concrete for structures in conformance with the Drawings and Specifications.

PART 2 - PRODUCTS

2.1 PORTLAND CEMENT

A. Portland cement shall conform to the requirements of AASHTO M 85.

B. Unless otherwise permitted by the ENGINEER, the product from only one mill and one brand and type of portland cement shall be used on the Project.

2.2 FINE AGGREGATE

A. Fine aggregate for portland cement concrete shall conform to the requirements of AASHTO M 6 with the following exceptions:

Delete section on deleterious substances and substitute the following:

The amount of deleterious substances shall not exceed the following limits:

Friable particles percent by weight ..... 5 max.
Coal and Lignite, percent by weight using a liquid of 1.95 specific gravity (only material that is brownish-black shall be considered as coal or lignite)... 0.5 max.
Material passing the No. 200 sieve, percent by weight..... 3.0 max.

Delete paragraph 4.2 of AASHTO M 6.

2.3 COARSE AGGREGATE

A. Coarse aggregate for portland cement concrete shall conform to the requirements of AASHTO M 80, class A, with the following exceptions:

Delete section on deleterious substances and substitute the following:

The amount of deleterious substances shall not exceed the following limits:

Coal and Lignite, percent by weight (only material that is brownish-black or black shall be considered coal or lignite) .....1.0 max.
Material passing the No. 200 sieve .....1.0 max
Thin-elongated pieces, percent by weight. (Length greater than five (5) times average thickness).....15 max.
Sticks and roots, percent by weight.....0.10 max.
Friable Particles, percent by weight .....0.25 max.
Maximum loss from AASHTO T 96 shall be 50 percent.
Maximum loss from AASHTO T-104 shall be 12 percent.

2.4 JOINT FILLERS

A. Joint filler, of the type designated in the contract, shall conform to the following:

1. Poured filler shall conform to AASHTO M 173 or AASHTO M 282 as specified.
2. Preformed fillers shall conform to AASHTO M 33 for bituminous type; AASHTO M 153 for sponge rubber (type I), cork (type II), and self-expanding cork (type III); AASHTO M 213 for nonextruding and resilient bituminous types and resilient bituminous types and AASHTO M 220 for pre-formed elastomeric types as specified.
3. AASHTO M 220 for preformed elastomeric types as specified. The filler shall be punched to admit the dowels where called for on the Drawings. Joint filler shall be furnished in a single piece for the depth and width required for the joint unless otherwise authorized by the ENGINEER. When more than one piece is authorized for a joint, the abutting ends shall be fastened securely, and held accurately to shape, by stapling or other positive fastening satisfactory to the ENGINEER.
4. Foam filler shall be expanded polystyrene filler having a compressive strength of not less than 10 psi.
5. Hot -poured sealants for concrete and asphaltic pavements shall conform to ASTM D 3405.
6. Hot-poured elastomeric type sealant for concrete pavements shall conform to ASTM D 3406.
7. Cold-poured silicone type sealant for concrete pavements shall conform to Federal Specification TT-S-1543, Class A. The sealant shall be a one part, low-modulus silicone rubber with an ultimate elongation of 1,200 percent.

2.5 CURING MATERIAL

A. Curing material shall conform to the following requirements as specified:

1. Burlap Cloth made from Jute Kenaf AASHTO M 182.
2. Sheet Material for Curing Concrete AASHTO M 171.
3. Liquid Membrane-Forming Compounds AASHTO M 148 for Curing Concrete, Type I.

B. The requirements specified in AASHTO M 148 covering "Liquid Membrane-Forming Compounds for Curing Concrete" are modified by adding the following:

1. Liquid membrane-forming compounds utilizing linseed oil shall not be used.

2.6 AIR ENTRAINING AGENTS

A. Air-entraining admixtures shall conform to the requirements of AASHTO M 154.

2.7 MIXING WATER

A. Unless otherwise permitted in writing by the ENGINEER, all water shall be obtained from the CBJ potable water system.

2.8 REINFORCING STEEL

A. Reinforcing shall conform to AASHTO M 31, and be of grade 60 or the grade designated on the Drawings or in the Specifications. Welded wire fabric shall conform to AASHTO M 55. Epoxy coated reinforcing bars shall conform to AASHTO M 284.

2.9 SHIPPING AND STORAGE OF CEMENT

A. Cement may be shipped from pretested approved bins. The cement shall be well protected from rain and moisture. Any cement damaged by moisture or which fails to meet any of the specified requirements shall be rejected and removed from the WORK.

B. Cement stored by the CONTRACTOR for a period longer than 60 days in other than sealed bins or silos shall be retested before being used. Cement of different brands, types, or from different mills shall be stored separately.

2.10 COMPOSITION OF CONCRETE

A. All portland cement concrete shall be ready-mix, provided by an approved plant regularly engaged in the production of concrete, unless otherwise authorized in writing by the ENGINEER. Ready-mix concrete shall conform to the requirements of AASHTO M 157.

B. The CONTRACTOR shall furnish the mix design to the ENGINEER for approval. The mix design shall be suitable for its intended use. Concrete shall be designed using an absolute volume analysis. The CONTRACTOR shall be responsible for having each mix design tested at a laboratory. Prior to the start of production of any mix design, the CONTRACTOR shall submit test results and certifications for all materials, detailed mix design data and results of laboratory tests to the ENGINEER for approval. Approval by the ENGINEER will be based on apparent conformity to these Specifications. It shall remain the CONTRACTOR's responsibility during production to produce concrete conforming to the mix design and the minimum acceptance criteria in the contract. When requested by the ENGINEER, the CONTRACTOR shall submit samples of all materials for verification testing. Production shall not commence until the mix design is approved by the ENGINEER.

C. Unless otherwise specified the design mix shall meet the following:

Minimum cement content	6 1/2 sacks (611 lb.) per C.Y.
Maximum water/cement ratio	5.75 gal/sack (0.51 #/#)
28-day compressive strength (fc)	as indicated on Drawings.
Slump	3" ± 1"
Entrained Air	3 to 6%
Coarse Aggregate	AASHTO M 43, Gradation No. 67

Cement factors are based on 94-pound sacks

D. The CONTRACTOR shall be responsible for producing and placing specification concrete with a cement content within a tolerance of two percent.

E. The use of superplasticizers in the concrete mix to improve the workability of mixes with low water cement ratios will require prior written approval by the ENGINEER

F. The CONTRACTOR may, subject to prior approval in writing, use alternative sizes of coarse aggregate as shown in Table 1 of AASHTO M 43. If the use of an alternative size of coarse aggregate produces concrete which exceeds the permissible water-cement ratio above, thereby requiring additional cement above that specified, no compensation will be made to the CONTRACTOR for the additional cement.

2.11 SAMPLING AND TESTING

A. Field tests of all materials will be made by the ENGINEER when deemed necessary, in accordance with the applicable Specifications. When the results of the field tests indicate the material does not conform to the requirements of the Specifications, the re-tests required by the ENGINEER shall be at the CONTRACTOR's expense.

B. Materials which fail to meet contract requirements, as indicated by laboratory tests, shall not be used in the WORK. The CONTRACTOR shall remove all defective materials from the site.

C. Types and sizes of concrete specimens shall be in accordance with ASTM C 31. Additional slump tests and/or test cylinders may be required at the discretion of the ENGINEER. Should the analysis of any test cylinder not meet the preceding requirements of Article 2.10 (Composition of Concrete) its representative concrete shall be removed and replaced at the CONTRACTOR's expense.

D. Three copies of all test reports shall be furnished to the ENGINEER.

2.12 COLD WEATHER CONCRETE

A. Concrete shall not be placed when the descending air temperature in the shade, away from artificial heat, falls below 40°F. Placement of concrete shall not resume before the ascending air temperature reaches 35°F, without specific written authorization. When the air temperature falls below 40°F, or is, in the opinion of the ENGINEER, likely to do so within a 24 hour period after placing concrete, the CONTRACTOR shall have ready on the job materials and equipment required to heat mixing water and aggregate and to protect freshly placed concrete from freezing.

B. Concrete placed at air temperatures below 40°F shall have a temperature not less than 50°F nor greater than 70°F when placed in the forms. These temperatures shall be obtained by heating the mixing water and/or aggregate. Mixing water shall not be heated to more than 160°F.

C. Binned aggregates containing ice or in a frozen condition will not be permitted nor will aggregates which have been heated directly by gas or oil flame or heated on sheet metal over an open fire. When aggregates are heated in bins, only steam-coil or water-coil heating will be permitted, except that other methods, when approved, may be used. If live steam is used to thaw frozen aggregate piles, drainage times comparable to those applicable for washed aggregates shall apply.

D. When the temperature of either the water or aggregate exceeds 100°F, they shall be mixed together so that the temperature of the mix does not exceed 80°F at the time the cement is added.

E. Any additives must have prior approval of the ENGINEER before being used.

F. The use of calcium chloride is prohibited.

G. When placing concrete in cold weather, the following precautions shall be taken in addition to the above requirements:

1. Heat shall be applied to forms and reinforcing steel before placing concrete as required to remove all frost, ice, and snow from all surfaces which will be in contact with fresh concrete.
2. When fresh concrete is to be placed in contact with hardened concrete, the surface of the previous pour shall be warmed to at least 35°F, thoroughly wet, and free water removed before fresh concrete is placed.
3. When Type I or II cement is used, freshly placed concrete shall be maintained at a temperature of not less than 70°F for three days or not less than 50°F for five days. When Type III cement is used, freshly placed concrete shall be maintained at a temperature of not less than 70°F for two days or not less than 50°F for three days.
4. The above requirements are not intended to apply during the normal summer construction season when air temperatures of 40°F or higher can reasonably be anticipated during the two-week period immediately following concrete placement, or until the concrete is no longer in danger from freezing.

H. When temperatures below 20°F are not expected during the curing period and, in the opinion of the ENGINEER, no other adverse conditions, such as high winds, are expected, concrete temperatures may be maintained in thick concrete sections by retention of heat of hydration by means of adequately insulated forms.

I. When, in the opinion of the ENGINEER, greater protection is required to maintain the specified temperature, the fresh concrete shall be completely enclosed and an adequate heat source provided. Such enclosure and heat source shall be so designed that evaporation of moisture from the concrete during curing is prevented. Precautions shall be taken to protect the structure from overheating and fire.

J. At the end of the required curing period protection may be removed, but in such a manner that the drop in temperature of any portion of the concrete will be gradual and not exceed 30°F in the first 24 hours.

K. For concrete placed within cofferdams and cured by flooding with water, the above conditions may be waived provided that the water in contact with the concrete is not permitted to freeze. De-watering shall not be carried out until the ENGINEER determines that the concrete has cured sufficiently to withstand freezing temperatures and hydrostatic pressure.

L. The CONTRACTOR shall be wholly responsible for the protection of the concrete during cold weather operations. Any concrete injured by frost action or overheating shall be removed and replaced at the CONTRACTOR's expense.

2.13 FORMS

A. Forms shall be so designed and constructed that they may be removed without injuring the concrete.

B. Unless otherwise specified, forms for exposed surfaces shall be made of plywood, hard-pressed fiberboard, sized and dressed tongue-and-groove lumber, or metal in which all bolt and rivet holes are countersunk, so that a plane, smooth surface of the desired contour is obtained. Rough lumber may be used for surfaces that will not be exposed in the finished structure. All lumber shall be free from knotholes, loose knots, cracks, splits, warps, or other defects affecting the strength or appearance of the finished structure. All forms shall be mortar tight, free of bulge and warp, and shall be cleaned thoroughly before reuse.

C. In designing forms and falsework, concrete shall be regarded as a liquid. In computing vertical loads a weight of 150 pounds per cubic foot shall be assumed. The lateral pressure for design of wall forms shall not be less than that given by the following formulas:

For walls with R less than or equal to 7 feet per hour:

$$P=150+\frac{9000R}{T}$$, but not more than 2000 p.s.f. or 150 h, whichever is less.

For walls with R greater than 7 feet per hour:

$$P=150+\frac{43{,}400}{T}+\frac{2800R}{T}$$, but not more than 2000 p.s.f. or 150 h, whichever is less.

Where:

P = lateral pressure for design of wall forms, p.s.f.
R = rate of placement, feet per hour
T = temperature of concrete in forms, °F
h = maximum height of fresh concrete in form, feet.

D. The above formulas apply to internally vibrated concrete placed at 10 feet per hour or less, without the use of retarding agents, and where depth of vibration is limited to four feet below the top of the concrete surface. The CONTRACTOR shall state the placement rate and minimum concrete temperature on the working drawings for concrete form WORK. Deflection of plywood, studs, and walers shall not exceed 1/360 of the span between supports.

E. Forms shall be so designed that placement and finishing of the concrete will not impose loads on the structure resulting in adverse deflections or distortions.

F. The forms shall be so designed that portions covering concrete that is required to be finished may be removed without disturbing other portions that are to be removed later. As far as practicable, form marks shall conform to the general lines of the structure.

G. When possible, forms shall be day-lighted at intervals not greater than 10 feet vertically, the openings being sufficient to permit free access to the forms for the purpose of inspecting, and working.

H. Metal ties or anchorages within the forms shall be so constructed as to permit their removal to a depth of at least one inch from the face without injury to the concrete. All fittings for metal ties shall be of such design that, upon their removal, the cavities which are left will be of the smallest possible size.

I. All exposed edges 90° or sharper shall be chamfered 3/4 inch unless otherwise noted. Chamfering of forms for re-entrant angles shall be required only when specifically indicated on the Drawings.

J. Forms shall be inspected immediately prior to the placing of concrete. Dimensions shall be checked carefully and any bulging or warping shall be remedied and all debris and standing water within the forms shall be removed. Special attention shall be paid to ties and bracing and where forms appear to be braced insufficiently or built unsatisfactorily, either before or during placing of the concrete, the ENGINEER shall order the WORK stopped until the defects have been corrected.

K. Forms shall be constructed true to line and grade. Clean-out ports shall be provided at construction joints.

L. The construction of concrete slabs with permanent steel forms shall conform to the requirements of this specification and as shown on the Drawings. Removable forms may be substituted for permanent metal forms with no adjustment in prices.

M. All forms shall be installed in accordance with approved fabrication and erection plans.

N. Form sheets shall not be permitted to rest directly on the top of the stringer or floor beam flanges. Sheets shall be securely fastened to form supports and shall have a minimum bearing one inch in length at each end. Form supports shall be placed in direct contact with the flange or stringer or floor beam. All attachments shall be made by permissible welds, bolts, clips or other approved means.

O. All porous forms shall be treated with non-staining form oil or saturated with water immediately before placing concrete.

P. Falsework shall be built to carry the loads without appreciable settlement. Falsework that cannot be founded on solid footings must be supported by ample falsework piling. Falsework shall be designed to sustain all imposed loads.

Q. Detail drawings of the falsework shall be submitted for review, but such review shall not relieve the CONTRACTOR of any responsibility under the contract for the successful completion of the structure.

R. Forms and falsework shall not be removed without the consent of the ENGINEER. The ENGINEER's consent shall not relieve the CONTRACTOR of responsibility for the safety of the WORK. Blocks and bracing shall be removed at the time the forms are removed and in no case shall any portion of the wood forms be left in the concrete.

S. To facilitate finishing, forms used on ornamental WORK, railings, parapets, and exposed vertical surfaces shall be removed in not less than 12 nor more than 48 hours, depending upon weather conditions. The side forms for arch rings, columns, and piers shall be removed before the members of the structure which they support are placed, so that the quality of the concrete may be inspected. All such side forms shall be removed before the removal of shoring from beneath beams and girders.

T. In warm weather, falsework and forms shall remain in place under slabs, beams, girders and arches for 14 days after the day of last pour when Type I or Type II cement is used, or for seven (7) days when Type III cement is used. Forms for slabs having clear spans or cantilever spans of less than ten (10) feet may be removed after seven (7) days when Type I or Type II cement is used, or after four (4) days when Type III cement is used. In cold weather, the length of time that forms and falsework are to remain in place shall be as approved.

U. Falsework supporting the deck of rigid frame structures shall not be removed until fills have been placed behind the vertical legs.

V. No superstructure load shall be placed upon finished concrete until the ENGINEER so directs. The minimum time allowed for the curing of structural concrete in the substructure before any load of the superstructure is placed thereon shall be seven days when Type I or Type II cement is used and two (2) days when Type III cement is used.

PART 3 - EXECUTION

3.1 GENERAL

A. All concrete shall be placed before it has taken its initial set and, in any case, within 30 minutes after mixing. Concrete shall be placed in such a manner as to avoid segregation of coarse or fine portions of the mixture, and shall be spread in horizontal layers when practicable. Special care shall be exercised in the bottom of slabs and girders to assure the working of the concrete around nests of reinforcing steel, so as to eliminate rock pockets or air bubbles. Enough rods, spades, tampers and vibrators shall be provided to compact each batch before the succeeding one is dumped and to prevent the formation of joints between batches.

B. Extra vibrating shall be done along all faces to obtain smooth surfaces. Care shall be taken to prevent mortar from splattering on forms and reinforcing steel and from drying ahead of the final covering with concrete.

C. Concrete shall not be placed in slabs or other sections requiring finishing on the top surface when precipitation is occurring or when in the opinion of the ENGINEER precipitation is likely before completion of the finishing, unless the CONTRACTOR shall have ready on the job all materials and equipment necessary to protect the concrete and allow finishing operations to be completed.

D. Troughs, pipes, or short chutes used as aids in placing concrete shall be arranged and used in such a manner that the ingredients of the concrete do not become separated. Where steep slopes are required, troughs and chutes shall be equipped with baffle boards or shall be in short lengths that reverse the direction of movement. All chutes, troughs, and pipe shall be kept clean and free of hardened concrete by flushing thoroughly with water after each run. Water used for flushing shall be discharged clear of the concrete in place. Troughs and chutes shall be of steel or plastic or shall be lined with steel or plastic and shall extend as nearly as possible to the point of deposit. The use of aluminum for pipes, chutes or tremies is prohibited. When discharge must be intermittent, a hopper or other device for regulating the discharge shall be provided.

E. Dropping the concrete a distance of more than five (5) feet or depositing a large quantity at any point and running or working it along the forms will not be permitted. The placing of concrete shall be so regulated that the pressures caused by wet concrete shall not exceed those used in the design of the forms.

F. High frequency internal vibrators of either the pneumatic, electrical, or hydraulic type shall be used for compacting concrete in all structures. The number of vibrators used shall be ample to consolidate the fresh concrete within 15 minutes of placing in the forms. In all cases, the CONTRACTOR shall provide at least two concrete vibrators for each individual placement operation (one may be a standby), which shall conform to the requirements of these Specifications. Prior to the placement of any concrete, the CONTRACTOR shall demonstrate that the two vibrators are in good working order and repair and ready for use.

G. The vibrators shall be an approved type, with a minimum frequency of 5,000 cycles per minute and shall be capable of visibly affecting a properly designed mixture with a one inch slump for a distance of at least 18 inches from the vibrator.

H. Vibrators shall not be held against forms or reinforcing steel nor shall they be used for flowing the concrete or spreading it into place. Vibrators shall be so manipulated as to produce concrete that is free of voids, is of proper texture on exposed faces, and of maximum consolidation. Vibrators shall not be held so long in one place as to result in segregation of concrete or formation of laitance on the surface.

I. Concrete shall be placed continuously throughout each section of the structure or between indicated joints. If, in any emergency, it is necessary to stop placing concrete before a section is completed, bulkheads shall be placed as the ENGINEER may direct and the resulting joint shall be treated as a construction joint.

J. The presence of areas of excessive honeycomb may be considered sufficient cause for rejection of a structure. Upon written notice that a given structure has been rejected, the rejected WORK shall be removed and rebuilt, in part or wholly as specified, at the CONTRACTOR's expense.

3.2 PUMPING CONCRETE

A. Concrete may be placed by pumping if the CONTRACTOR demonstrates that the pumping equipment to be used will effectively handle the particular class of concrete

with the slump and air content specified and that it is so arranged that no vibrations result that might damage freshly placed concrete. The operation of the pump shall be such that a continuous stream of concrete without air pockets is produced.

B. When pumping is completed, the concrete remaining in the pipeline, if it is to be used, shall be ejected in such a manner that there will be no contamination of the concrete or separation of the ingredients. After this operation, the entire equipment shall be thoroughly cleaned. Slump tests shall be taken at the discharge end of the pipe.

3.3 COLUMNS

A. Concrete in columns shall be placed in one continuous operation unless otherwise permitted. The concrete shall be allowed to set at least 12 hours before caps are placed.

3.4 SLAB AND GIRDER SPANS

A. Slabs and girders having spans of 30 feet or less shall be cast in one continuous operation.

B. Girders spanning more than 30 feet may be cast in two operations, the first operation being the casting of the girder stems to the bottom of the slab haunches. Shear keys shall be provided for by inserting oiled timber blocks to a depth of at least 1-1/2 inches in the fresh concrete at the top of each girder stem. A sufficient number of blocks shall be used to cover uniformly about 1/2 the top surface of the girder stem. The blocks shall be removed as soon as the concrete has set sufficiently to retain their shape. The period between the first or girder casting and the second or slab casting shall be at least 24 hours. Immediately before the second casting, the CONTRACTOR shall check all falsework for shrinkage and settlement and shall tighten all wedges to insure minimum deflection of the stems due to the added weight of the slab.

3.5 SLABS ON STEEL BEAMS

A. A concrete slab on simple steel girder spans may be placed in not more than three sections with the first section centered on the span.

B. On truss spans or continuous girders, the concrete slab shall be placed as shown on the Drawings or as directed by the ENGINEER.

3.6 CONCRETE DEPOSITED UNDER WATER

A. Construction joints shall be located where shown on the Drawings or as permitted by the ENGINEER. Construction joints shall be perpendicular to the principal lines of stress and in general shall be located at points of minimum shear.

B. At horizontal construction joints, gage strips 1-1/2 inches thick shall be placed inside the forms along all exposed faces to give the joints straight lines. Before placing fresh concrete, the surfaces of construction joints shall be washed and scrubbed with a wire broom, drenched with water until saturated, and kept saturated until the new concrete is placed.

C. Immediately prior to placing new concrete, the forms shall be drawn tight against the concrete already in place. Concrete in substructures shall be placed in such manner that all horizontal construction joints will be truly horizontal and, if possible, in locations such that they will not be exposed to view in the finished structure. Where vertical construction joints are necessary, reinforcing bars shall extend across the joint in such a manner as to make the structure monolithic. Special care shall be taken to avoid construction joints through large surfaces which are to be treated architecturally.

D. All construction joints shall be provided with concrete shear keys at least 1-1/2 inches deep and 1/3 of the concrete thickness in width, unless otherwise shown on the Drawings.

3.7 EXPANSION JOINTS

A. Expansion joints shall be located and formed as required on the Drawings.

B. Open Joints. Open joints shall be placed in the location shown on the Drawings and shall be formed. The form shall be removed without chipping or breaking the corners of the concrete. Reinforcement shall not extend across an open joint, unless so specified on the Drawings.

C. Filled Joints. Unless otherwise shown on the Drawings, expansion joints shall be constructed with pre-molded expansion joint filler with a thickness equal to the width of the joint.

D. The joint filler shall be cut to the same shape and size as the adjoining surfaces. It shall be fixed firmly against the surface of the concrete already in place in such manner that it will not be displaced when concrete is deposited against it.

E. Immediately after the forms are removed, the expansion joints shall be inspected carefully. Any concrete or mortar that has sealed across the joint shall be removed.

F. Joint sealer for use in deck joints shall be of the type shown on the Drawings conforming to the requirements of Article 2.4 (Joint Filler) of this Section. The faces of all joints to be sealed shall be free of foreign matter, paint, curing compound, oils, greases, dirt, free water, and laitance.

G. Elastomeric Compression Seals. The joint seal shall be shaped as shown on the Drawings. It shall be installed by suitable hand or machine tools and thoroughly secured in place with a lubricant-adhesive recommended by the seal manufacturer. The lubricant-adhesive shall cover both sides of the seal over the full area in contact with the sides of the joint.

H. The seal shall be in one piece for the full width of the joint. Any joints at curbs shall be sealed adequately with additional adhesive.

I. The seal may be installed immediately after the curing period of the concrete. Temperature limitations of the lubricant-adhesive as guaranteed by the manufacturer shall be observed.

J. Strip Seals. Expansion joint strip seals shall be as shown on the Drawings, and composed of a steel extrusion and an extruded strip seal. The steel shall conform to ASTM A242 or A588. Strip seals shall be one piece for the length of the joint.

K. Installation of the expansion joints shall be in accordance with the manufacturer's recommendations, except that the joint opening shall be adjusted for the dimensions indicated on the Drawings.

L. Steel Joints. The plates, angles, or other structural shapes shall be accurately shaped at the shop to conform to the section of the concrete slab. The fabrication and painting shall conform to the requirements of the Specifications covering those items. Care shall be taken to insure that the surface in the finished plane is true and free of warping. Positive methods shall be employed in placing the joints to keep them in correct position during the placing of the concrete. The opening at expansion joints shall be that designated on the Drawings at normal temperature.

3.8 ANCHOR BOLTS

A. Anchor bolt assemblies conforming to the details shown shall be accurately secured in the forms in the positions shown on the Drawings, before any concrete is placed in the forms. The positions shall be checked and any adjustments made as soon as the concrete has been placed.

B. When pipe sleeves or pre-cast holes are provided, no water shall be allowed to freeze in the cavity. If frost causes cracks in the concrete, the entire placement shall be removed and replaced at the CONTRACTOR's expense. When anchor bolts are installed in pipe sleeves or pre-cast holes, the cavity shall be completely filled with grout at the time the grout pads are constructed or at the time the bearing assemblies or masonry plates are placed.

3.9 DRAINAGE AND WEEP HOLES

A. Drainage holes and weep holes shall be constructed as indicated on the Drawings.

B. Weep holes through concrete shall be formed. If wooden forms are used, they shall be removed after the concrete is cured. If subsurface drainage is not shown on the Drawings, weep holes shall be provided in retaining walls and abutment walls where the height of the wall is over five feet measured from the top of the footing. Weep holes shall be four inches in diameter and shall be spaced not more than 15 feet apart. The outlet end of weep holes shall be placed just above the finish ground line at the face of wall, or as directed.

3.10 PIPES, CONDUITS, AND DUCTS

A. Pipes, conduits, and ducts that are to be encased in concrete shall be installed in the forms by the CONTRACTOR before the concrete is placed. Unless otherwise indicated, they shall be standard, lightweight cast-iron water pipe or wrought iron. They shall be held rigidly so they will not be displaced during concrete placement.

3.11 FINISHING CONCRETE SURFACES

A. All concrete surfaces exposed in the completed WORK shall receive an Ordinary Finish, as described below, unless otherwise noted on the Drawings or in the special provisions.

3.12 ORDINARY FINISH

A. An Ordinary Finish is defined as the finish left on a surface after the removal of the forms, the filling of all holes left by form ties, and the repairing of all defects. The surface shall be true and even, free from stone pockets and depressions or projections. All surfaces that cannot be satisfactorily repaired shall be given a Rubbed Finish.

B. The concrete in caps and tops of walls shall be struck off with a straightedge and floated to true grade. The use of mortar topping for concrete surfaces shall in no case be permitted.

C. As soon as the forms are removed, metal devices that have been used for holding the forms in place, and which pass through the body of the concrete, shall be removed or cut back at least one inch beneath the surface of the concrete. Fins of mortar and all irregularities caused by form joints shall be removed.

D. All small holes, depressions, and voids, that show upon the removal of forms, shall be filled with cement mortar mixed in the same proportions as that used in the body of the WORK. In patching larger holes and honeycombs, all coarse or broken material shall be chipped away until a dense uniform surface of concrete exposing solid coarse aggregate is obtained. Feathered edges shall be cut away to form faces perpendicular to the surface. All surfaces of the cavity shall be saturated thoroughly with water, after which a thin layer of neat cement mortar shall be applied. The cavity shall then be filled with stiff mortar composed of one part portland cement to two parts sand, which shall be thoroughly tamped into place. The mortar shall be pre-shrunk by mixing it approximately 20 minutes before using. The length of time may be varied in accordance with brand of cement used, temperature, humidity, and other local conditions. The surface of this mortar shall be floated with a wooden float before initial set takes place and shall be neat in appearance. The patch shall be kept wet for a period of five days.

E. For patching large or deep areas, coarse aggregate shall be added to the patching material. All mortar for patching on surfaces which will be exposed to view in the completed structure shall be color matched to the concrete. Test patches for color matching shall be conducted on concrete that will be hidden from view in the completed WORK and shall be subject to approval.

3.13 RUBBED FINISH

A. When forms can be removed while the concrete is still green, the surface shall be pointed and wetted and then rubbed with a wooden float until all irregularities and form marks are removed and the surface is covered with a lather composed of cement and water. This lather shall be allowed to set for at least five days. The surface shall then be smoothed by being rubbed lightly with a fine carborundum stone. If permitted, a thin grout composed of one part cement and one part fine sand may be used in the rubbing.

B. If the concrete has hardened before being rubbed, a medium coarse carborundum stone shall be used to finish the surface. Such WORK shall not be done until at least four days after placing and it shall be done in the following manner:

1. A thin grout composed of one part cement and one part fine sand shall be spread over a small area of the surface. It shall be rubbed immediately with the stone until all form marks and irregularities are removed and the surface is covered with a lather. The surface shall then be finished as described above for green concrete.

C. The surface shall be smooth in texture and uniform in appearance. The building up of depressions will not be permitted.

D. If, through the use of first-class form materials and the exercise of special care, concrete surfaces are obtained that are satisfactory, the CONTRACTOR may be relieved entirely or in part from the requirements for a rubbed finish.

3.14 CONCRETE DECKS

A. A smooth riding surface of uniform texture, true to the required grade and cross section, shall be obtained on all bridge roadway decks. The CONTRACTOR may use hand tools or finishing machines, or a combination of both, conforming to the requirements specified herein for finishing bridge roadway deck concrete.

B. Finishing of concrete placed in bridge decks shall consist essentially of striking off the surface of the concrete as placed and floating with longitudinal floats the surface so struck off.

C. The placing of concrete in bridge roadway decks will not be permitted until the ENGINEER is satisfied that the rate of production and placement of concrete will be sufficient to complete the proposed placing and finishing operations within the scheduled time, that experienced finishing machine operators and concrete finishers are employed to finish the deck, and all necessary finishing tools and equipment are on hand at the site of the WORK and in satisfactory condition for use.

D. Finishing machines shall be set up sufficiently in advance of use to permit inspection during the daylight hours before each placement. Before any fresh concrete is deposited on the deck, the finishing machine shall be moved on its rails across the length of the scheduled placement and the clearance between the strike off and deck reinforcing steel shall be checked to ensure that the required minimum concrete cover will be maintained with due consideration for deflections.

E. Unless adequate lighting facilities are provided by the CONTRACTOR, the placing of concrete in bridge decks shall cease at such time that finishing operations can be completed during daylight hours.

F. Rails for support and operation of finishing machines and headers for hand-operated strike off devices shall be completely in place and firmly secured for the scheduled length of concrete placement before placing of concrete will be permitted. Rails for finishing machines shall extend a sufficient distance beyond both ends of the scheduled length of

concrete placement. This distance shall permit the float of the finishing machine to fully clear the concrete to be placed. Rails or headers shall be adjustable for elevation and shall be set to elevations with allowance for anticipated settlement, camber, and deflection of falsework, as required to obtain a bridge roadway deck true to the required grade and cross section.

G. Rails or headers shall be of a type and shall be installed so that no springing or deflection will occur under the weight of the finishing equipment. Rails or deaders shall be located so that finishing equipment may operate without interruption over the entire bridge roadway deck being finished.

H. Details for supporting finishing machine rails shall be submitted and must be approved before any deck slab concrete is placed.

I. The rate of placing concrete shall be limited to that which can be finished before the beginning of initial set. However, concrete for the deck surface shall not be placed more than 10 feet ahead of strike off.

J. After the concrete has been placed and consolidated, the surface of the concrete shall be carefully struck off by means of a hand-operated strike board, operating on headers, or by a finishing machine operating on rails. A uniform deck surface true to the required grade and cross section shall be obtained.

K. Following strike off, the surface of the concrete shall be floated longitudinally. In the event strike off is performed by means of a hand-operated strike board, two separate hand-operated float boards for longitudinal floating shall be provided. The first float shall be placed in operation as soon as the condition of the concrete will permit and the second float shall be operated as far back from the first float as the workability of the concrete will permit.

L. In the event the strike-off is performed with a finishing machine, longitudinal floating of the concrete shall be performed by means of a hand-operated float board or a finishing machine equipped with a longitudinal float. The longitudinal float on the finishing machine shall have a length of not less than eight (8) feet nor more than twelve (12) feet.

M. Any finishing machine used for strike off which has a wheelbase of six (6) feet or less shall be followed by two (2) separate hand-operated float boards for longitudinal floating. All the provisions in this section pertaining to hand-operated float boards shall apply to the two (2) separate float boards for longitudinal floating.

N. Longitudinal floats, either hand-operated or machine-operated, shall be used with the long axis of the float parallel to the centerline of the bridge roadway. The float shall be operated with a combined longitudinal and transverse motion planing off the high areas and floating the material removed into the low areas. Each pass of the float shall lap the previous pass by 1/2 the length of the float. Floating shall be continued until a smooth riding surface is obtained. The driving surface of the concrete shall have a heavy broom finish. Decks to receive waterproof membranes shall be float finished.

O. Hand-operated float boards shall be from 12 feet to 16 feet long, ribbed and trussed as necessary to provide a rigid float, and shall be equipped with adjustable handles at each

end. The float shall be wood, not less than one inch thick and from four inches to eight inches wide. Adjusting screws spaced at a distance not to exceed 24 inches on center shall be provided between the float and the rib. The float board shall be true and free of twists.

P. Hand-operated float boards shall be operated from transverse finishing bridges. The finishing bridges shall completely span the roadway area being floated. A sufficient number of finishing bridges shall be provided to permit operation of the floats without undue delay. Not less than two transverse finishing bridges shall be provided when hand-operated float boards are used. When a finishing machine is used for longitudinal floating, one finishing bridge equivalent to the transverse finishing bridge specified herein shall be furnished for use by the ENGINEER.

Q. All finishing bridges shall be of rigid construction.

R. Immediately following completion of the deck finishing operations, the concrete in the deck shall be cured as specified in Article 3.17, Curing Concrete, of this Section.

S. The finished surface of the concrete shall be tested by means of a straightedge 10 feet long. The surface shall not vary more than 0.01 foot from the lower edge of the straightedge, except bridge decks receiving asphalt wearing courses shall not vary more than 0.02 foot from the lower edge of the straightedge. All high areas in the hardened surface in excess of 0.01 foot as indicated by testing shall be removed by abrasive means. After grinding by abrasive means has been performed, the surface of the concrete shall not be smooth or polished. Ground areas shall be of uniform texture and shall present neat and approximately rectangular patterns.

T. Devices for supporting finishing machine rails shall be of such design that those portions which are to remain embedded in the concrete deck will be covered by a minimum of two inches of concrete when finishing is completed.

3.15 CURB AND SIDEWALK SURFACES

A. Exposed faces of curbs and sidewalks shall be finished to true surfaces. Concrete shall be worked until coarse aggregate is forced down into the body of the concrete and a layer of mortar approximately 1/4 inch thick is flushed on the top. The surface shall then be floated to a smooth but not slippery finish.

3.16 CURING CONCRETE

A. Water Curing:

1. All concrete surfaces shall be kept wet for at least seven (7) days after placement if Type I or II cement has been used or for three days if Type III cement has been used. Concrete shall be covered with wet burlap, cotton mats, or other materials meeting the requirements of AASHTO M 171 immediately after final finishing of the surface. These materials shall remain in place for the full curing period or they may be removed when the concrete has hardened sufficiently to prevent marring. The surface shall immediately be covered with sand, earth, straw, or similar materials.

2. In either case the materials shall be kept thoroughly wet for the entire curing period. All other surfaces, if not protected by forms, shall be kept thoroughly wet, either by sprinkling or by the use of wet burlap, cotton mats, or other suitable fabric, until the end of the curing period. If wood forms are allowed to remain in place during the curing period, they shall be kept moist at all times to prevent opening at joints.

B. Membrane Curing. Liquid membrane curing compound meeting the requirements of AASHTO M 148, Type I, may be permitted, subject to approval by the ENGINEER. Compounds utilizing linseed oil shall not be used. All finishing of concrete surfaces shall be performed to the satisfaction of the ENGINEER prior to applying the impervious membrane-curing compound. The concrete surfaces must be kept wet with water continuously until the membrane has been applied. The manufacturer's instructions shall be carefully followed in applying the membrane. In all cases, the membrane-curing compound must always be thoroughly mixed immediately before application. If the membrane becomes marred, worn, or in any way damaged, it must immediately be repaired by wetting the damaged area thoroughly and applying a new coat of the impervious membrane-curing compound. Membrane curing will not be permitted for concrete slabs that are to be covered with waterproof membranes, for polymer modified concrete or at construction joints.

3.17 BACKFILLING AND OPENING TO TRAFFIC

A. Unbalanced backfilling against concrete structures will not be permitted until the concrete has attained a compressive strength of not less than 80% of the ultimate strength (f'_c) shown on the Drawings.

B. Concrete culverts and bridges with concrete decks shall remain closed to traffic until permission to open them is granted. No vehicle will be allowed on any span until the concrete in the span has attained a compressive strength of not less than 80% of the ultimate strength (f'_c) shown on the Drawings. Loads of any character having a total weight in excess of 4000 pounds will not be permitted on any span until the concrete in the span has attained a compressive strength of not less than the ultimate strength (f'_c) shown on the Drawings.

C. The compressive strength shall be determined from informational test cylinders cured on the site under similar conditions of temperature and moisture as the concrete in the structure.

3.18 CLEANING UP

A. Upon completion of the structure and before final acceptance, the CONTRACTOR shall remove all falsework. Falsework piling shall be removed or cut off at least two feet below the finished ground line.

END OF SECTION

SECTION 03302 - CONCRETE STRUCTURES

PART 1 – GENERAL

1.1 DESCRIPTION

A. The WORK under this Section includes providing all labor, materials, tools, and equipment necessary for furnishing and installing minor concrete structures, removal and disposal of the existing structure to be replaced by the proposed structure, and all backfill and grading, in accordance with these Specifications and in reasonably close conformity with the lines, grades, details, and locations shown on the Drawings or established by the ENGINEER.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Portland Cement shall conform to the requirements of AASHTO M 85.

B. Aggregate shall be clean, durable, uniformly graded sand and gravel, or crushed stone, 100 percent passing a 1 1/2 inch sieve and containing not more than five percent passing a U.S. No. 200 sieve.

C. Air-entraining admixtures shall conform to the requirement of AASHTO M 154.

D. Water shall be obtained from the CBJ potable water system, unless otherwise permitted in writing by the ENGINEER.

E. Curing materials shall conform to the requirements of AASHTO M 182, AASHTO M 171, or AASHTO M 148, as appropriate, except that AASHTO M 148 is modified to prohibit the use of compounds utilizing linseed oil.

F. Reinforcing Steel shall conform to the requirements of AASHTO M 31.

G. Welded Wire Fabric shall conform to the requirements of AASHTO M 55.

H. Joint Fillers shall be of the type specified in the contract, and shall conform to the appropriate following requirements:

1. Poured filler - AASHTO M 173 or AASHTO M 282 as specified
2. Preformed filler - AASHTO M 213
3. Hot-poured sealant - ASTM D 3405
4. Hot-poured elastomeric type sealant - ASTM D 3406

2.2 COMPOSITION OF CONCRETE

A. Portland cement concrete will ordinarily be accepted on the basis of certification.

B. The concrete shall contain three to six percent of entrained air, as determined by AASHTO T 152. Concrete shall have a slump of not more than four inches as determined by AASHTO T 119.

C. Concrete shall contain not less than 611 pounds of cement and not more than 300 pounds of water per cubic yard.

D. The concrete shall develop a minimum compressive strength of 3,000 psi in 28 days.

E. The concrete shall be subject to acceptance or rejection by visual inspection at the job site. Re-tempering concrete will not be permitted.

F. The CONTRACTOR shall submit for approval the following:

1. The type and sources of aggregates and cement.
2. Scale weights of each aggregate proposed as pounds per cubic yard of concrete.
3. Quantity of water proposed as pounds per cubic yard of concrete.
4. Quantity of cement proposed as pounds per cubic yard of concrete.
5. Air content.
6. Slump.

G. When a commercial supplier is used, the CONTRACTOR shall furnish a certification with each truckload of concrete certifying that the material and mix proportions used are in conformance with the approved mixture.

H. Concrete complying with Section 03301 – Structural Concrete will be acceptable as an approved mixture with appropriate certification.

I. The ENGINEER may make and test cylinders for strength determinations.

2.3 FORMS

A. Forms shall be designed and constructed to be removed without injuring the concrete. They shall be free of bulge and warp, and constructed so the finished concrete will be of the form and dimensions shown on the Drawings, and true to line and grade. Forms for concrete containing a retarding admixture shall be designed for a lateral pressure equal to that exerted by a fluid weighing 150 pounds per cubic foot.

PART 3 - EXECUTION

3.1 PLACING CONCRETE

A. Concrete shall be placed to avoid segregation of materials and shall be consolidated with mechanical vibrators in accordance with Section 03301 – Structural Concrete.

B. When concrete is placed by the pumping method or by tremie operations, the use of aluminum pipe or conduit for transporting the concrete will not be permitted.

C. The intervals between delivery of batches for a single pour shall not exceed 30 minutes.

D. When placing concrete at or below an atmospheric temperature of 35°F. the CONTRACTOR shall comply with the applicable requirements of Section 03301 – Structural Concrete.

3.2 FINISHING CONCRETE SURFACES

A. All concrete surfaces shall be finished in accordance with the requirements of Section 03301 – Structural Concrete, except "Concrete International Corporation" Ashford formula shall be used as a curing compound.

3.3 CURING CONCRETE

A. All concrete will be cured a minimum of seven days, or, if high early strength cement is used, a minimum of three days. The concrete shall be cured in accordance with Section 03301 – Structural Concrete.

END OF SECTION

SECTION 03303 - SIDEWALK, CURB AND GUTTER

PART 1 – GENERAL

1.1 DESCRIPTION

A. The WORK under this Section includes providing all labor, materials, tools, and equipment necessary for furnishing and installing sidewalk, curb, and gutter as shown on the Drawings and Standard Details.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials shall conform to the requirements of Section 03302 – Concrete Structures, except "Concrete International Corporation" Ashford Formula, or approved equal, shall be used instead of the specified curing materials.

B. Synthetic fibers may be substituted for rebar or wire mesh upon approval of the ENGINEER.

PART 3 - EXECUTION

3.1 METHODS OF CONSTRUCTION

A. Sidewalk, concrete slabs, curb and gutter, and valley gutter shall conform to the applicable requirements of Section 03302 - Concrete Structures, and as shown on the Drawings, except "Concrete International Corporation" Ashford formula, or approved equal, shall be used as a curing compound.

1. The curing compound shall be sprayed on the surface with a low-pressure sprayer immediately following the finishing operation.
2. The entire surface shall be kept wet for 30 minutes by brooming excess material onto the dry spots or by re-spraying them immediately. No areas on the concrete surface shall be allowed to dry during the initial 30 minute period.
3. As the curing compound begins to dry into the surface and becomes slippery, lightly sprinkle the surface with water to aid the penetration of the curing compound and to bring any alkali to the surface.
4. After 30 to 40 minutes, squeegee or broom the surface to remove any excess curing compound and alkali or other impurities brought to the surface. All WORK required for the application of the curing compound shall conform to the manufacturer's recommendations.

B. All exposed or unprotected edges of sidewalks shall be tooled to a radius of not more than one-half inch. After floating, trowel finish the entire surface using steel trowels. Final finish shall be obtained by brooming the surface, including the tooled edge, to a gritty finish after all free moisture has disappeared from the surface. Sprinkling of cement or sand for blotting will not be permitted.

C. Concrete curb and gutter, curb, and valley gutter shall be integral, one course construction, and molded in place on a gravel subgrade. The face forms of the integral curb and gutter shall be removed as soon as practicable. The top and inclined surface

D. shall then be worked with float or steel trowels to a gritty finish. Glazing, sprinkling of sand or cement, or blotting will not be permitted. Both front and back edges shall be tooled to a radius of one-half inch.

E. Use of monolithic curb and gutter machines will be permitted only on the written approval of the ENGINEER. Mortar may be added to the curb machine in a quantity approved by the ENGINEER.

F. Expansion joints shall be placed at 30-foot, maximum, intervals along all structures and about all features that project into, through, or against the concrete. An expansion joint shall be constructed at the intersection of sidewalks, between sidewalk crossings and sidewalks and at the beginning and end of curb returns. Expansion joints shall not be placed between the sidewalk and the curb.

G. Expansion join material shall conform to the requirements of AASHTO M 213. This material shall extend the full width of the structure and shall be cut to such dimensions that the base of the expansion joint shall extend to the subgrade and the top shall be depressed not less than one-quarter inch nor more than one-half inch below the finished surface of the concrete. The material shall be one piece in the vertical dimension and shall be securely fastened to the existing concrete face against which fresh concrete is to be poured.

H. Transverse contraction joints, cut to a depth of one inch prior to the final set of the concrete, shall be tooled in the sidewalk at intervals approximately equal to the width of the sidewalk, and at ten foot intervals in the curb and gutter. Where the sidewalk adjoins the curb (parallel to it), contraction joints in the sidewalk and curb shall be made to match where practicable.

I. The top and face of the finished curb shall be true and straight and the top surface of curbs shall be of uniform width, free from lumps, sags, or other irregularities. When a straightedge 10 feet long is laid on the top or face of the curb, or on the surface of gutters, the surface shall not vary more than 0.02 foot from the edge of the straightedge except at grade changes or curves. All discolored concrete shall be cleaned at the CONTRACTOR's expense. The concrete may be cleaned by abrasive blast cleaning or other methods approved by the ENGINEER. Repairs shall be made by removing and replacing the entire unit between scoring lines or joints.

J. Sidewalks at driveway approaches shall have a minimum thickness of six (6) inches.

END OF SECTION

SECTION 03304 - REMOVE EXISTING SIDEWALK, CONCRETE SLAB, OR CURB AND GUTTER

PART 1 – GENERAL

1.1 DESCRIPTION

A. The WORK under this section includes providing all labor, materials, tools, and equipment necessary for removing and disposing of existing concrete sidewalks, concrete slabs, concrete curb and gutter, or concrete valley gutter as indicated on the Drawings or as directed by the ENGINEER

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 CONSTRUCTION

A. Sidewalks, concrete slabs, curb and gutter, or valley gutter to be removed shall be separated from the remaining portion by saw cutting. Saw cuts shall be at right angles to the curb, sidewalk, or slab edge. Broken edges shall be trimmed to eliminate jagged or irregular surfaces. The CONTRACTOR shall dispose of the material at an approved disposal area.

B. The CONTRACTOR is responsible to secure disposal sites, including obtaining written permission from the owner and any required permits, if none are indicated on the Drawings. The cost of securing such sites shall be borne by the CONTRACTOR.

END OF SECTION