

**CITY AND BOROUGH
OF SITKA, ALASKA**

2002

STANDARD SPECIFICATIONS

Street - Drainage - Utilities - Parks



CITY AND BOROUGH OF SITKA
STANDARD CONSTRUCTION SPECIFICATIONS

INDEX

<u>DIVISION</u>	<u>DESCRIPTION</u>	<u>COLOR CODE</u>
10.00	General Provisions	Gold
15.00	Miscellaneous Project Requirements	Yellow
20.00	Earthwork	White
30.00	Portland Cement Concrete	Blue
40.00	Asphalt Surfacing	Green
50.00	Sanitary Sewers	Pink
55.00	Storm Drain Systems	Yellow
60.00	Water Systems	White
65.00	Construction Survey	Blue
70.00	Miscellaneous	Green
75.00	Landscaping Improvements	Pink
90.00	Standard Details	White

**STANDARD GENERAL PROVISIONS
DIVISION 10
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**STANDARD GENERAL PROVISIONS
DIVISION 10**

SECTION 10.01 DEFINITIONS

In these specifications and the contract, the following words or expressions shall be understood to have the meaning given below:

AASHTO	-	American Association of State Highway & Transportation Officials
ADA	-	The Americans with Disabilities Act of 1990
ADOT&PF	-	State of Alaska, Department of Transportation and Public Facilities
ACI	-	American Concrete Institute
ANSI	-	American National Standard Institute
API	-	American Petroleum Institute
APWA	-	American Public Works Association
ASA	-	American Standard Association
ASME	-	American Society of Mechanical Engineers
ASTM	-	American Society for Testing & Materials
AWS	-	American Welding Society
AWWA	-	American Water Works Association
CBSS	-	City and Borough of Sitka Standard Construction Specifications
IEEE	-	Institute of Electrical & Electronics Engineers
ISO	-	Insurance Service Office
NEC	-	National Electrical Code
NEMA	-	National Electrical Manufacturer Association
NESC	-	National Electric Safety Code
OSHA	-	Occupational Safety and Health Act
UBC	-	Uniform Building Code

Act of God – “Act of God” shall mean an earthquake, flood, cyclone or other cataclysmic phenomenon of nature. A rain, windstorm, high water, or other natural phenomenon of unusual intensity for a specific locality, but which might reasonably have been anticipated from historical records of the general locality, shall not be construed as an “Act of God.”

ADA – “ADA” refers to the Americans with Disabilities Act of 1990. Public Law 101-336, which prohibits discrimination on the basis of disability by private entities in places of public accommodations.

ADEC – State of Alaska, Department of Environmental Conservation.

ADOT – State of Alaska, Department of Transportation and Public Facilities.

Addenda (Addendum) - “Addenda” shall mean written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the Contract Documents.

Assembly – “Assembly” shall mean the elected Assembly of the City and Borough of Sitka, Alaska.

Bid – The offer or proposal of a bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

Bidder – Any individual, firm, partnership, corporation, or combination thereof formally submitting a Bid for the work contemplated, or any portion thereof, acting directly or through an authorized representative.

Bidding Documents – The Invitation to Bid, Bid Guarantee, Provisions, Specifications, Forms, Schedules, Bidders Checklist, proposed Contract Documents, and all Addenda.

Bid Guarantee – The security furnished by the Bidder as a guarantee to enter into a Contract for the Work contemplated if the Bidder is awarded the Contract.

Bonds - Performance and Payment bonds and other instruments of security.

Change Order – Any written agreement entered into between the Contractor and the CBS to supplement or clarify or alter the plans, specifications, or contract, or to otherwise provide for extra work, contingencies, alterations in plans, and other matters not contemplated by or adequately described in the plans and specifications.

CBS – City and Borough of Sitka, Alaska.

Construction Schedule – “Construction Schedule” shall mean the time and activities plan for completion of the work prepared in the format required by the Contract Documents.

Contract – The written agreement executed by the CBS and the Contractor covering the performance of the work.

Contractor - The individual, firm or corporation undertaking the execution of the work under the terms of the contract and acting directly or through its agents or employees.

Contract Completion Date – The calendar date specified in the proposal for the full completion of all Work required by the Contract Documents, except as otherwise provided in the Contract.

If a number of calendar days is specified in the proposal for the completion of the Contract, the Contract Completion Date will be those specified number of days after the effective date of the Notice to Proceed, including authorized time extensions.

Contract Documents – The plans, specifications, agreements, performance and payment bond, including all agreed modifications thereof incorporated in the documents before their execution and all agreements of a supplemental nature that may be entered into during the progress of the work.

Date of Substantial Completion – For all construction contracts, the term “date of substantial completion of work” shall mean that date upon which the improvements which are the subject matter of the Contract, are accepted as essentially completed and available for CBS’s beneficial use for the purposes and in a manner intended by the CBS.

Days – Unless otherwise designated in the SPECIAL PROVISIONS, days as used in the Contract Documents will be understood to mean calendar days.

Drawings – The maps, plans, sheets, or other graphic illustrations listed and referred to in the Contract.

Extra Work – Work not within the original scope of work but is determined by the Engineer to be essential for the satisfactory completion of the contract.

Design Engineer - Shall mean the Engineering Consultant under contract to the CBS to prepare the plans and specifications.

Engineer – Shall mean the CBS’s designated representative.

Fair Cost Estimate – The Design Engineer’s estimate as announced at the bid opening.

Final Acceptance Date – The date of final acceptance of the contract shall be defined as that date at which the project has been constructed, cleaned up, and all warranty periods have been completed in accordance with the Plans and Specifications and pursuant to Article 5.13 – Final Inspection.

It is mutually agreed between parties to the Contract that no payment by the CBS shall constitute an acceptance of unauthorized or defective work or improper material.

Projects may be accepted in respect to construction at such time as they are entirely completed; however, on projects consisting of several disconnected streets, sewer lines, or water lines, the Engineer may accept any of these separate sections if he so elects. Continuous sewer or water projects will not be accepted until completed in their entirety.

Final Payment - Represents a sum of money to perform all tasks necessary from Substantial Completion to Final Completion, including completion of final punch list,

completion of as-built data, turnover of all warranty information, notarized acknowledgments of payments, and relinquishment of claims against Owner.

Force Account Work – Work performed by the Contractor at the direction of the Engineer, for which no item is provided in the contract and for which no unit price or lump sum basis can be agreed upon.

Furnish – Purchase and deliver to the Project.

Indicated – Shown, noted or specified on the Drawings, or a combination thereof.

Install – Set in place and make usable.

Inspector – The authorized representative of the Engineer or CBS assigned to observe the work.

Liquidated Damages – The amount prescribed herein to be paid to the CBS, or to be deducted from any payments due or to become due the Contractor, for each day's delay in completing the whole or any specified portion of the work beyond the time allowed in the specifications or as extended by Change Order.

The liquidated damage amount shall only apply to damages and expenses the CBS may incur as a result of a delay in placing the facility (or material) in use and operation, exclusive of third party damages or claims.

Municipality – City and Borough of Sitka, Alaska

Necessary – Needed, as reasonably inferred from the Contract Documents, in order to make the Work complete and available for use.

Notice to Proceed – The written communication, issued by the CBS to the Contractor authorizing him to proceed with the Work, which establishes the time of commencement and date of completion.

“Or Equal” – Whenever a material, article, or piece of equipment is identified on the plans or in the specifications by reference to manufacturers' or vendors' names, trade names, catalogue numbers, etc., it is intended merely to establish a standard; and any material, article, or equipment of other manufacturers and vendors which will perform in an equal or better manner the duties imposed by the general design will be considered equally acceptable provided the material, article, or equipment so proposed is, in the opinion of the Engineer, of equal or better substance and function.

The burden of proof that an alternate material, article or piece of equipment is indeed equal, and the cost of the burden of proof, shall be borne by the proposer.

Owner – City and Borough of Sitka, Alaska, acting through its legally constituted officials, officers, employees, or agents.

OSHA – Occupational Safety and Health Administration.

Performance and Payment Bond – The form of security approved by the CBS, furnished by the Contractor and his surety guaranteeing the complete and faithful performance of all the obligations and conditions placed upon the Contractor by the contract.

Plans – The maps, plans, and drawings as listed and referred to in the “Contract Documents” together with any additional maps, plans, or drawings, and any supplemental drawings furnished by the Engineer.

Project Manager – The authorized representative of the CBS assigned to manage the contract administration and construction progress and quality control of the project. The terms Project Manager, Engineer, and CBS’s Representative may or may not be synonymous.

Record Drawing – Detailed drawings which accurately depict all changes in location (both horizontal and vertical), material, equipment, and other elements of Work accomplished by Contractor. The drawings shall also depict the horizontal and vertical locations of all other utilities and obstructions encountered during construction. Final elevations and locations shall be clearly marked with actual dimensions, or existing dimensions shall be noted with “ASB” if no changes occur.

Samples – Physical examples which illustrate materials, equipment, or workmanship and establish standards by which Work or a product will be judged.

Shop Drawings – All drawings, diagrams, illustrations, brochures, schedules, and other data which are prepared by the Contractor, a subcontractor, manufacturer, supplier, or distributor and which illustrate the equipment, material or some portion of the work.

Special Provisions – That portion of the Specifications entitled SPECIAL PROVISIONS containing specific clauses setting forth conditions or requirements peculiar to the work and supplementary to the Standard Specifications.

Specifications – The directions, requirements, explanations, terms, and provisions pertaining to the various features of the work to be done, the manner and method of performance, and the manner and method of measurement and payment.

Street Closure – Any action which renders one or more lanes of a street unusable to vehicular traffic.

Subcontractor – Any individual, firm or corporation, partnership or joint venture acting for or on behalf of the Contractor in the performance of a part of the contract. This does not include those working for hire or suppliers of material or equipment except that production of materials or supplies at the project site shall be deemed as being produced by a subcontractor where such is not produced by the Contractor’s own forces and equipment.

Supplemental Specifications – Supplemental Specifications are those adopted subsequent to the Standard Specifications and generally involve alterations to standard specifications or the addition of a new construction item

Surety – The company or association which is legally bound to the CBS for the acceptable performance of the contract, and for payment of all the Contractor’s obligations arising out of the contract. Where applying to the “Proposal Guaranty,” it refers to the Company or Association which will forfeit the sum of the Guarantee if the Bidder fails to execute the Contract after the Bid is accepted by the CBS.

Time and Material Work – Work performed by the Contractor at the written direction of the Engineer for which no item is provided in the Contract and for which no unit price or lump sum basis can be agreed upon.

Unit Price – “Unit Price” shall mean the amount bid by the Contractor for furnishing one unit of construction, the quantities being subject to adjustment within the limits specified in the Contract Documents.

Units of Construction –

a. Basic Unit of Construction

An elementary part of the total construction which includes like materials and labor, is repetitive in nature, and is readily and economically measurable, i.e., ‘cubic yard of concrete in place’, ‘linear foot of pipe installed’, or ‘pound of reinforcing steel furnished’.

b. Lump Sum Unit of Construction

A part of the total construction which combines various quantities of unlike materials, equipment, and labor into a separate piece of construction where the component materials, equipment, and labor are not in themselves readily and economically measurable, i.e., ‘Pumping station complete’, includes pumps, excavation, concrete, electrical work, backfill, etc.

Utility Company – The person, corporation, company, agency, or other entity which furnishes service through, operates, or owns, a conduit, pipe, wire, cable, or other transmission line for the purpose(s) of petroleum and petroleum products, electricity, sanitary sewer, communications, water, natural gas, and storm sewer.

Warranty Period Payment - A sum of money held by Owner until a year-end warranty inspection to assure performance by Contractor during the warranty period. The sum shall be paid at Warranty Completion after correction of items identified by Owner's inspection.

Work – Work shall be understood to mean the furnishing of all labor, materials, equipment, and other incidentals necessary or convenient for the successful completion of the project or the portion of the project involved and the carrying out of all the duties and obligations imposed by the contract.

Written Notice – A written communication delivered in person to the individual or to a member of a firm or to an officer of the corporation for whom it is intended, or if delivered or sent by mail to the last business address stated in the Contract Documents.

SECTION 10.02 BID REQUIREMENTS AND CONDITIONS

Article 2.1 Examination of Plans, Specifications, Special Provisions, and Site Work

The Bidder is expected to examine carefully the site of the proposed work, the proposal, plans, specifications, and Contract Documents before submitting a bid. The submission of a Bid will be an admission that the bidder has made such examination and is satisfied as to the conditions to be encountered in performing the work and as to the requirements and accuracy of the plans, specifications, special provisions, and term of the Contract. The failure or neglect of a Bidder to receive or examine any of the Bid Documents shall in no way relieve the Bidder from any obligations with respect to their Bid, or to the Contract. Misinterpretation or reputed lack of knowledge concerning the Bid will not serve as a basis for a claim for additional compensation.

The CBS will make available to prospective bidders, upon request and at the office of the Design Engineer, prior to Bid opening, any information that he may have as to subsurface conditions and surface topography at the work site. Investigations conducted by the Design Engineer of subsurface conditions were made for the purpose of study and design, and neither the CBS nor the Design engineer assumes any responsibility whatever in respect to the sufficiency or accuracy of borings, or of the logs of test borings, or of their investigations that have been made, or of the interpretations made thereof, and there is no warranty or guarantee, either expressed or implied, that the conditions indicated by such investigations are representative of those existing throughout the project, or any part thereof, or that unforeseen developments may not occur. No claim for additional compensation will be allowed which is based upon lack of knowledge of the project site and its improvements.

Logs of test borings or topographic maps showing a record of the data obtained by the Design Engineer's investigations of surface and subsurface conditions that are made available or bound herewith shall not be considered a part of the Contract Documents, said logs representing only the opinion of the Design Engineer as to the character of the materials encountered by him in his investigations, and is provided only for the convenience of the Bidders.

Information derived from inspection of logs of test borings, of topographic maps, or from drawings showing the location of utilities and structures will not in any way relieve the Contractor from any risk, or from properly examining the site and making such additional investigations as he may elect, or from properly fulfilling all the terms of the Contract Documents.

Oral questions may be presented at a pre-bid conference if one is provided for in the Bidding Documents. Interpretations, corrections, or changes, if any, to the Bidding Documents shall be made by Addendum. Bidders shall not rely upon interpretations, corrections, or changes made in any other manner, including orally at the pre-bid

conference. Interpretations, corrections, and changes shall not be binding unless included in an Addendum.

By submitting a bid, the Contractor declares that he has carefully examined the contract documents, that he has full knowledge thereof and that he has investigated the site and satisfied himself as to the conditions affecting the work, including, but not limited to those bearing upon transportation, disposal, handling and storage of materials, availability of labor, water, electrical power, roads, and uncertainties of weather, physical conditions at the site including all existing utilities, the conformation and conditions of the ground, the character of equipment and facilities needed preliminary to and during prosecution of the work. The Contractor further declares that he is satisfied as to the character, quality and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all prior exploratory work, as well as from information presented by the drawings and specifications made a part of this contract. Any failure by the Contractor to acquaint himself with the available information will not relieve him from responsibility for estimating properly the difficulty or cost of successfully performing the work.

Article 2.2 Method for Clarifications

Any Bidder in doubt as to the true meaning of any part of the plans, specifications, or other documents must submit to the CBS a written request for an interpretation thereof. The Bidder submitting the request will be responsible for its prompt delivery not less than seven (7) days prior to the date set for opening of Bids. Replies will be issued by Addenda mailed or delivered to all parties recorded by CBS as having received the Bidding Documents. Only questions answered by formal written Addenda will be binding. Oral interpretations or clarifications are not binding.

Article 2.3 Preparation and Submission of Bids

Submission of Bids: Bids shall be submitted on the forms furnished and must be manually signed. Bids shall be submitted in a sealed envelope addressed as indicated in the Invitation to Bid.

Preparation of Bids: Bidders must quote on all items, unless specifically allowed to bid on only a portion of the items within the Invitation to Bid and they are warned that failure to do so shall disqualify the Bid. When quotations on all items are not required, Bidders should insert the words "no bid" in the space provided for any item where no quotation is made. If erasures or other changes appear on the forms, each such erasure or change must be initialed by the person signing the Bid.

Bids shall specify a unit or lump sum price, typed or written in ink for each bid item called for. If the bid is submitted in both words and figures and there is a discrepancy

between the written words and figures, the written words shall govern. In case of error in the extension of prices, the unit price will govern. Bids may be rejected if they show any omissions, alteration of the forms, additions not called for, conditional or alternate bids not called for, qualified bids, or irregularities of any kind. Qualified Bids will not be allowed. CBS reserves the right to waive any defects or irregularities under this subparagraph.

No consideration will be given by the CBS to a claim of error unless such claim is made to the CBS in writing within two (2) hours after the time of Bid Opening. Written notification shall consist of a letter delivered to the Municipal Clerk supporting evidence of the error, within 24 hours after time of Bid Opening (excluding Saturday, Sunday and legal holiday), to allow consideration of the claim for error. Supporting evidence shall be original documents used to compute the Bids. The CBS shall be the sole judge of a claim of Bid Error.

Article 2.4 Bid Guarantee

Bids must be accompanied by a certified check, or cashier's check drawn on a bank in good standing, or a Bid Bond issued by a Surety authorized to issue such bonds in the State where the work is located in the amount of five percent (5%) of the total amount of the Bid submitted. This Bid Security shall be given as a guarantee that the Bidder will not withdraw his Bid for a period of sixty (60) days after the Bid Opening, unless otherwise specifically stated elsewhere in the Contract Documents, and if awarded the Contract, the successful Bidder will execute the attached Contract, and furnish a properly executed Performance and Payment Bond as specified in these instructions. The Bid Guarantee shall name the CBS as payee or beneficiary.

The Attorney-in-Fact (Resident Agent) who executes this bond on behalf of the Surety must attach a notarized copy of his power-of-attorney as evidence of his authority to bind the Surety on the date of execution of the bond.

Bids submitted without a Bid Bond will be considered non-responsive and will not be publicly read or considered.

Article 2.5 Bids to Remain Open

All Bids shall remain open for sixty (60) days after the day of the Bid Opening, unless otherwise specifically stated elsewhere in the Contract Documents, but the CBS may, at its sole discretion, release any Bid and return the Bid Security prior to that date.

SECTION 10.03 AWARD AND EXECUTION OF CONTRACT

Article 3.1 Bidder Qualifications

Before the Bid is considered for award, the CBS may require the apparent low Bidder to submit the Contractor's Questionnaire. If requested, this document shall be submitted to the CBS Clerk within two (2) working days from the time of the Bid Opening. The Bidder's qualifications, which shall be listed upon the Contractor's Questionnaire, will include: a listing of Bidder's previous Contracts of a nature similar to that being bid upon; a listing of Bidder's staff to include managerial, and technical, who will be available for use in the execution of the Contract; and the listing of the projects to which Bidder is currently obligated or anticipates being obligated during the period of this Contract. The CBS may also require a current financial statement prepared by a certified public accountant.

The CBS may also require that within two (2) working days after the time of Bid Opening, the apparent low bidder submit one of the following to the office of the CBS Clerk:

1. For Corporations:

Most recent copy of Articles of Incorporation, By-Laws and a current copy of a Resolution of its Board of Directors, granting the authority of the officer signing on behalf of the corporation.

2. For Co-partnership:

Most recent copy of the Partnership Agreement and a statement signed by all partners granting authority to the partner signing the Bid.

3. For Joint Venture:

A current copy of the Joint Venture Agreement and a statement signed by authorized persons of each party to the Joint Venture. Each Party to the Joint Venture shall comply with the above requirements for Corporations, Co-Partnerships, or Individuals, as applicable.

Failure to fully complete and respond in the manner prescribed may result in the rejection of the Bid as non-responsive.

If signature on Bid is by an agent other than an officer of a corporation or a member of a co-partnership, a Power of Attorney must either be on file with the Municipal Clerk prior to opening or submitted with the Bid in Packet B.

A Bidder may be deemed to be unqualified to perform the Contract if, after review and verification of the representations included upon the Contractor's Questionnaire submitted by the Bidder, the following conditions appear:

- a. Bidder does not have sufficient prior experience (or an acceptable substitute therefore, as described below) with projects of a similar nature in technical, managerial, and financial requirements to that in the present Contract being Bid.
- b. Bidder does not have sufficient financial capability to undertake the obligations of the Contract. A determination in this respect will be made when the CBS, upon review of the probable cash flow needs of the Contractor for this particular Contract (to include payroll, costs of material and supplies, equipment rental costs, and any other direct or incidental costs of the Contract), determines that Contractor does not have sufficient financial resources to enable him to continue to satisfy his financial obligations under the Contract. The CBS will consider all other pertinent financial data required by this clause and submitted by the Contractor.
- c. Bidder does not have sufficient staff, equipment, or plant available to perform the Contract. CBS's determination in this matter will be based upon that represented by Bidder in his completion of the Contractor's Questionnaire documents discussed above.
- d. Bidder has a consistent history of unsatisfactory performance of Contracts of this or similar nature, regardless of whether such Contracts existed between CBS and the Contractor, or other parties and the Contractor.

Bidder's representations concerning his qualifications will be construed as a covenant under the Contract. Should it appear that Bidder has made a material misrepresentation on his Contractor's Questionnaire form, the CBS shall have the right to terminate the Contract for Contractor's breach, and the CBS may then pursue such remedies as exist elsewhere under this Contract, or as otherwise are provided at law or equity.

Any determination that a Bidder is unqualified will be made by the CBS. Such determination will be made in writing and include a thorough discussion of why the Bidder is deemed unqualified. A letter will be sent to the Bidder deemed unqualified, stating the reasons for such determination, and the Bidder's right to request a review of this determination by appeal to the CBS Assembly.

Article 3.2 Receipt and Opening of Bids

a. Time of Opening Bids shall be submitted no later than the time specified in the Invitation to Bid and the exact date and hour of receipt of Bids will be recorded. Late Bids will not be considered, but will be held unopened until the time of award and then returned to the Bidder, unless other disposition is requested or agreed to by the Bidder. If the Invitation to Bid fixes the time of bid opening at 2:00 PM local time, a bid stamped "2:00 PM" by the CBS Clerk's official clock will be accepted, whereas any time after 2:00 PM will be a Late Bid. The official time shall be shown in the Invitation to Bid.

b. Oral, Telephonic, and Facsimile Bids Oral, telephonic, and facsimile Bids will not be considered. Modification by facsimile, of Bids already submitted, will be considered if received up to one hour prior to the time of bid opening fixed in the Invitation to Bid. Facsimile modifications shall not reveal the amount of the original or revised bid. Modifications shall state a plus or minus to the affected bid item. The modification shall be signed by a properly authorized agent, officer, or partner.

c. CBS's Responsibility No responsibility will be attached to any officer or employee of the CBS for the premature opening of, or the failure to open, a Bid or facsimile modification not properly addressed and identified.

Article 3.3 Withdrawal of Bids

Bids may be withdrawn on written or facsimile request received from Bidders, prior to the time specified for opening. Withdrawn Bids may be resubmitted up to the time designated for the receipt of Bids provided that they are then fully in conformance with the Instructions to Bidders.

Article 3.4 Multiple Bids

Multiple bids offered by a single Bidder shall result in the rejection of all bids by that bidder.

Article 3.5 Bidders Present

At the time and place specified for the opening Bids, contents of the bids will be made public for the information of Bidders and others properly interested, who may be present either in person or by representation.

Article 3.6 Action On Bids

The CBS reserves the right to reject any or all Bids, and to waive any informalities and irregularities in Bidding or award of Contract. The following provisions shall apply:

a. Unless otherwise stated in the Bidding Documents, the Contract, if awarded, shall be awarded to the responsible Bidder who submits the low responsive Bid. When the Bidding documents contain a basic bid and alternates, only the total of the basic bid and the alternates to be awarded shall be used to determine the low Bidder.

When the Bidding documents contain a basic bid and additive alternates, a Contract award shall be made on the basis of a total basic bid plus additive alternates or less deductive alternates, which the Owner selects. The Owner is not required to award any alternate and may choose to do all, none, or some of the alternates as it deems in its best interest. If the order of bidders would not be affected, the Owner reserves the right to select any alternate, or combination of alternates. If the order of bidders would be affected, then alternates will be selected in the order listed. Award will be subject to the availability of funds, which is deemed slowly by the Owner. The CBS may bypass any additive alternate whose selection would cause the Contract to exceed the funds available.

When the Bidding documents contain deductive alternates, the low Bidder will be determined by the lowest basic bid. If the lowest basic bid exceeds the funds available, the low bidder will be determined by eliminating deductive alternates in the order listed in the Bid until the award can be made within the available funds. The CBS may bypass any deductive alternate to maximize the use of available funds.

b. The CBS reserves the right to reject any Bid which exceeds the Fair Cost Estimate by more than fifteen percent (15%).

c. Any bids found to have arithmetic errors or other pricing ambiguities which affect the total Bid price may be rejected. In evaluating Bids, the CBS will consider the qualifications of the Bidders, whether or not the Bids comply with the prescribed requirements, alternatives, and unit prices if requested in the Bid forms. The CBS may consider the qualifications and experience of subcontractors, and may reject the Bid of any Bidder or Subcontractor who does not pass any such evaluation to CBS's satisfaction.

d. Unbalanced Bids - Submission of unbalanced bids is not allowed. An unbalanced bid is when, for a variety of reasons, a contractor raises the prices on certain bid items and decreases the prices on others proportionately so that the bid for the total job remains unaffected. Unit bid prices for each individual item shall accurately reflect the true cost of performing the work and each item shall bear its proportionate share of costs and overhead, and profit. In the case of increased quantities, or where additional work is paid for under unit prices bid, no claim for extra expense other than the bid price

will apply except as allowed in Section 10.04, Article 4.3 Increased or Decreased Quantities. In the case of decreased quantities, the decrease will be calculated using the unit bid price. No claims for additional expense or loss of anticipated profits shall apply, except as allowed in Section 10.04, Article 4.3 Increased or Decreased Quantities. Bids may be rejected if, in the opinion of the Engineer, the Bid is unbalanced.

Article 3.7 Amount of Contract

The amount of the Contract shall be understood to be the total sum of the amounts computed from the approximate quantities and unit prices or the lump sum as given in the proposal form. Where prices are given on alternate items, only the amounts of the alternates accepted by the CBS will be included in the total.

Article 3.8 Award of Contracts

a. Notice of Award

The acceptance of the Bid will be written Notice of Award, mailed or delivered to the location designated in the Bid. In the event of failure of the lowest responsible Bidder to sign and return the Contract with acceptable Performance and Payment Bonds and Certificate of Insurance as prescribed herein, the CBS may award the Contract to the next lowest responsible Bidder.

b. Execution of Contract

1) By Contractor: The Bidder whose bid is accepted shall execute the Contract and furnish the required bonding and Insurance Certificates within ten (10) days after receiving the Notice of Award. The date the Contract is executed by the CBS is the Contract date. The rights and obligations provided for in the Contract shall become effective and binding upon the parties as of the Contract date. Failure or neglect to execute the Contract within the time specified shall constitute a breach of the agreement effected by the acceptance of the Bid

The amount of the bid guarantee of the successful Bidder who fails or neglects to execute the Contract after proper Notification of the acceptance of the Bid, shall be retained by the CBS as liquidated damages for such breach.

2) By CBS: Upon receipt of at least two copies signed by the Contractor, the properly authorized CBS representatives will execute the documents within ten (10) working days. The notice to Proceed will also be issued within (10) days of complete execution of the Contract unless otherwise specified in the Special Provisions. The Engineer, or authorized representative, and his address shall be designated in the Notice to Proceed. The Contract shall be deemed to be completely executed when at least two (2) copies thereof, accompanied by the required bonds, liability, and other necessary insurance, and signed by the contractor, are executed by the CBS. The rights and

obligations, provided for in the contract shall become effective and binding upon the parties only after its formal execution on behalf of the CBS.

Article 3.9 Contractor to Furnish Performance and Payment Bond

If the Bidder fails to provide the required Performance Bond and Payment Bond within ten (10) days from the date on which the Bidder is notified of being the successful Bidder, the Bid Bond and the amount thereof shall be forfeited to the CBS.

The Performance and Payment Bond shall be in the amounts according to the following schedule:

Contract Amount	Performance and Payment Bond Amount
Over \$50,000	Performance Bond 100% Payment Bond 100%

The bonds shall be maintained in force during the continuance of this Contract, and shall maintain the Bond in force during the continuance of this Contract including the one-year warranty period, and shall be intended for the faithful performance of the Contract in all respects, including but not limited to payments for all materials, labor, etc., and no Contract shall be binding until the said bonds are furnished and approved by the CBS. No work may commence until the bonds have been approved by the CBS. All alterations, extensions of time, extra and additional work, and other changes authorized by the Contract Documents may be made without securing the consent of the surety, or sureties, of the Contract bond. Power of Attorney for the official signing the bond for the surety company must be submitted with the bond.

Article 3.10 Guarantee and Warranty Section

The Contractor and its Surety shall guarantee all items of materials, equipment, and workmanship against defects for a period of one year beginning on the Date of Substantial Completion.

The Contractor shall immediately attend to warranty repairs. If the defect, in the opinion of the CBS, is of such nature as to demand immediate repair, the CBS may make such repair and the cost thereof shall be borne by the Contractor.

Article 3.11 License Requirements

Contractors and Subcontractors, in order to perform public work in the State of Alaska, are required to hold State of Alaska Contractor’s licenses of the class required to perform the specified work. General Contractors licenses are necessary where more than two (2) distinct trades are required to perform the work. Contractors and Subcontractors are also required to hold current Alaska Business Licenses in order to perform public work in the State of Alaska. Contractor’s License, and Business License numbers shall be inserted in

the appropriate place on the Bid Form, if requested. Evidence of Subcontractors' compliance with the above shall be submitted to the Engineer before starting subcontract work on public work Contracts.

Article 3.12 Compliance with Law

Contractors and Subcontractors shall comply with all applicable statutes, ordinances, federal, state, or local laws of any government entity having jurisdiction in the project area.

SECTION 10.04 SCOPE OF WORK

Article 4.1 Intent of the Plans and Specifications

The true intent of the plans and specifications is to provide for the execution and completion in every detail of the work described in the Contract Documents. Except as otherwise specifically provided, the Contractor shall furnish all labor, tools, implements, machinery, supplies, materials, and incidentals, and shall do all things necessary to perform and to complete, according to the plans and specifications, the work to be done under the Contract.

Article 4.2 Estimates of Quantities Approximate Only

It is expressly agreed that the quantities shown in the Bid, whether for a unit price contract or a combination of a lump sum contract and unit price contract are approximate and are only for use as a basis for comparison of Bids and are not to be taken to be either representations or warranties. The CBS does not expressly nor by implication agree that the actual amount of work will correspond therewith.

Article 4.3 Increased or Decreased Quantities

The CBS reserves the right to increase or decrease the quantity of any item or portion of the work or to omit portions of the work; also to make such alterations or deviations, additions to, or omissions from the plans and specifications as may be determined during the progress of the work to be necessary and advisable for the proper completion thereof. No re-negotiation of unit prices will be considered unless one of the following conditions is satisfied:

- a. The total quantity changes result in a total Contract Cost increase or decrease of twenty-five percent (25%) or more.
- b. The actual quantity of work for any major item differs by more than twenty-five percent (25%) of the estimated quantity stated in the Contract for such item. A major item is defined as any item, unless otherwise indicated on the drawings or designated in the Special Provisions, for which the Contract price amounts to ten percent (10%) or more of the total Contract price as determined by the original quantities and the unit contract prices.

Where the total Contract Cost decreases by twenty-five percent (25%) or more and/or the actual final quantity of work for any major item is less than the estimated quantity stated in this Contract by more than twenty-five percent (25%), the Contractor will be paid at the Contract unit price for those items of work actually performed and, in addition, may request compensation for the loss of indirect costs, and profit on those indirect costs, on the quantity of work represented by the difference between the actual quantity and the estimated quantity of work less twenty-five percent (25%) thereof. Indirect costs and

profit on indirect costs shall be considered as a total of fifteen percent (15%) of the unit price of a major item or ten percent (10%) of the original item amount, if a major item is not involved.

Article 4.4 Changed Conditions

a. The Contractor shall promptly, within two (2) working days and before such conditions are disturbed, give a written notice to the Engineer of:

1) subsurface or latent physical conditions at the site which differ materially from those indicated in this Contract, or

2) unknown physical conditions at the site of an unusual nature, which differ materially from those ordinarily encountered and generally recognized as inhering in work of the character provided for in this Contract.

b. The Engineer shall investigate the site conditions promptly after receiving the written notice. If the conditions do materially so differ and cause an increase or decrease in the Contractor's cost of, or of the time required for, performing any part of the work under this Contract, whether or not changed as a result of the conditions, an equitable adjustment shall be made under this clause and the Contract modified in writing accordingly.

c. No request by the Contractor for an equitable adjustment to the Contract under this clause shall be allowed unless the Contractor has given the written notice required; provided, however, the time prescribed in "A" above for giving written notice may be extended by the Engineer.

d. No request by the Contractor for an equitable adjustment to the Contract for differing site conditions shall be allowed if made after final payment under this Contract.

SECTION 10.05 CONTROL OF WORK

Article 5.1 Authority of the Engineer

The Engineer shall be the CBS's representative and shall observe the Work in progress on behalf of the CBS and will be identified at the time of the Notice to Proceed. The Engineer shall not be responsible for construction means, methods, techniques, sequences, or procedures, or for safety precautions and programs in connection with the work. Visits and observations made by the Engineer shall not relieve the Contractor of his obligation to conduct comprehensive inspections of the work and to furnish materials and perform acceptable work, and to provide adequate safety precautions, in conformance with the intent of the Contract. The Work will not be considered completed until approved by the Engineer and accepted by the CBS. The Contractor shall at all times carry out and fulfill the written instructions and written directions of the Engineer regarding the Contract Documents.

The Engineer shall, in all cases, make determinations on any and all questions which may arise concerning the quality, quantity, and acceptability of materials furnished and work performed; the manner and rate of progress of the performance of all work; the interpretation of plans, specifications, and contract documents.

In the case of the termination of the employment of the Engineer, the CBS shall appoint a capable and reputable Engineer whose status under the Contract shall be that of the former Engineer. The CBS shall give the Contractor notice of such appointment in writing.

If the Contractor determines that instructions, clarifications, or directions issued by the Engineer constitute a change in the requirements of the Contract Documents, he may make claim as provided under Article 5.22, Claims for Damage or Extra Work.

Article 5.2 Interpretation of Contract, Specifications and Plans

These specifications, plans, special provisions, and all supplementary documents are essential parts of the Contract, and a requirement occurring in one is as binding as though occurring in all. They are intended to be complementary and to describe and provide for a complete work.

In case of conflict in the requirements and provisions as set out by the Contract, the specifications, or the plans, such conflict shall be resolved by the acceptance of the following order of precedence for the various Contract Documents: 1) Change orders; 2) the Contract bearing the signature of the CBS and the Contractor; 3) addenda; 4) the written Bid of the Contractor; 5) Special Provisions; 6) General Conditions; 7) General Provisions 8) Technical Specifications; 9) Contract Drawings (plans); 10) Instructions to Bidders. Figures dimensions on the drawings will be used in preference to scaling the drawings. If dimensions are omitted, operations shall not be started on that part of the

construction until the necessary dimensions have been obtained from the Engineer in an Engineer's Instruction or on a Contract Drawing.

The apparent silence of the specifications and plans as to any detail or the apparent omission from them of a detailed description concerning any point, shall be regarded as meaning that only the best general practice is to prevail and that only approved material and workmanship of first quality are to be used.

The Contractor shall take no advantage of any errors or omissions in the specifications and plans or of any discrepancies in or between same. Work knowingly performed by the Contractor as a result of an error or omission in the plans or specifications where such error or omission is not called to the attention of the Engineer shall be at the Contractor's risk.

All Contractor-initiated requests for interpretation or clarification of the Contract documents shall be accompanied by a completed Design Clarification/Verification Request (DC/VR) form. Each request shall clearly and completely state the basis for lack of clarity in the Contract documents and shall refer to the applicable specifications, plan sheets and details, that give rise to the request. If not provided in the Contract documents, a copy of the DC/VR form shall be obtained from the Engineer. Engineer shall respond to the DC/VR in writing within ten (10) working days.

Article 5.3 Plans, Materials, Equipment, and Workmanship

a. Plans, Shop and Supplemental Drawings

The Contractor will be supplied with five (5) sets of specifications and prints of the drawings (plans) showing the project in detail, together with all Addenda thereto. Additional copies of the contract specifications and drawings may be obtained from the engineer on the following basis:

Full or partial set of contract drawings	At CBS Cost
Each book of contract specifications	At CBS Cost
Sitka Standard Construction Specifications	At CBS Cost

General drawings showing such details necessary to give a comprehensive idea of the construction contemplated will be included in the plans; but the Contractor shall submit to the Engineer for review such additional shop details, settings, schedules product data (including illustrations, performance charts, brochures, diagrams and other information to illustrate materials or equipment for some portion of the work), and other such supplemental drawings (collectively, "Submittals") as may be required for the construction of any part of the work. Any work done, or material ordered prior to the approval of such Submittals by the Engineer shall be at the Contractor's risk.

All shop drawings, product data, and other Submittals shall be made in such a manner that clear and legible reproductions can be made from them. Any Submittals which are, in the Engineer's opinion, carelessly prepared, erroneous or unchecked, will be returned to the Contractor for redrawing and checking, and after such redrawing and checking shall be resubmitted to the Engineer.

Shop drawings for structural steel items, structures, or miscellaneous iron items shall consist of shop details, erection and other working plans showing dimensions, sizes of material, lists of field rivets and bolts, details, and other information necessary for the complete fabrication and erection of all such metal work.

Shop drawings for structural elements shall consist of such detailed plans as may be reasonably required for the successful prosecution of the work and which are not included in the plans furnished by the Engineer. These may include plans for false work, bracing, centering and form work, masonry layout diagrams, bar schedule for steel reinforcement, shop details for pre-cast concrete items, and installation drawings or instructions. All structural shop drawings shall be sealed by a Registered Professional Engineer.

The Contractor shall submit, with such promptness as to cause no delay in his own work or in that of any other Contractor, five (5) copies of each Submittal required for the work. The Engineer will check and return two (2) copies of such Submittals only for conformance with the design concept of the project and compliance with the information given in the Contract Documents. Review of Submittals by the Engineer or CBS is subject to the limitations of Paragraph 5.3.j. The approval of any Submittal by the Engineer shall not relieve the Contractor from responsibility for deviations from drawings or specifications, unless he has in writing called the Engineer's attention to such deviations at the time of submission and secured the Engineer's written approval, nor shall it relieve him from responsibility for errors of any sort in the items submitted.

The Contract Bid prices shall include the cost of furnishing all Submittals and the Contractor will be allowed no extra compensation for such Submittals. The Contractor shall keep one copy of all Submittals (including shop drawings) and specifications on the work, in good order, available to the Engineer and to his representatives at the construction site.

b. Quality of Equipment and Materials

In order to establish standards of quality, the Engineer may have in the detailed specifications referred to certain products by name and catalog number. This procedure is not to be construed as eliminating from competition other products of equal or better quality by other manufacturers. The words "approved equal" shall be considered following all such listings where they so appear.

Contractor shall furnish the Engineer the complete list of proposed substitutions within ten days of the effective date of the Notice-to-Proceed, together with complete engineering and catalog data in sufficient time prior to their use to give the Engineer adequate time for review. Failure on the part of the Contractor to obtain the necessary approval prior to ordering or using such alternate material or equipment shall not relieve the Contractor of furnishing acceptable material or equipment as required by the Contract Documents.

The Contractor shall abide by the Engineer's judgment when proposed substitute materials or items of equipment are judged to be unacceptable and shall furnish the originally specified material or item of equipment in such case. The Engineer will approve or disapprove proposed substitutions in writing within a reasonable time. No substitute materials shall be used unless approved in writing.

c. Materials Approval Data

Only materials conforming with the specified requirements in the Contract Documents shall be used in the work.

Before delivery to the job site of any material to be used in the work, the Contractor shall have provided to the Engineer for review and approval such product data, samples or other submittal needed to demonstrate the way the Contractor proposes to conform to the requirements and design concept expressed in the Contract Documents. The approval of any material or source of supply by the Engineer will not imply that all material from that source will be approved, and should material from an approved source fail to maintain a quality meeting the requirements of the specifications, use of material from that source shall be discontinued, and the Contractor shall furnish approved material from other sources. Regardless of prior approval, any material incorporated into the work which fails to meet the requirements may not be allowed to be incorporated in the work. Material which after approval has, for any reason, become unsuitable for use, shall be rejected and not used.

The approval of any Submittal for materials by the Engineer shall not relieve the Contractor from responsibility for deviations from drawings or specifications, unless he has in writing called the Engineer's attention to such deviations at the time of submission and secured the Engineer's written approval, nor shall it relieve him from responsibility for errors of any sort in the items submitted.

The Contractor shall check and approve the item described by the Product Data with the Contract Documents for deviations and errors prior to submittal to the Engineer for approval. It shall be the responsibility of the Contractor to insure that items to be furnished fit the space available.

Satisfactory proof of compliance with the specifications shall be submitted in one of the following ways:

1. Manufacturer's Certificate

For standard labeled stock products of standard manufacture which give a record of satisfactory performance in similar work over a period of not less than two (2) years, the CBS may accept a notarized statement from the manufacturer certifying that the product conforms to the applicable specification.

2. Mill Certificates

For materials, where such practice is the usual standard, the CBS may accept manufacturer's certified mill and laboratory certificate.

3. Laboratory Certification

The CBS may accept a certificate from a commercial testing laboratory satisfactory to him certifying that it has tested the product submitted within a period acceptable to the CBS, and that it conforms to the specifications.

d. Storage of Materials

Materials shall be stored in such a manner as to insure the preservation of their quality and fitness for use. When considered necessary to protect materials against dampness, or to keep them clean and free from dust, dirt, or other detrimental matter, suitable sheds, platforms and covers shall be provided. Materials shall be stored in such a manner as to facilitate inspection.

e. Defective Materials

All materials not conforming to the requirements of the material specifications shall be considered as defective. No defective material, the defects of which have been subsequently corrected, shall be used until approval has been given. Upon failure on the part of the Contractor to remove, repair, or replace defective material when so ordered by the Engineer, the CBS shall have authority to remove, repair, or replace such defective material and to deduct all costs so incurred from any money due or to become due the Contractor. Defective material not permitted for use shall be immediately removed from the site or disposed of as directed by the Engineer.

f. Materials Furnished by the CBS

Materials specifically indicated shall be furnished by the CBS. The fact that the CBS is to furnish material is conclusive evidence of its acceptability for the purpose intended, and the Contractor may continue to use it until otherwise directed. If the Contractor discovers any defects in material furnished by the CBS, he shall notify the Engineer. Unless otherwise noted or specifically stated, materials furnished by the CBS, which are

not of local occurrence, are considered to be f.o.b. the nearest freight station. The Contractor shall be prepared to unload and properly protect all such material from loss or damage after receipt of material at the point of delivery.

g. Manufacturer's Directions

Manufactured articles, material, and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by the manufacturer. Instructions and directions for any CBS furnished materials and equipment will be furnished to the Contractor by the Engineer.

h. Equipment Approval Data

The Contractor shall submit to the Engineer for review and approval four (4) copies of catalog data, as required by the Contract Documents, for the manufactured items of equipment and all components. Catalog data may include specified performance data, material description, rating, capacity, working pressure, material gauge or thickness, brand name, catalog number, and general type, as requested by the Engineer.

The Submittal shall be compiled by the Contractor and approved by the Engineer before any of the equipment is delivered to the job site. After written approval, this Submittal shall become a part of the Contract, and may not be deviated from except upon written approval of the Engineer.

The approval of catalog data by the Engineer shall not relieve the Contractor from responsibility for deviations from drawings or specifications, unless he has in writing called the Engineer's attention to such deviations at the time of submission and secured the Engineer's written approval, nor shall it relieve him from responsibility for errors of any sort in the items submitted. The Contractor shall check and approve the work described by the catalog data with the Contract Documents for deviations and errors prior to submission to the Engineer for approval.

It shall be the responsibility of the Contractor to insure that items to be furnished fit the space available. He shall make necessary field measurements, including those for connections, and shall order such sizes and shapes of equipment that the final installation shall suit the true intent and meaning of the drawings and specifications.

Where equipment requiring different arrangement of connections from those shown is approved, it shall be the responsibility of the Contractor to install the equipment to operate properly, and in harmony with the intent of the drawings and specifications and to make all changes in the work required by the different arrangement of connections.

After approval by the Engineer, the Contractor shall furnish three (3) copies of such catalog data of all process equipment or components thereof together with operating and maintenance instructions.

Photocopies of catalog data are not allowed as submittals for operating and maintenance manuals. Original catalog cuts are required for these manuals.

i. Testing

All tests shall be made in accordance with approved methods as described and designated in the specifications. When tests of materials are required, such tests, unless otherwise noted in the Technical Specifications, shall be made by a testing laboratory approved by the Engineer and at the expense of the CBS. The Contractor shall afford such facilities as may be required for collecting and forwarding samples and shall hold the materials represented by the samples until tests have been made and the materials found equal to the requirements of the specifications or to approved samples. The Contractor in all cases shall furnish the required samples without charge.

In the absence of any definite specification or reference to a specification in the technical specifications or in the special provisions for the particular project involved, it shall be understood that such materials and test shall meet the specifications and requirements of the American Society for Testing and Materials.

Wherever in the specifications a particular specification of a Society for Testing and Materials is referred to by number, it shall be understood that such reference shall include all amendments and additions thereto adopted by such organizations prior to the award of the Contract.

Re-tests of materials in constant use may be required periodically by the CBS. Required re-testing shall be accomplished at the expense of the Contractor when materials have previously been tested and have not met the requirements of the specifications.

Limited Scope of Review and Approval

The Engineer will review and approve or take other appropriate action upon the Contractor's Submittals such as shop drawings, or catalog product data and samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Engineer's action will be taken with such reasonable promptness as to cause no delay in the Work or in the activities of the CBS, Contractor or separate contractors, while allowing sufficient time in the Engineer's professional judgment to permit adequate review. Review of such Submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Engineer's review of the Contractor's Submittals shall not relieve the Contractor of the warranty obligations under Article 7.11, Correction of Work After Final Payment.

The Engineer's review or approval of Submittals shall not constitute review or approval of the Contractor's safety program or safety precautions, all of which remain the sole responsibility of the Contractor, as more fully described in Article 6.5, Industrial Safety. Unless otherwise specifically so stated by the Engineer, review or approval of Submittals shall not constitute approval of any construction means, methods, techniques, sequences or procedures. The Engineer's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

Article 5.4 Cooperation with Other Contractors

The Contractor shall conduct his operations so as to interfere as little as possible with those of other Contractors or Subcontractors on or near the work. It is expressly understood that the CBS has the right and may award other Contracts in connection with the work so long as it does not interfere with the work under this Contract.

Article 5.5 Contractor to Have Representative at Work Site

The Contractor shall within five (5) days after the Notice to Proceed, name the Superintendent, the Safety Supervisor required by Article 6.5, Industrial Safety and file with the Engineer a list of all persons who are authorized to sign documents on behalf of the Contractor to fully bind the firm.

The Contractor shall at all times have a competent Superintendent or Foreman capable of reading and thoroughly understanding the plans and specifications as his agent on the work, who shall have authority to receive instructions from the Engineer or his authorized representatives. The Superintendent or Foreman shall have full authority to execute the orders or directions of the Engineer without delay and to supply promptly such materials, tools, plant, equipment, and labor as may be required, regardless of whether or not the work is to be performed by the Contractor's own forces or those of a Subcontractor.

The Contractor shall not employ or continue to employ on the project, a Project Construction Manager, Superintendent or Foreman who is unsatisfactory to the CBS.

The fact that an approved Subcontractor is performing any portion of the work shall not relieve the Contractor of this requirement. The CBS has the authority to require the Contractor to designate the chain of command at the pre-construction conference or at any time thereafter.

Article 5.6 Certified Payrolls

All Contractors who perform work on a public construction Contract shall file with the Alaska Department of Labor, Labor Law Compliance Division, and the CBS, a certified payroll on Friday of each week that covers the preceding week.

Article 5.7 Notice to Contractors

Any written notice to the Contractor which may be required by law or by the provision of the specifications may be served on said Contractor or his representative, either personally or by mailing to the address given in the Contract.

Article 5.8 Notice by Contractors

Wherever in the specifications the Contractor is required to notify the Engineer concerning the work, or concerning any complaint which he may have to make, or for any reason, it shall be understood that such notification is to be made in writing, delivered to the Engineer or his representative in person, or mailed to the office of the Engineer at the address given in the official "Notice to Proceed."

Article 5.9 Construction Surveying by the Contractor

The Contractor shall perform all surveying and staking essential for the completion of the project in conformance with the plans and specifications, and shall perform all the necessary calculations required to accomplish the work. Staking, surveying, computations and calculations shall be accomplished in accordance with standard engineering and surveying practice.

The CBS will provide a benchmark and sufficient centerline points or references thereto, at the beginning of the project, to enable the establishment of the planned elevations and centerline by the Contractor.

The Contractor shall use competent personnel and suitable equipment for the layout work required and shall furnish all stakes, templates, straight edges, and other devices necessary for checking and maintaining points, lines and grades.

The Contractor shall be responsible for the supervision of the construction surveying personnel and any errors resulting from the operations of said personnel shall be corrected at the expense of the Contractor, and at no additional cost to the CBS.

The CBS may randomly spot check the Contractor's surveys to insure that the work is within the order of accuracy required, but the CBS assumes no responsibility for the accuracy of the work.

The Contractor shall perform all staking necessary to delineate clearing and grubbing limits; all cross sections necessary for determination of excavation and embankment quantities, including intermediate and re-measure cross sections; all staking of culverts, utilities, structures, and appurtenances, and other features required for successful completion of the work.

If necessary, forty-eight hours shall elapse between the completion of clearing limits staking and the beginning of the clearing and grubbing operations to allow for coordination with affected property owners.

The Contractor's surveyor shall make a conscious attempt to locate all property corners and monuments along the route of work, and shall reference those corners that may be disturbed due to this work. At the completion of the project, the Contractor shall restore all disturbed property corners and monuments at no additional cost to the CBS. This work shall be performed by a land surveyor registered in the State of Alaska or under his immediate direction.

Bench Marks (BMs) and/or reference points have been identified and/or placed initially by the Engineer, and the horizontal and vertical reference locations are indicated in the plan drawings. It shall be Contractor's responsibility to determine that all construction surveying Work required is completed in strict conformity with CBSS Division 65 Standard Construction Specifications for Construction Survey.

At various points throughout the Work, Contractor's operations may be expected to disturb existing survey monuments, BMs, or referenced points. If these items are disturbed by Contractor, they shall be replaced at Contractor's expense. Any existing survey monuments, BMs, or reference points which, in the judgment of the Engineer, are outside the limits of the Work area and which are disturbed or destroyed by Contractor will be replaced at Contractor's expense.

The Contractor's surveyor shall maintain accurate and up-to-date as-built measurements of the ongoing construction. Upon completion of the project, the Contractor shall provide the CBS with one set of record drawings and survey notes. This work shall be under the direct supervision of a professional land surveyor, licensed in the State of Alaska, who shall stamp the survey notes and record drawings.

The CBS may retain up to five (5) percent of the total contract amount until the record drawings are received in a satisfactory form.

Article 5.10 Protection of Property

a. The Contractor shall continuously maintain adequate protection of all its construction, the CBS's property, and the adjacent public and private property from damage, injury, or loss arising from construction. The Contractor shall pay for any damage, injury, or loss resulting from inadequate protection. The Contractor shall maintain adequate insurance coverage to protect the work from loss until the work is accepted for CBS occupation and operation.

b. The Contractor shall not enter upon public or private property for any purpose without obtaining permission from the proper public authority or private property owner. Construction on state highways, or any public right-of-way shall meet the requirements of the authority having jurisdiction over such right-of-way. It shall be the Contractor's responsibility to notify said authority before beginning construction to ascertain that the schedule of operations proposed is satisfactory to the authority.

c. Wherever construction under the Contract is undertaken on easements or rights-of-way over private property, or public right-of-way franchise, all construction operations shall be confined to the limits of such easement, right-of-way or franchise and to be completed so as to cause the least amount of disturbance and a minimum amount of damage.

d. Construction across public or private property shall be carried out in one (1) continuous operation with immediate restoration and cleanup of the construction area. If the Contractor should fail to perform such construction, restoration and cleanup continuously, the CBS may give the Contractor a written notice to do so. In the event of failure by the Contractor to complete such construction, restoration and cleanup within five (5) days after receipt of such notice, the CBS may complete same to the extent the CBS deems advisable. The cost of all labor, material, supervision, and other expenses incurred by the CBS in so doing shall be paid by the Contractor to the CBS and if not so paid, shall be deducted from any payments due the Contractor under the Contract.

e. The Contractor shall protect and maintain all underground or above ground utilities and structures affected by its construction and all lawns, shrubs, trees, fences, and other improvements on property crossed over or adjacent to its operations, and shall repair and restore in a satisfactory manner at its expense all damage resulting from the Contractor's operations. The Contractor shall be responsible for all damage caused by its construction to roads, highways, ditches, walls, bridges, culverts, utilities, barricades, lights, or other property, whether such damage be at the Project site or elsewhere, and the Contractor shall repair or replace at its own expense all such damage in a satisfactory manner.

f. It is expressly understood that the Contractor shall restore all easement and right-of-way property to a condition equal to its original condition. Before beginning construction the Contractor shall file with the Engineer properly identified and dated photographs of such property as may be designated on the Contract Drawings or described in the Special Conditions.

g. Protection of Water Resources. The Contractor shall control the disposal of fuels, oils, bitumens, calcium chloride, acid or harmful materials, both on and off the premises, and shall comply with applicable federal, state, and municipal laws concerning pollution of waterways while performing work under this Contract. Special measures shall be taken to prevent chemicals, fuels, oils, greases, bituminous materials, and sewage from entering established drainages.

The Contractor shall control the discharge of mud, debris, or turbid water from impacting surface or subsurface waters, wetlands, estuaries, or private property. Environmental laws and regulations of the United States and the State of Alaska shall be observed by the Contractor at all times.

Dust and Mud Control

1. The Contractor shall maintain all excavations, embankments, stockpiles, access roads, waste areas, borrow areas, and all other work areas free from excess dust and mud to such a reasonable degree as to avoid causing a hazard or nuisance to others.
2. All existing paved areas and roadways, especially heavily traveled roads, adjacent to the project construction site or used as haul roads shall be kept clean of dirt, mud, and debris resulting from the Contractor's operation during the construction period.

Article 5.11 Inspection of Construction

- a. The Contractor shall maintain an adequate inspection system and perform such inspections as will ensure that the work performed under the contract conforms to contract requirements. The Contractor shall maintain complete inspection records and make them available to the CBS. All work shall be conducted under the general direction of the Engineer and is subject to the CBS's or Engineer's inspections and tests at all places and at all reasonable times, before acceptance, to ensure strict compliance with the terms of the contract.
- b. The CBS, Engineer or their representatives shall be allowed access to all parts of the work at all times and to the preparations, fabrication or manufacture of the materials or equipment to be used, and shall be furnished with every reasonable facility for ascertaining whether or not the work as performed is in accordance with the requirements and the intent of the plans and specifications.
- c. Any CBS or Engineer tests or inspections pursuant to this Article 5.11 are for the sole benefit of the CBS and do not:
 1. Relieve the Contractor of responsibility for providing adequate quality control measures;
 2. Relieve the Contractor of responsibility for safety at any time or for damage to or loss of the material before acceptance;
 3. Constitute or imply acceptance; or
 4. Affect the continuing rights of the CBS after acceptance of the completed work.

d. Inspectors are not authorized to alter or waive the provisions of the Contract. Inspectors are not authorized to issue instructions contrary to the plans and specifications.

e. If the Engineer requests it, the Contractor shall, at any time before final acceptance of the work, remove or uncover such portions of the finished work as may be directed. After examination, the Contractor shall restore portions of the work to the standard required by the specifications. Should the work thus exposed or examined prove acceptable, the uncovering or removing, and the replacing of the coverage or the making good of the parts removed, shall be paid for as "extra work", but should the work so exposed or examined prove unacceptable, the covering or removing, and replacing of the covering and the making good of the parts removed, shall be at the Contractor's expense under the terms of Article 5.18, Cleaning Up.

f. If the Contractor does not promptly replace or correct rejected work, the CBS may (1) by contract or otherwise, replace or correct the work and charge the cost to the Contractor, or (2) terminate for default the Contractor's right to proceed.

g. When any unit of government, political subdivisions, utility, or corporation is to pay a portion of the cost of the work covered by this Contract, its respective representatives shall have the right to inspect the work. Such inspection shall in no sense make any unit of government, political subdivision, utility, or corporation a party to this Contract, and shall in no way interfere with the rights of either party hereunder.

Article 5.12 Temporary Erosion Control During Construction

The Contractor shall provide all temporary erosion control measures necessary during construction for the prevention of water pollution, erosion, and/or siltation. These measures are for the protection of all streams, lakes, ponds, wetlands, and tidal waters.

Article 5.12 shall apply to any waste area created or used by the Contractor to dispose of waste excavation and/or debris from the project.

The Contractor is directed to Alaska State regulations which state that no person may conduct an operation which causes or contributes to a violation of water quality standards set forth in 18AAC70.

Unless a temporary erosion control plan during construction is specifically called out and included in the drawings and other contract documents, the Contractor shall provide a plan describing temporary erosion control measures to be employed during construction. The plan shall be delivered to the Engineer within ten (10) days of the effective date of the Notice to Proceed or five (5) days before the commencement of work, whichever is the earlier date. The Engineer will review and accept or reject the plan within five (5) working days. The accepted temporary erosion control measures shall be in place

immediately after the Contractor mobilizes to the job site and before any construction begins.

Temporary erosion control measures include such items as silt fences, sedimentation ponds, interception embankments and channels, check dams, rock lining, mulching, jute matting, seeding, sodding, and other erosion control devices as required. Where erosion is expected to be a severe problem, clearing, grubbing, grading, filling, and other operations shall be scheduled and performed such that permanent erosion control measures follow immediately. Permanent erosion control measures are those work items specified elsewhere in the Contract Documents which are intended to provide permanent erosion control such as paving, seeding, and other measures as required.

Temporary erosion control measures shall remain in place and in good working condition until work is complete under the Contract. The continued maintenance of these temporary erosion control items and replacement of damaged items shall be the ongoing responsibility of the Contractor. Under CBSS Section 10.05 of these Contract Documents the Engineer may suspend work if the Contractor fails to carry out the requirements of the temporary erosion control plan. After suspension of the work, the CBS may perform or contract the performance of the erosion control measures and deduct those costs from the Contractor's progress payments.

Payment for this work shall be considered incidental to the Contract and no separate payments shall be made unless otherwise identified in the Bid Schedule.

Article 5.13 Substantial Completion

Substantial Completion is defined as the state of construction at which the work is sufficiently complete and in accordance with the contract documents, so that Owner could occupy and utilize the work or a specific portion of it, for its intended use.

When Contractor considers the work substantially complete he shall notify Engineer in writing and request a Substantial Completion inspection. The notice shall include a comprehensive list of items to be completed, reasons they are not completed and a date of anticipated completion. The notice shall also include copies of all code compliance inspections, the Certificate of Occupancy, if applicable, and any other documents required by the contract.

The Engineer shall schedule the Substantial Completion inspection and notify Contractor. The inspection will be performed by Engineer, CBS Representatives, and the Contractor. The Contractor, at his expense, will be prepared to expose all gate valve risers, manhole lids, etc. to allow inspection during the inspection and the final. Should this inspection find the work not substantially complete, Owner may terminate the inspection and promptly notify Contractor in writing of the conditions for re-inspection. Any deficiencies identified by this inspection will be listed and promptly furnished to Contractor for remedial action.

If Contractor has requested that Engineer and Owner make an inspection to ascertain Substantial Completion, and if the work is not then substantially complete, Contractor shall be liable for all costs Owner, Engineer, and Project Representatives have incurred in making the inspection. Re-inspection costs including costs incurred by Owner, Engineer, and subconsultants shall be deducted from the final payment.

If it is determined on the basis of inspection that the work is substantially complete, Engineer will issue a Certificate of Substantial Completion. Included in the certificate shall be a list of items which must be completed or corrected before final payment and the time within which such items shall be complete and corrected. Failure to include an item on this list does not alter the responsibility of Contractor to complete all work in accordance with contract requirements.

Certificate of Substantial Completion shall state the date of Substantial Completion and the respective responsibilities of Owner and Contractor for the maintenance, insurance and security of the work. Certificate of Substantial Completion shall specifically authorize Owner to take possession of the premises and utilize them for their intended purpose. Owner's beneficial occupancy of the premises shall make reasonable allowance for the performance of the work that Contractor must complete prior to final completion.

If Contractor fails to complete or correct work required by the Certificate of Substantial Completion within the time allowed, then the Certificate of Substantial Completion shall be voided and the contract time expended by Contractor shall be counted, and the acceptability of the work shall be inspected as if a Certificate of Substantial Completion had not been issued.

Article 5.14 Final Completion and Warranty Period

The terms Final Completion and Warranty Period refer to, respectively, the finalization of the construction phase and the normal one-year warranty period following the construction phase. These items are to be represented by lump sum dollar amounts identified on the schedule of values as (1) Final Payment and (2) Warranty Period Payment. Final Payment represents a sum of money to perform all tasks necessary from Substantial Completion to Final Completion, including completion of final punch list, completion of as-built data, turnover of all warranty information, notarized acknowledgments of payments, and relinquishment of claims against Owner. Warranty Period Payment is a sum of money held by Owner until a year-end warranty inspection to assure performance by Contractor during the warranty period. The sum shall be paid at Warranty Completion after correction of items identified by Owner's inspection. When Contractor considers the work ready for Final Completion, he shall forward to Project Representative an application for final payment including (1) an affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the work have been paid or otherwise satisfied, (2) consent of surety, if any, to payment, and, (3) irrevocable, notarized proof of payment and relinquishment of claim against Owner,

issued by every subcontractor (whether or not in privity with Contractor), material supplier and other party who might assert a claim against Owner (4) The Contractor shall include with his final pay estimate request a letter of certification from the Alaska Department of Labor that all employee's wages and employment security taxes have been paid to his employees and the employees of his subcontractors. Project Representative and Owner shall promptly inspect the work to see that it is fully performed and complete, that all portions of the work are acceptable and that the contract is fully performed. After Project Representative has made a determination that these requirements have been met, he shall prepare and recommend that Owner issue a Certificate of Final Completion and Final Payment.

Engineer's approval of Final Payment constitutes an additional representation by Engineer to Owner that to the best of Engineer's knowledge and information, all conditions that Contractor must fulfill prior to being entitled to Final Payment have in fact been fulfilled in accordance with the contract documents

If any party refuses to relinquish its claim, or if Owner considers that any item or portion of the work: (1) is of doubtful acceptability under the contract documents; or (2) may diminish the value of the work; or (3) may prove to be ultimately unreliable; or (4) may prove to be less functional than required by the intent of the contract, then Owner, in lieu of refusing Final Payment to Contractor, may allow Contractor to furnish a bond in a form and in an amount satisfactory to indemnify Owner against losses occasioned thereby. If any additional costs to settle the claim or to correct work of doubtful quality accrue to Owner in excess of the indemnity available to Owner, Contractor shall refund to Owner all differences and costs which Owner might be compelled to pay, including all litigation costs and reasonable attorney fees.

Acceptance of final payment by Contractor constitutes an explicit waiver of all claims that Contractor might assert against Owner except those previously made in writing and identified by Contractor as unsettled at the time of the Application for Final Payment.

Final Payment to Contractor shall constitute a waiver of all claims which Owner might assert except those arising from: (1) unsettled claims; (2) faulty or defective work (3) failure of the work to comply with the requirements of the contract documents; (4) warranties required by this contract or that by their terms do not expire upon completion of the contract.

If, after Substantial Completion, Warranty Completion is delayed through no fault of Contractor, or by the issuance of change orders affecting Final Completion, Owner may, upon recommendation of the Engineer, extend the contract time by a reasonable period and accept certified applications for further Progress Payments.

If the Contract is a lump sum contract, the contract sum identified on the schedule of values as "Final" shall be based on the contract award in an amount as follows:

CONTRACT AWARD		FINAL AMOUNT	
\$100,000	-	\$249,999	5.00% of Contract Amount
\$250,000	-	\$499,999	3.00% of Contract Amount
\$500,000	-	\$1,999,999	2.00% of Contract Amount
\$2,000,000	-	\$4,999,999	1.50% of Contract Amount
\$5,000,000	-	\$9,999,999	1.25% of Contract Amount
\$10,000,000	-	\$19,999,999	1.00% of Contract Amount
\$20,000,000	-	up	0.75% of Contract Amount

For lump-sum contracts only: Upon completion of all requirements identified in ARTICLE 8 as "Final", the funds representing Final Payment shall be released to Contractor along with the Certificate of Final Completion. Upon issuance of Certificate of Final Completion, all contract sums shall be accounted for to Contractor, and shall be paid to Contractor except for the Warranty Period Payment based on the Contract award in an amount as follows:

CONTRACT AWARD		WARRANTY AMOUNT	
\$100,000	-	\$249,999	2.50% of Contract Amount
\$250,000	-	\$499,999	1.50% of Contract Amount
\$500,000	-	\$1,999,999	1.00% of Contract Amount
\$2,000,000	-	\$4,999,999	0.75% of Contract Amount
\$5,000,000	-	up	0.50% of Contract Amount

Article 5.15 Suspension of Work

When, in the judgment of the Engineer, unfavorable weather, or other conditions warrant the granting of a suspension order, the Engineer shall issue to the Contractor a written order to suspend work wholly or on any part of the Contract. When conditions are again favorable for prosecution of the work the Engineer shall issue to the Contractor a written order to resume the suspended work. Orders to suspend work will not be written for intermittent shutdowns due to weather conditions except under the provisions of Section 10.05, Article 5.28, Limitations of Operations. The Contractor shall take every precaution to prevent any damage or unreasonable deterioration of the work during the time it is suspended. Suspension of the work by the Engineer shall not furnish any grounds for claims by the Contractor for damages or extra compensation, but the period of such suspensions shall be taken into consideration in determining the revised date for completion as hereinafter provided. The contractor shall not suspend work under the Contract without the written order of the Engineer as stated in the preceding paragraph. Questions as to the necessity of suspending any portion of the work shall be determined by the Engineer.

Upon failure of the Contractor to carry out the orders of the Engineer or to perform work under the contract in accordance with its provisions, the Engineer may suspend the work for such period as he may deem necessary. Time lost by reason of such suspension or in replacing the improper work or material shall not furnish any grounds to the Contractor for claiming an extension of time or extra compensation, and shall not release the Contractor from damages or liability from failure to complete the work within the time prescribed.

In the event that a suspension of work is ordered in writing by the Engineer for an extended period of time due to unsuitable weather, the Contractor, at his own expense, shall do all work necessary to provide a safe, smooth and unobstructed roadway through the construction area for use by public traffic, and particularly for access to abutting property, during the period of suspension. If the Contractor fails to do the work as above specified, the CBS will perform such work and deduct the cost thereof from any monies due or to become due the Contractor.

In the event that a suspension of work for an extended period of time is ordered in writing by the Engineer due to unsuitable weather or unforeseen conditions and, in the opinion of the Engineer, the Contractor has prosecuted the work with energy and diligence prior to the time of suspension of operations and has so constructed the temporary roadway or detour that it may be maintained by routine maintenance forces of the CBS during the period of suspension, maintenance will be borne by the CBS at no cost to the Contractor.

In the event that a suspension of work for an extended period of time is ordered in writing by the Engineer on oiling or resurfacing projects which do not require disturbing the existing traveled surface and on which the existing surface or shoulders have not been disturbed by the Contractor, the CBS will maintain the roadway at no cost to the Contractor during the period of suspension.

If a suspension of work for an extended period, under which the CBS assumes the responsibility of maintenance, is granted in writing by the Engineer, the CBS will assume no responsibility except for routine maintenance which shall include and be restricted to the following:

- a. Maintenance of the traveled roadway and/or detour surface.
- b. Maintenance of roadway surface drainage along roadway and/or detour.

Any areas which are closed to traffic shall be maintained and safeguarded by the Contractor at his own expense.

In the event that the CBS has assumed maintenance of a project during a period of suspension, the Contractor agrees to accept the roadway or detour as it has been maintained by the CBS and no claim for extra payment shall be made on account of its condition or in the manner in which the maintenance has been performed by the CBS.

Such suspensions of work shall not relieve the Contractor of his responsibility of restoring the roadway and its slopes to the designated roadway section at his unit Contract prices and for performing all other remaining work in accordance with the Contract.

An extended period of time, as expressed in these specifications, is intended to mean shutdowns ordered in writing by the Engineer to cover extended shutdowns due to winter or seasonal weather, or extended shutdowns due to delays occasioned by the failure of another Contractor to complete a portion of the work on which progress of the Contract is dependent, or for other causes approved by the Engineer.

Article 5.16 Protection of Work During Suspension

If it should become necessary, for any reason, to stop work, the Contractor shall open proper drainage ditches, erect temporary structures where necessary, prepare the work so there will be minimum interference with traffic, and take every precaution to prevent any damage or unreasonable deterioration of the work during the time the work is closed. Unless otherwise provided in the work suspension order, the Contractor will be responsible for all damage to the work that may occur during suspensions of work the same as though the damage has occurred while the work was in progress.

Article 5.17 Final Trimming of Work

The work to be done under the Contract shall include such repair work as may be necessary to overcome such deterioration as may occur on some portions of the work while other portions of the work are being performed. The project shall be in a neatly trimmed and well finished condition throughout at the time of completion and acceptance.

Article 5.18 Cleaning Up

At any time during the progress of construction that clean up is not keeping pace with the rest of the work in the opinion of the Engineer, the Contractor shall at the direction of the Engineer suspend all operations on the major items of work until the premises are cleaned up to the satisfaction of the CBS. Any additional expense involved will be the sole responsibility of the Contractor and the CBS will not be held liable for this additional expense.

Upon completion of the work and before acceptance and final payment will be made, the Contractor shall clean up the right-of-way and all properties on which he has operated in the construction of the project, including removing all construction equipment, removing and disposing of all discarded materials, rubbish and debris. He shall tear down, remove and dispose of all construction plant structures erected by or for him or by or for his Subcontractors or employees on the right-of-way or on property controlled by the CBS.

He shall do all things necessary to put the whole of the right-of-way and such other property controlled by the CBS as he may occupy in a neat, clean and orderly condition. It is further understood and agreed that any such equipment and material of all kinds belonging to the Contractor that is not removed, as herein provided within thirty (30) days after the date upon which all other work to be done under the Contract is completed, or within such longer times as may be agreed upon in writing between Contractor and the Engineer, shall become the property of the CBS without obligation to the Contractor or to any party to whom he may transfer title.

Nothing in the above clause shall be construed as relieving the Contractor from his obligation to clean up the right-of-way and the sites of his operations and to remove and dispose of debris, waste materials, etc., in accordance with other provisions of the Contract.

All street or traffic control signs, mailboxes, newspaper boxes, property corner markers, survey monuments, and utility markers removed to facilitate or damaged by the Contractor's operations shall be restored by the Contractor unless otherwise directed.

Article 5.19 Easements and Rights-of-Way

The CBS will provide the work limits, right-of-way and/or easements for the work. Information regarding the width and status of easements is shown on the plans; special conditions pertaining to easements are listed in the SPECIAL PROVISIONS. The Contractor shall confine his operation to the designated easement areas and observe all restrictions.

The Contractor will be responsible for any trespass upon adjacent property or injury thereto, resulting from or in connection with his operations. The Contractor shall be liable for any claims that may be made on account of trespass or damage of any kind to private property, and shall provide written certification of full restoration or satisfactory arrangements prior to final acceptance of the work. The Contractor shall not have the right to remove material from a right-of-way, easement or work area unless otherwise provided in the Contract Documents.

Should the Contractor desire to go outside the existing right-of-way or easement to operate his equipment, stockpile material, or intrude on private property with any phase of the construction, the Contractor shall provide the CBS with written permission from the property owner before entering onto such property.

The written permission shall specifically provide that the property owner will not hold the CBS liable for use of or damage to his property. The Contractor shall be held liable for any trespass and property damage incurred outside of the easement area.

The CBS will attempt to contact property owners and request that they remove personal property within the right-of-way prior to the beginning of construction. However, when

fences, trailers, sheds, oil barrels, machinery, mailboxes and other miscellaneous personal property have not been removed and which interfere with construction, the Contractor shall remove these items of personal property from the right-of-way or easement to the property owner's lot or as directed by the Engineer. Any damage to the above items as a result of construction under this Contract will be repaired or the item replaced in kind by the Contractor. Care shall be exercised so that the property owner is inconvenienced as little as possible when items are removed. In the case of interrupting fuel services from oil barrels, service shall be restored to the property owner immediately after moving the barrel.

Article 5.20 Unauthorized and Defective Work

Any work, not in accordance with the plans and specifications whether the result of poor workmanship, or defective materials, found to exist during construction or within one (1) year of final acceptance by the CBS shall be removed immediately and replaced by work and materials which shall conform to the specifications, or shall be remedied otherwise in an acceptable manner authorized by the Engineer. Work done contrary to the instructions of the Engineer, or beyond the lines shown on the plans, or any extra work done without authority, will not be considered as authorized and will not be paid for by the CBS. Work so done may be ordered by the Engineer to be removed or replaced at the Contractor's expense.

If the Contractor fails to correct unauthorized or defective work, the CBS may, three (3) days after a written notice to the Contractor, correct such deficiencies and deduct the cost thereof from any payment due the Contractor without prejudice to any other remedy.

Article 5.21 Additional or Extra Work

Upon the written order of the engineer, the Contractor shall perform such additional or extra work that may or may not be included under or covered by Contract prices, as may be necessary for the satisfactory completion of the project. If the work is of a kind for which a specification is given herein, it shall be performed in accordance with that specification subject to any supplemental or additional specifications, plans and instructions as the Engineer may issue. If the work is of a kind not covered by a specification given herein, it shall be performed in accordance with such requirements as may be issued by the Engineer.

The CBS will pay for additional or extra work at the stipulated unit prices, or at the stipulated lump sum prices given in the Bid form, or on a force account basis as described in these specifications. Payment for extra work will be made only when it has been authorized by the Engineer in writing prior to performance of the work. In the case of a negotiated proposal the Contractor shall furnish a price breakdown with his proposal itemized as required by the Engineer. Unless otherwise directed, the breakdown shall be in sufficient detail to permit an analysis of all materials, labor, equipment, subcontract and overhead costs as well as profit and shall cover all work involved to accomplish the

modification, whether deleted, added or changed. Any amount claimed for subcontracts shall be supported by a similar price breakdown. In addition, if the proposal includes a time extension, a justification thereof shall also be furnished. The proposal together with the price breakdown and time extension justification shall be furnished by such date as may be specified by the Engineer.

ALLOWABLE OVERHEAD AND PROFIT: When the value of change order work is determined by the lump sum method or by the time and materials method, the following definitions and percentages shall apply.

Direct costs are defined as the net cost to Contractor to accomplish a given change. Costs of bonds and insurance associated with the change shall be applied after addition of indirect costs.

Indirect costs are defined as general operational charges relating to the accomplishment of a given change, including but not limited to small tools, incidental job burdens and general office expense.

Overhead and Profit: Allowances for all indirect costs shall be identified as combined overhead and profit and shall not exceed nor be less than the percentages in the following schedule:

Additive work:

(1) Prime Contractor:

(a) 15% of the direct costs of own work in excess of \$1000.00; 20% under.

(b) 8% of the direct costs of work performed by subcontractors not including subcontractor's overhead and profit.

(c) 8% of the direct costs of equipment that requires furnishing and delivery only.

(2) Subcontractor:

(a) 15% of the direct costs of own work in excess of \$2500.00; 20% under.

(b) 8% of the direct costs of work performed by subcontractors not including subcontractor's overhead and profit.

(c) 8% of the direct costs of equipment that requires furnishing and delivery only.

Deductive work:

(1) Prime Contractor: 4% of the direct cost of deleted own work.

Article 5.22 Claims for Damage or Extra Work

a. CBS:

If the Contractor shall claim compensation from the CBS for any injury or damage sustained by reason of any acts of the CBS or its agents, he shall, within five (5) days after the act causing (sustaining) such damage, submit a written statement of the nature of the damage sustained, to the Engineer. The notice to the Engineer shall state that the

Contractor intends to hold the CBS liable for such damages and shall set forth substantially the time and place of the injury or damage, the manner in which it occurred, the nature of the act or occurrence in question, the extent of the injury or damage so far as known, and the names and addresses of witnesses known to the claimant. Any notice required by (a) of this section shall be under oath or affirmation. Failure to give notice of injury or damage as required by (a) of this section or failure to present a claim within the time and in the manner provided therein shall bar any action upon said claim.

b. Extra Cost:

If the Contractor claims that any instructions by drawings or otherwise involve extra cost or any extension of time, he shall notify the CBS in writing within ten (10) days after the receipt of such instructions and in any event before proceeding to execute the work. No such claim shall be valid unless made in accordance with the terms of this section.

c. Claims for Weather:

The Contractor shall have no claims against the CBS for damages for any injury to work, materials, or equipment, resulting from the action of the elements. If, however, in the opinion of the Engineer, the Contractor has made all reasonable efforts to protect the materials, equipment and work, he may be granted reasonable time to make proper repairs, renewals and replacements of the work.

Article 5.23 Prosecution of Work

The work to be done under the Contract shall not be commenced until written "Notice to Proceed" has been received by the Contractor.

Performance of the work to be done under the Contract shall be commenced within ten (10) days after receipt of written "Notice to Proceed" from the CBS, unless later commencement of the work is authorized by the Engineer.

From time of commencement of the work to the time of completion, the work shall be prosecuted vigorously and continuously and always in accordance with a schedule which will insure completion within the specified time limit. There shall be no voluntary shutdown or slowing of operations without prior approval of the Engineer. Limitations of operations due to weather conditions will be governed by Article 5.28 Limitations of Operations.

If it appears to the Engineer that the rate of progress being made is not such as will insure the completion of the work within the specified time limit, it shall be within the authority of the CBS, upon notification by the Engineer, to require the Contractor to provide additional equipment and men and to take such other steps as may be necessary to insure completion as specified.

Article 5.24 Progress Schedule and Requirements for Overtime Work

a. Schedule:

The Contractor shall within five (5) days or within such time as determined by the Engineer, before commencement of the work, prepare and submit to the Engineer for approval a Construction Progress Schedule in a form approved by the Engineer showing the order in which the Contractor proposes to carry on the work, the date on which he will start the several salient features, including procurement of materials, plant and equipment and the contemplated dates for completing same. This schedule shall be named the "As Planned" schedule and shall indicate appropriately the percentage of work scheduled for completion at any time. The Engineer may upon written request require the Contractor to submit an updated progress schedule at any time during the Contract but not more often than once a month. All subsequent schedules shall be measured against the "As Planned" schedule.

b. Forces:

The Contractor shall furnish sufficient forces, construction plant and equipment and shall work such hours, including night shifts and overtime operations, as may be necessary to insure the completion of the work in accordance with the approved "As Planned" progress schedule. If the Contractor's actual progress fails to meet the "As Planned" construction schedule, the Contractor shall increase its work force and equipment as required to bring the actual progress of its operations into conformance with said schedule without additional cost to the CBS.

Article 5.25 Unusual Working Hours

The Contractor shall give the Engineer twenty-four (24) hours advance notice of his intention to work overtime, nights, Sundays, or holidays, or any time outside the usual working hours.

Article 5.26 Subletting or Assignment of Contract

If any part of the work to be done under the Contract is subcontracted, the subcontracting shall be done in accordance with the following provisions:

The Contractor shall notify the Engineer in writing, of the names of all Subcontractors, together with a summary of the extent and character of the work to be done by each Subcontractor. If for sufficient reason, at any time during the progress of the work, the Engineer determines that any Subcontractor is incompetent or undesirable, he will notify the Contractor accordingly and the Contractor will take immediate steps to correct the performance of the Subcontractor.

Subletting by Subcontractors shall be subject to the same regulations. The CBS will not approve of the subcontracting of more than fifty percent (50%) of the work to be done under the Contract.

The Contractor shall be fully responsible to the CBS for the acts and omissions of his Subcontractors and of persons either directly or indirectly employed by them. Nothing contained in the Contract Documents shall create any contractual relation between any Subcontractor and the CBS.

Insofar as is practicable, the Contractor shall make payment for Subcontract work in the same units and on the same basis of measurements as apply under the main Contract. The CBS will not be responsible for loss resulting from the Contractor's failure to do so. In making payment to Subcontractors, the Contractor shall protect himself against the possibility of overpayment and he shall assume such losses as may result from overpayment.

Article 5.27 Assignments

The Contractor shall not assign the Contract or assign any monies due or to become due under the Contract without previous written consent of the CBS. No assignment of the Contract by the Contractor shall be valid unless it contains a provision wherein funds to be paid to the assignee under the assignment are subject to all the Contractor's obligations under the Contract.

Article 5.28 Limitations of Operations

Operations on the various units or portions of the work shall be conducted during the times and at the locations specified in the Contract Documents or as may be approved by the Engineer. No part of the work shall be undertaken without his approval, and no work shall be carried on contrary to his instructions.

In an emergency affecting the safety of life or property, including adjoining property, the Contractor, without special instructions or authorization from the Engineer, is authorized to act, at his discretion, to prevent such threatened loss or injury; and he shall so act if instructed to do so by the Engineer. Any compensation claimed by the Contractor on account of such emergency work, shall be processed according to Article 5.21, Additional or Extra Work.

The Contractor shall not perform excavation, backfill or other earthwork when weather conditions are such that the desired grades, tolerances, compactions or other performance standards as outlined in these Contract Documents cannot be met.

When unfavorable weather makes it impractical to secure desired results, the Contractor may request from the Engineer a written order to suspend work, in whole or in part, for an intermittent or extended period of time. The period of the suspension will be taken

into consideration in determining the revised date for completion. It shall be the Contractor's responsibility to maintain and protect the work and provide for traffic flow during intermittent shutdowns. The CBS may assume maintenance during extended shutdowns and shall be governed by the provisions of Article 5.15, Suspension of Work.

Article 5.29 Workmen and Equipment

The Contractor shall employ only competent and efficient laborers, mechanics, or artisans. Whenever, in the opinion of the Engineer, any employee is or becomes unsatisfactory for the work assigned to the employee, the Contractor shall, upon written request of the Engineer, remove said employee from the work.

The Contractor shall furnish to the Engineer, upon request, a list of all equipment, tools and machines to be utilized to perform the work under this Contract, in his possession or available to him. Said equipment, tools and machines shall be subject to inspection by the Engineer, shall comply with applicable safety regulations and shall be maintained in a satisfactory and safe working condition at all times.

If the Contractor does not promptly repair or replace non-complying equipment, tools or machines utilized in the Work, the CBS may terminate the Contractor's right to proceed.

Article 5.30 Time of Completion of Work and Extension of Time Limit Including Liquidated Damages

Time is of the essence in the Contract. Therefore, the work to be done under the contract shall be completed in its entirety within the time specified in the bid; provided however, that the Engineer may at his discretion recommend that the CBS extend the time for completion of the work without invalidating any of the provisions of the Contract and without releasing the surety.

Extensions of time, when recommended by the Engineer, will be based upon the effect of delays to the project as a whole and will not be recommended for non controlling delays to minor portions of the work unless it can be shown that such delays were the direct cause of the delay in the progress of the project as a whole. Governmental regulations, priorities, labor disputes, strikes and fires, and required "Extra Work" may constitute such a delay; in addition, Federal government restrictions arising out of the National Defense or War Program and resulting in inability to obtain materials, equipment or labor may constitute such a delay.

Change in plans and increases in the quantities of work to be performed will be considered cause for extension of time only when they are of such nature and when they occur at such times that they materially and necessarily affect the completion time of the project.

The Owner may withhold from any progress payment the sum of \$400 per day, unless otherwise identified in the Contract Documents, as Liquidated Damages for each and

every calendar day that the Substantial Completion Date is delayed beyond the Contract Completion Date. After substantial completion, the Owner may withhold out of any progress payment the sum of \$400 per day, unless otherwise identified in the Contract Documents, as Liquidated Damages for each and every calendar day that the Final Completion Date is delayed beyond the Contract Completion Date. If no money is due Contractor, the Owner shall have the right to recover said sums from Contractor, the Surety, or both.

The Contractor acknowledges that the daily amount of the Liquidated Damages provision is not a penalty but rather is a reimbursement for damages that the Owner will sustain by reason of delayed completion. The Contractor further acknowledges that the daily amount of Liquidated Damages is a reasonable alternative to the complex calculations that would otherwise be necessary to determine such damages.

Permitting the Contractor to continue and finish the work or any part of it after the time fixed for its completion, or after the date to which the time for completion may have been extended, will in no way operate as a waiver on the part of the Owner of any of its rights under the Contract.

Delay caused by failure of the CBS or its representatives to act promptly in the carrying out of its obligations and duties under the Contract will be considered cause for extension of time only when and to such extent as such failure actually prevents completion of the work within the specified time.

Time extensions requested by the Contractor shall be made to the Engineer in writing within twenty (20) days of the date on which the alleged delay is said to have occurred and any claim for extension of time shall state explicitly the reasons therefor.

Should the Contractor fail to file such written claim for extension of time within the period provided therefor, he thereby shall have abandoned any claim therefor.

In naming the prices for completion of the work within the time specified it shall be understood and agreed the work shall be completed within that time. If, however, said work is not completed within the time named in the Contract, as extended to cover the total days of delay allowed in the paragraphs above, the CBS may deduct and retain as liquidated damages out of any sum then due the Contractor at time of such delinquency, or later, the sum of \$400/day unless otherwise specified in the Contract for each and every calendar day that the date of final completion of each Contract is delayed. In submitting a bid and signing the Contract, the Contractor thereby shall have agreed to these provisions and, furthermore, that the sum deducted and retained is not a penalty but a reimbursement to the CBS for damages which the CBS will have sustained by reason of such delayed completion. Damages so liquidated are understood to include the additional cost to the CBS for engineering supervision, interest charges, overhead, and other indirect costs.

The amount due the CBS from the Contractor under the foregoing provisions shall be deducted from any monies then due or to become due said Contractor under the Contract, and such deductions shall not in any degree release the Contractor from further obligations in respect to the fulfillment of the entire Contract, nor any right which the CBS may have to claim, sue for, and recover compensation and damages for nonperformance or breach of Contract.

Article 5.31 Termination of Contract by CBS

If the Contractor should be adjudged as bankrupt, or if he should make a general assignment for the benefit of his creditors, or if a receiver should be appointed on account of his insolvency, or if he should persistently or repeatedly refuse or should fail to supply enough properly skilled workmen or proper materials for the efficient prosecution of the work, or if he should fail to make prompt payment to subcontractors for material or persistently disregard laws, ordinances, or the instruction of the Engineer, or otherwise be guilty of a substantial violation of any provisions of the Contract, then the CBS, upon the certificate of the Engineer that, in his opinion, sufficient cause exists to justify such action, may without prejudice to any other right or remedy and after giving the Contractor and his surety ten (10) days concurrent written notice, terminate the services of the Contractor and take possession of the premises and of all materials, tools, and appliances thereon and finish the work by whatever method it may deem expedient.

In the event such action is taken by the CBS, the Contractor shall not be entitled to receive any further payment until the work is completed. On completion of the work, determination shall be made by the Engineer of the total amount the Contractor would have been entitled to receive for the work under the terms of the Contract, had he himself completed the work. If the difference between said total amount and the sum of all amounts previously paid to the Contractor, which difference will hereinafter be called the "unpaid balance," exceeds the expense incurred by the CBS in completing the work, including expense for additional managerial and administrative services, such excess will be paid to the Contractor, with the consent of the Surety. If, instead, the expense incurred by the CBS exceeds the unpaid balance, the amount of the excess shall be paid to the CBS by the Contractor or his Surety.

The expense incurred by the CBS as herein provided, and the damage incurred through the Contractor's default, shall be as determined and certified by the Engineer.

In addition to and apart from the above mentioned rights of the CBS to terminate the Contractor, it is expressly understood that the Contract may be cancelled at the election of the CBS for any willful failure or refusal on the part of the Contractor to faithfully perform the Contract according to all of its terms and conditions; provided, however, that in the event the CBS should cancel the Contract, neither the Contractor nor his surety shall be relieved from damages or losses suffered by the CBS on account of the Contractor's said breach of Contract.

It is understood and agreed that the CBS may, at its discretion, avail itself of any or all of the above rights or remedies and that the invoking of any one of the above rights or remedies will not prejudice or preclude the CBS from subsequently invoking any other right or remedy set forth above or elsewhere in the Contract.

In the case of termination of this Contract before completion from any cause whatsoever, the Contractor, if notified to do so by the CBS, shall promptly remove any part or all of his equipment and supplies from the property of the CBS. Failure to do so will authorize the CBS to remove such equipment and supplies from its property at the expense of the Contractor.

Article 5.32 Termination of Work for CBS's Convenience

At any time during the term of this contract, the CBS may terminate the work, in whole or in part, for any reason that the Engineer shall determine to be in the best interest of the CBS. Any such termination shall be effected by delivery of a Notice of Termination to the Contractor, specifying that the termination is for the convenience of the CBS; the extent to which performance of the work under the Contract is terminated; and the date upon which such termination becomes effective.

After receipt of a Notice of Termination the Contractor shall:

Stop work under the contract on the date and to the extent specified in the Notice of Termination;

Place no further orders of subcontracts for materials, services, or facilities except as may be necessary for completion of such portion of the work under the contract as is not terminated;

Terminate all orders and subcontracts to the extent that they relate to the performance of work terminated by the Notice of Termination;

Settle all outstanding liabilities and all claims arising out of such termination of orders and subcontracts, the cost of which would be reimbursable, in whole, or in part, in accordance with the provisions of the contract;

Submit to the Engineer a list, certified as to quantity and quality, of any or all items of termination inventory exclusive of items the disposition of which had been directed or authorized by the Engineer;

Transfer to the Engineer the completed or partially completed plans, drawings, information, and other property which, if the contract had been completed, would be required to be furnished to the CBS.

Take such action as may be necessary, or as the Engineer may direct, for the protection and preservation of the property related to the contract which is in the possession of the Contractor and in which the CBS has or may acquire any interest.

The Contractor shall proceed immediately with the performance of the above obligations notwithstanding any delay in determining or adjusting the amount of any item of reimbursable cost under this clause.

When the CBS orders termination of work, effective on a certain date, all completed units of work within each pay item as of that date will be paid for at the contract unit price. Payment for materials included in the material inventory describe in item 5 above will be paid at actual cost delivered to the project or storage site, including transportation charges. Allowable total markup on the actual cost shall be 15%.

After receipt of a Notice of Termination, the Contractor shall submit to the Engineer his claim for alleged additional damages or cost not covered above or elsewhere in these specifications as provided in Section 10.05 Article 5.22 Claims for Damage or Extra Work. In no event, however, will loss of anticipated profits be considered as part of any settlement.

Article 5.33 Use of Completed or Uncompleted Portions

The CBS shall have the right to take possession of and use any completed or partially completed portions of the work, notwithstanding that the time for completing the entire work or such portions may not have expired, and such taking and use shall be deemed an acceptance of that work completed in accordance with the Contract Documents. If such prior use increases the cost of or delays the completion of uncompleted work or causes refinishing of completed work, the Contractor may be entitled to extra compensation, or extension of time or both. Claims for additional compensation shall follow procedures set forth in Article 5.22 Claims for Damage or Extra Work. The CBS shall be responsible for routine maintenance or damages caused by its use of such portions of the Work.

Article 5.34 Contractor's Right to Stop Work or Terminate Contract

If the work should be stopped under an order of any court, or other public authority, for a period of three (3) months, through no act or fault of the Contractor or of anyone employed by him or if the CBS should fail to pay the Contractor within thirty (30) days of its presentation, any sum certified by the Engineer and approved by the CBS, then the Contractor may, upon seven (7) days written notice to the CBS and Engineer, stop work or terminate this Contract and recover from the CBS payment for all work executed and any loss sustained upon any plant or materials and reasonable profit and damages.

Article 5.35 Disposal Sites

Except as otherwise stated in the specifications, the Contractor shall make his own arrangements for and shall assume all costs in connection with disposal sites or areas. Any and all disposal sites or areas shall be in such locations and so maintained, that they shall be neither offensive nor become a menace to public health and welfare. Disposal sites must be approved by the CBS.

The Contractor shall obtain written permission from the property owner or owners for such disposal sites and furnish the Engineer with a copy of this agreement. The written permission shall specifically provide that the property owner will not hold the CBS, its employees, agents or consultants liable for use of or damage to this property. The Contractor shall be held liable for any trespass and property damage incurred outside of disposal area.

Prior to construction, the Contractor shall submit a description of his plan for disposing of unsuitable materials and waste resulting from the Work under this Contract. If any material is placed in unauthorized areas, the Contractor shall remove the material and restore the area to the condition of the adjacent undisturbed areas.

Article 5.36 Load Restrictions

The Contractor shall comply with all legal road restrictions as set forth in "Alaska Oversize and Overwidth Permit Manual," current edition, and current revisions to Title 17, Chapter 25, of the Alaska Administrative code in the hauling of materials on public roads beyond the limits of the project, and on all public roads within the project limits that are scheduled to remain in use upon completion of the project.

Any load restrictions applicable to roadway or structures within the project limits will be given in the special provisions. A special permit will not relieve the Contractor of liability for damage which may result from the moving of equipment.

The operation of equipment of such weight or so loaded as to cause damage to structures or the roadway or to any other type of construction will not be permitted. No loads will be permitted on a concrete pavement, base or structure before the expiration on the curing period. In no case shall legal limits be exceeded unless permitted in writing. The contractor shall be responsible for all damage done by his equipment.

Article 5.37 Claims for Adjustments and Disputes

If the Contractor becomes aware of any act or occurrence which may form the basis of a claim, he shall immediately inform the Engineer. If the matter is not resolved within seven (7) days, the Contractor shall, within the next fourteen (14) days, submit written notice of the facts which may form the basis of the claim. In addition, the Contractor shall submit the claim in writing to the Engineer within sixty (60) days of the submission

of the written notice of the facts unless the Engineer agrees in writing to an extension of time for good cause shown. Good cause shown shall include time for the Contractor to prepare his claim, and the Engineer shall grant an extension of not more than sixty (60) days for the preparation of the claim. The Contractor agrees that unless these written notices are provided, the Contractor will have no entitlement to additional time or compensation for any such act or occurrence. The Contractor shall, in all cases, continue diligent performance of the Contract.

In presenting the written claim, the Contractor shall specifically include the following:

- a. The facts and circumstances surrounding the claim;
- b. The Contract provisions under which the claim is made;
- c. The bid items and quantities, if any, upon which the claim is based; and
- d. The specific relief requested, including the additional compensation claimed and the basis upon which it was calculated or the additional time requested and the basis upon which it was calculated.

The CBS will render a decision on the claim within sixty (60) days of receipt of the full and complete written claim. Any change in the Contract sum resulting from such claim shall be authorized by Change Order.

This decision shall be final and conclusive unless it is fraudulent or unless the Contractor commences court action in the Court within the jurisdiction and venue provisions of the Contract within one hundred twenty (120) days from receipt thereof.

Article 5.38 Record Documents

Contractor shall maintain Record Documents on the job site consisting of a complete set of blue-line plans, survey line and grade books, and other Contract Documents. All changes in location (both vertical and horizontal), material, equipment, or other changes in the Work and other horizontal and vertical locations of other utilities encountered shall be recorded (on Record Documents) and kept current on a daily basis in conformance with the requirements of CBSS Section 65.02 Construction Surveying, Article 2.14 Asbuilt Surveys and Record Drawings. Design dimensions, elevations, and grades that are not changed shall be identified as being accurate by noting "ASB" adjacent to the design value. The Record Documents shall be made available to the Engineer at all times. Contractor shall provide horizontal and vertical locations of all water service connections at the property line or lease lot line, including swing ties and offsets to property or lease lot corners.

The "RECORD" set of prints shall include three or more swing ties from prominent, permanent features to show the location of each installed water service connection. Swing ties are to be as close to perpendicular to each other as possible. When property or lease lot corners are in, they shall be used as swing tie referenced points.

All additions and corrections shall be neat, clean, and legible. If additional plan sheets are required, Contractor shall prepare them on reproducible mylar of like material and size as the original plans. Plans damaged or lost by Contractor shall be replaced by Contractor at his expense and to the satisfaction of the Engineer.

The Engineer will review all Record Documents for completeness and conformance to the standards stated above. Contractor shall make all corrections, changes, additions, and deletions required to conform to the standards. The Engineer may periodically review the status of the Record Documents during the course of the Work. Failure of Contractor to keep the Record Documents current and in the required condition will be considered cause for additional withholding from the progress payments.

The CBS will provide will furnish the Contractor with a set of Auto-CAD plans for use in preparing as-builts. In addition the red ink as-builts, Contractor shall provide as-built plans submitted in Auto-CAD 2002.

Approved final Record Documents, bearing certification by Contractor that the Record Documents are a complete and accurate representation of the project as constructed, shall be delivered to the Engineer within 30 days after Substantial Completion or prior to final acceptance of the project, whichever is earlier.

Article 5.39 Operating and Maintenance Manuals

Along with the final Record Documents, the Contractor shall provide to the Engineer prior to the pre-final inspection four (4) sets of Operating and Maintenance Manuals for all items of material and equipment as required by the Technical Specifications. In addition to the requirements in the Technical Specifications and Special Provisions, the Manuals shall contain an Index, by Specification Section; a key plan which graphically locates items of equipment; a list of manufacturers, suppliers and distributors with addresses and telephone numbers; and a list of local representatives with addresses and telephone numbers.

Article 5.40 Pre-Construction Conference

Before starting the Work at the site, a Pre-Construction Conference will be held to establish a working understanding between the parties as to the project. Contractor and his Superintendent and Subcontractors shall attend the conference to meet with the Owner or his Representative, Engineer, and Inspector.

SECTION 10.06 LEGAL RELATIONS AND RESPONSIBILITIES

Article 6.1 Laws to be Observed

The Contract shall be governed by the laws of the State of Alaska. The Contractor at all times shall observe and comply with all federal, state and local laws, ordinances, and regulations in any manner affecting the conduct of the work, and all such orders or decrees as exist at present and those which may be enacted or promulgated by legislative bodies or tribunals having any jurisdiction or authority over the work, and shall indemnify and save harmless the CBS and the officers, employees and agents (including the Engineer) of the CBS against any claim or liability arising from or based on the violation of any such laws, ordinances, regulations, orders or decrees, whether such violations be by the Contractor, his Subcontractors or his employees.

Protection of Water Resources. The Contractor shall control the disposal of fuels, oils, bitumens, calcium chloride, acid or harmful materials, both on and off the premises, and shall comply with applicable federal, state, and municipal laws concerning pollution of waterways while performing work under this Contract. Special measures shall be taken to prevent chemicals, fuels, oils, greases, bituminous materials, and sewage from entering established drainages.

Article 6.2 Permits

The Contractor will obtain all licenses necessary to perform the Work and will obtain all necessary permits except those that the CBS will obtain. The CBS will obtain all those permits which may be necessary for approval of the project including permits from the U.S. Corps of Engineers, U.S. Fish and Wildlife Service, State Department of Fish and Game, State Department of Environmental Conservation and the State Department of Transportation unless otherwise specified in the special provisions. All permits and licenses, either temporary or permanent, which are required by the Federal government, the State of Alaska, the CBS, or any other government unit, including public utilities, which are necessary for the prosecution of the work shall be obtained and shall be paid for by the Contractor except for water connect permit fees which shall be paid by the CBS. This requirement shall be binding upon the Contractor although the prosecution of the work may be in the hands of a Subcontractor. It shall be the Contractor's responsibility to secure all permits and licenses, either temporary or permanent, to give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the work as specified herein. The Contractor shall also be responsible for requesting all code compliance inspections.

For work to be performed within the State rights-of-way, a utility permit which authorizes the use of State rights-of-way for location of the utility, will be obtained by the CBS. Prior to award of the Contract, the apparent low bidder shall obtain from the applicable agency approval for the method, plans and schedule of construction for any work to be performed within the right-of-way.

Before starting the work, the Contractor shall apply for a construction permit which will outline specific methods and procedures. The permit will be issued to the Contractor by the applicable agency prior to the start of any work within the concerned rights-of-way. In all cases a valid construction permit must exist while the Contractor is working within rights-of-way of the State. Failure on the part of the Contractor to comply with any or all stipulations set forth in the construction permit shall be sufficient cause for the CBS to suspend the Contractor from working within the rights-of-way of the State.

Article 6.3 Patented Devices, Materials, and Processes

The Contractor assumes the responsibility of defending any and all suits or actions brought for the infringement of any patent claimed to be infringed by any material, device, plan, method or process to be incorporated in the work and/or required to be used in connection with the work to be done under the Contract, including all attorney's fees and court costs, and he shall indemnify and save harmless the CBS, the officers, employees, and agent (including the Engineer) of the CBS from all claims of and suits or actions for infringement of patents.

Article 6.4 Sanitary Provisions

The Contractor shall observe all rules and regulations of the State and local health officials, and shall take such precautions as are necessary to avoid creating conditions which are not sanitary. The Contractor shall provide and maintain in a neat and sanitary condition such accommodations for use of his employees as may be necessary to comply with the requirements of public health officials. He shall permit no public nuisance at any place over which he has control.

Article 6.5 Industrial Safety

Safety Precautions and Programs

The Contractor alone shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

1. The Contractor shall give notices and comply with applicable laws, ordinances, rules, regulations, and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury, or loss.
2. The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations, and notifying owners and users of adjacent sites and utilities.
3. When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the work, the Contractor shall exercise

utmost care and carry on such activities under supervision of properly qualified personnel.

The Contractor shall develop and maintain, for the duration of this Contract, a safety program that effectively incorporates and implements all required safety provisions.

5. The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent, unless otherwise designated by the Contractor, in writing, to the CBS and Engineer.

6. Acts of the CBS or Engineer in conducting construction review of the work is not intended to include any review or approval of the accuracy or performance of the Contractor's safety supervisor, the safety program, or any safety measures taken in, on, or near the construction site.

7. The Contractor shall not load or permit any part of the construction site to be loaded beyond its safe structural capacity.

Safety of Persons and Property

The Contractor shall be solely and completely responsible for conditions of the job site, including safety of all persons (including its employees and the public) and property in connection with the performance of the Contract.

The Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:

1. All employees on the work and other persons who may be affected thereby;
2. All the work and materials and equipment to be incorporated therein, whether in storage on or off the site; and
3. Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation or replacement in the course of construction.

Financial Responsibility for Injury, Loss or Damage

Damages resulting from personal injury (including death) or loss to any property caused directly or indirectly, in whole or in part, by the Contractor, any subcontractor, supplier, or any other person or organization directly or indirectly employed by any contractor subcontractor, or supplier to perform or furnish any of the work, or anyone for whose acts any of them may be liable, shall be remedied by the Contractor with no change in the contract price or contract time.

The Contractor's duties and responsibilities for the safety and protection of the work shall continue until final acceptance, except as otherwise expressly provided in connection with substantial completion. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Article 6.15 Responsibility for Damages.

Emergencies

In emergencies affecting the safety or protection of persons or the work or property at the site or adjacent thereto, the Contractor, without special instruction or authorization from the CBS, is obligated to act to prevent threatened damage, injury, or loss. The Contractor shall give the Engineer prompt written notice if the Contractor believes that any significant changes in the work or variations from the contract documents have been caused thereby. If the CBS determines that a change in the contract documents is required because of the action taken in response to an emergency, a contract change will be authorized by one of the methods indicated in the Contract, as determined by the Engineer.

Notice and Reporting

If death, serious injury, or serious damage occurs on the job site, such incident shall be reported immediately by the telephone or messenger to both the Engineer and the CBS. The Contractor shall thereafter submit a written report to the Engineer and CBS within three days of the occurrence. The Contractor also shall promptly report, in writing, to the Engineer all accidents whatsoever arising out of or in connection with the performance of the work, whether on or adjacent to the site, giving full details and statements of witnesses. If a claim is made by anyone against the Contractor or any subcontractor on account of any accident or incident, the Contractor shall promptly report the facts, in writing, to the Engineer, giving full details of the claim.

Article 6.6 Public Safety

The Contractor shall conduct the work in a manner that minimizes the inconvenience to traffic on intersections and connecting streets and to persons conducting commercial enterprises or residing along the route of the work.

Entrances to residences, garages, service stations, business places, and driveways of all kinds shall not be blocked. Temporary bridges, ramps or culverts shall be provided and maintained at entrances to properties where vehicular traffic is necessary and shall be adequate in width and strength for the service required. Satisfactory means of ingress and egress for persons residing or having occasion to transact business along the route of the work shall be maintained at all times. All work involved in providing for construction, maintenance, and use of private roads or driveways, etc., shall not be paid for directly but shall be considered a subsidiary obligation of the Contractor covered under other Contract items. Proper notification and arrangements thereof for interruption

of such access shall be the responsibility of the Contractor. All culverts, private or otherwise, which are disturbed will be replaced or repaired at the expense of the Contractor.

Article 6.7 Traffic

It will be the Contractor's responsibility to maintain all detour routes, haul routes, and streets under construction. This includes grading, dust control and minor drainage work necessary to keep the streets or roads in good condition throughout the construction period. Detour routes and haul routes must be approved by the Engineer in advance and shall be left in a condition at least equal to their condition immediately prior to being opened by the Contractor.

The Contractor shall at his own expense and without further orders provide, erect, and maintain barricades, fences, signs, flagmen, flags, torches and lights as may be necessary or as may be ordered by the Engineer to insure the safety of the public as well as those engaged in connection with the work. All regulatory signs, warning signs, guide signs, barricades, direction arrows, and route markers will conform to the provision of Section 5 of the "Manual of Uniform Traffic Control Devices" (published by U.S. Government Printing Office). Traffic control devices must be set up prior to the start of construction or maintenance operations and shall be properly maintained during the time such special conditions exist. When no longer required, they shall be removed. Where operations are performed in stages, only these devices which pertain to the stage in progress shall be visible. When traffic control devices do not apply, they shall be covered or out of the view of traffic. All traffic control devices shall be kept in proper position, clean, and legible at all times. All barricades and sign supports shall be neatly constructed and shall not appear makeshift or hastily thrown together. They shall be repaired, cleaned or repainted as needed to keep up their appearance. Oil burning torches shall not be placed so close to signs or barricades as to scorch them or deposit soot on them.

Special care shall be taken to see that weeds, shrubbery, construction material or equipment, and spills are not allowed to obscure any sign, light or barricade. All barricades and signs will be illuminated one-half hour before sunset to one-half hour after sunrise.

It shall be the Contractor's responsibility to maintain all barricades, flags, torches or lights throughout the night hours, weekends, holidays, or other periods of inactivity and to check these warning devices at least once every eight (8) hours to assure that they are in the proper position and are operating properly.

The Contractor shall also inform the Engineer, in writing, of the name(s) and phone number(s) of the person(s) who is (are) personally responsible for the maintenance of the warning devices. In the event of an emergency when this (these) person(s) cannot be reached, the CBS reserves the right to take appropriate precautions. If it becomes necessary to exercise this right by having the CBS's forces, or others, erect the necessary

barricades, torches or lights, the Contractor shall be charged a minimum of \$100 for each such trip to the job site. Such charge will be deducted from any payment due the Contractor. Charges in excess of \$100 shall be determined by the amount of equipment and men necessary for the work to be done. Action by the CBS to erect barricades, signs or lights does not relieve the Contractor of his indemnification obligation set forth in safety responsibilities set forth in Articles 6.5, 6.15 and 6.24.

Streets will be closed only as approved by the Engineer. The Contractor shall so conduct his operations as to offer the least possible inconvenience to the public, and he shall have under construction no greater length or amount of work than he can prosecute properly with due regard to the rights of the people. Local traffic shall be provided access to private properties at all times unless otherwise approved by the Engineer. Emergency traffic such as police, fire, and disaster units shall be provided reasonable access at all times. No two adjacent parallel streets may be closed to emergency traffic at one time. The Contractor shall give the Engineer forty-eight (48) hour advance notice (excluding Saturdays, Sundays, and holidays) before closing any street or performing major work on these streets. It will be the Contractor's responsibility to notify the Engineer daily of any change in plans to close or open any street or alley regardless of the length of time the street or alley is to be closed or opened.

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. Since it is not practical or possible to prescribe detailed standards of application for the many diverse maintenance and construction activities that might conceivably arise, modifications of the traffic control requirements and sign size may be required to fit special circumstances.

Article 6.8 Barricades, Warning Signs, and Flagmen

The Contractor shall at his expense and without further or other orders provide, erect and maintain at all times during the progress or temporary suspension of the work suitable barricades, fences, signs, or other adequate warnings or protection, and shall provide, keep and maintain such danger lights, signals, and flagmen as may be necessary or as may be ordered by the Engineer to insure the safety of the public as well as those engaged in connection with the work. All barricades and obstructions shall be protected at night by signal lights which shall be suitably distributed and illuminated from sunset to sunrise. Barricades shall be of substantial construction and shall be suitably painted to increase their visibility at night.

If flagmen are necessary for the purpose of protection and safety to traffic, such flagmen shall be furnished at the Contractor's expense. Flagmen shall be properly certified in accordance with current standards of the State of Alaska Department of Transportation.

The signs to be furnished and used by the Contractor in directing, controlling and safeguarding traffic shall conform with the standard sign designs specified in the Manual of Uniform Traffic Control Devices, 1988 edition or subsequent editions.

The Contractor's responsibility for the safeguarding of traffic as specified above shall cease when the work included in the Contract is accepted as complete.

Article 6.9 Drainage

The Contractor shall provide and maintain all water courses, gutters and drains which are interrupted by his work and shall replace all in as good condition as he found them.

Contractor shall be responsible for maintaining existing drainage patterns disturbed as a result of construction, including reestablishment of drainage ditches, swales, and gutter flowlines to their preconstruction condition, grade, and elevation. Catch basins or storm drains damaged during construction shall be repaired or replaced in kind as an incidental item of construction at no cost to the Owner.

All costs associated with maintenance of drainage patterns and repair or replacement of drainage ditches, swales, catch basins, storm drains, gutter flowlines, and any other drainage appurtenances shall be incidental to the Contract or to the item under construction, and no separate payment shall be made.

Article 6.10 Air and Water Pollution Laws

The attention of the Contractor is called to statutes of the State and CBS relating to the pollution of water and air. The Contractor shall carry out his operations in conformity with the applicable sections of State and CBS ordinances and all regulations which are adopted pursuant thereto.

Article 6.11 Safeguarding of Excavations

The Contractor shall provide such safeguards and protections around and in the vicinity of the excavations he makes as may be necessary to prevent and avoid the occurrence of damage, loss, injury and death to property and persons because of such excavations.

Liability for any such damage, loss, injury or death shall cease when all work done under the Contract is completed and accepted by the CBS, except as otherwise noted.

Article 6.12 Use of Explosives

In the handling and storage of explosives, the Contractor must comply with all Federal, State and local laws, and shall use every precaution to prevent injury to persons and damage to property. The Contractor will notify the Sitka Fire Marshall of location and quantity of explosives. Secured storage places shall be provided and identified with warning signs. Only persons licensed and experienced in the handling of explosives shall be allowed to use them and no explosive shall be detonated until warning has been

sounded and all persons removed from within the radius of danger. Proof of license must be provided to the City prior to handling and use of explosives.

Article 6.13 Utilities

a. Plans:

Locations of utilities shown on the drawings are not exact. The CBS shall not be held liable for damages to utilities incurred during construction due to deficiencies or omissions of the Drawings or these provisions. At least 48 hours prior to commencing work, the Contractor shall contact all local utility companies to obtain underground locates and shall protect the utilities:

The Contractor shall notify the utility companies of any damage and shall have repaired, at his own expense, any damage to underground utilities and structures where such damage is due to the failure of the Contractor to properly inform himself beforehand of the probable existence and location of underground utilities, or where such damage is due to the failure of the Contractor to exert due care and caution in his construction operations.

b. Protecting Utilities:

Whenever the construction is within the area of other public utilities (water, sewer, electrical, communications, or gas, overhead or underground) and the utility has to be temporarily raised, lowered, guyed, shored or braced or otherwise protected during construction, it shall be done at the expense of the Contractor and shall be included in the contractor's Bid price for that item of work in place. If construction endangers support of communication or power poles, the agency having jurisdiction shall be notified and the poles shall be adequately protected to the satisfaction of the agency at the expense of the Contractor, before construction is started.

c. Changing Location of Utilities

It is the intent of the plans that no utilities will be moved to facilitate construction of the improvements provided for in this Contract, except as otherwise noted on the plans or in the specifications.

The Engineer shall not determine that an existing utility must be moved unless it cannot be guyed, shored, braced or by-passed by ordinary construction procedures. However, if it will be moved by the utility company having jurisdiction over the utility, it will be done at no charge to the Contractor. The Contractor shall be solely responsible for coordinating his work schedule with any relocation work of the utility company. If the work of the Contractor is delayed because of any delays, acts or omissions caused by the utility company in its relocation work, the Contractor shall have no claim against the

CBS for that reason, other than for an extension of time equal to that of the delay in which to complete the Contract.

d. Exposed Utilities

Whenever a line of communication or electrical underground cable conduit, conduit bank, or gas line is to be exposed and the exact location and depth is not known, the utility company shall be notified and excavation by the Contractor shall not be started until a representative of the utility company is present to aid the Contractor in the location of the utility. Wherever a utility is exposed, it shall be backfilled with original material unless otherwise specified by the Engineer. All utilities, cable ducts, pipes or poles encountered must be adequately supported to prevent breakage or fatigue.

e. Utility Locate Requirement:

Upon receipt of written notification from any of the public agencies listed in this paragraph that the Contractor has caused damage to any facility, equipment or installation of that agency and that the Contractor failed to request a locate service at least two (2) normal business days prior to the damage, or if the locate service was properly requested, that the damage was not proximately caused by an error in the locate service, the CBS will withhold from forthcoming Contract payments, including advances, an amount sufficient to cover the damage. The term "normal business day" means the hours between 8:00 a.m. and 5:00 p.m., Monday through Friday. The amount sufficient to cover the damage shall be designated by the agency providing notification of damage and may include the total cost of repair, including overhead, and three hundred dollars (\$300.00) to cover legal expenses.

Article 6.14 Utilities – Connections

Whenever the plans and specifications require connections to be made to CBS or privately owned utility lines or services, the Contractor shall, unless otherwise specified in the special provisions, be responsible for making the connection to the utility line, or have the utility company make the connection, at the point(s) indicated on the drawings. The Contractor shall be responsible for making all necessary applications to the utility company, for paying all fees and for performing any work associated with making the connections which is not performed by the utility company. The Contractor is not responsible for bringing utility lines to the point of connection. The Contractor shall pay all costs for utility service prior to the Date of Substantial Completion.

Article 6.15 Responsibility for Damages

The Contractor shall be responsible for all damages to property, injury to persons, and loss, expense, inconvenience, and delay that may be caused by, or that may result from, any act, omission, or neglect of the Contractor, his Subcontractors, or his employees in the performance of the work to be done under this Contract.

The Contractor shall indemnify and save harmless the CBS, its officers and employees, from all suits, actions, or claims of any kind brought because of any injuries or damages received or sustained by any person, persons or property on account of the operations of the said Contractor; or on account of or in consequence of any neglect in safeguarding the work; or through use of unacceptable materials in constructing the work; or because of any claims or amounts recovered from any infringements of patent, trademark or copyright; or from any claims or amounts arising or recovered under the "Worker's Compensation Act," or any other law, ordinance, order, or decree; and so much of the money due the said Contractor under and by virtue of his Contract as may be considered necessary by the CBS for such purpose, may be retained for the use of the State; or, in case no money is due, his surety may be held until such suit or suits, action or actions, claim or claims for injuries or damages as aforesaid shall have been settled and suitable evidence to that effect furnished to the CBS.

It is specifically agreed between the parties executing this Contract that it is not intended by any of the provisions of any part of the Contract to make the public, or any member thereof, a third party beneficiary hereunder, or to authorize anyone not a party to this Contract to maintain a suit for personal injuries or property damage pursuant to the terms or provisions of this Contract.

Article 6.16 Restoration of Damaged Property

All damage and injury to property that may be caused or that may result from the carrying out of the work to be done under the Contract, or from any act, omission or neglect of the Contractor, his Subcontractor, or his employees, shall promptly be made good by the Contractor either by the repairing, rebuilding, or replacing of the property damaged, or in some other manner satisfactory to the CBS of such property. In case of failure on the part of the Contractor to promptly and satisfactorily make good such damage or injury, the CBS may, without notice to the Contractor, proceed to repair, rebuild, or replace such property as may be deemed necessary, and the cost thereof will be deducted from any monies due or which may become due the Contractor under the Contract.

In applying the provisions stated above, the repairing, rebuilding or replacing of damaged property shall be understood to include the providing of any temporary facilities that may be needed to maintain normal service until the required repairing, rebuilding or replacing is accomplished.

Article 6.17 Contractor's Responsibility for Work

Until final acceptance of the Contract, the Contractor shall be held responsible for any injury or damage to the work or to any part thereof by the action of the elements, and he shall make good at his own expense all injuries or damages to any portion of the work before its completion and final acceptance.

Article 6.18 Insurance

a. General:

Before the execution of the Contract, the Contractor shall obtain all insurance required under this section; and he shall not allow any Subcontractor to commence work until the Subcontractor also has obtained similar insurance applicable to his work. The Contractor shall maintain insurance throughout the life of this Contract including the warranty, guarantee and maintenance period.

Proof of the required insurance shall be provided to the CBS in the form of a Certificate of Insurance, showing the type and the amounts of insurance, the policy number, expiration date and signed by an authorized representative of the insurance company. Each Certificate of Insurance shall state that the policy or policies have been endorsed whereby the insurance company will provide not less than thirty (30) days written notice to the CBS of any material change, cancellation, or non-renewal of the insurance policies. All insurance policies required under this Article shall name the CBS as an additional insured for the purposes of the Project and shall contain a waiver of subrogation against the CBS.

The Contractor, its principals, partner, employees, agents, representatives, heirs or assigns, hereby agrees to protect, defend, save harmless and indemnify the CBS, its officials, employees and authorized representatives or its successors against any loss, cost, damage, suits, expense, judgment or liability of any kind whatsoever from or by reason or on account of, as a result of work or activities or any nature whatsoever arising directly or indirectly under this Contract including any claims for injury to person or property or death to the parties or to employees of the Contractor or its principals or of the CBS.

The Contractors shall purchase and maintain appropriate insurance for maritime employees subject to Federal jurisdiction including both the United States Longshoremen and Harbor Workers Compensation Act and Federal Maritime Employers Liability Law (Jones Act).

The Contractor shall provide the following types of insurance:

- | | | |
|----|--|----------------|
| 1. | Worker's Compensation | Minimum Limits |
| | Employer's Liability and Workers' Compensation
as required by Alaska State Workers' Compensation
Statutes. | Statutory |

U.S. Longshoremen & Harbor Workers' (USL&H) if required.

- | | | |
|----|---------------------------------|----------------|
| 2. | Comprehensive General Liability | Minimum Limits |
| | Single Limit | \$1,000,000 |
| | Aggregate | \$1,000,000 |

Bodily Injury & Property Damage Liability
Premises Operations
Blanket Contractual
Broad Form Property Damage
Personal Injury
Independent Contractors
Collapse and Underground
Professional Errors and Omissions if required in Instruction to Bidders

- | | | |
|----|---|----------------|
| 3. | Comprehensive Automobile Liability | Minimum Limits |
| | Bodily Injury and Property Damage, including
All owned, hired and non-owned vehicles | \$1,000,000 |

- c. Builder's Risk:

Builder's Risk Insurance may be required as specified in the special provisions.

Article 6.19 Payment of Bills by Contractors

The Contractor shall promptly make full payment for labor, material supplies and provisions, at such times as they become due and payable, to all persons supplying said Contractor or his Subcontractor with labor, services, materials, supplies or provisions for the prosecution of the work provided for in the Contract, and he shall not permit any lien or claim to be filed or prosecuted against the CBS for or on account of any labor, services, material, supplies or provisions furnished.

In the event that said Contractor (or his Subcontractors) fails, neglects, or refuses to make prompt and full payment of any claim for labor, services, materials, supplies or

provisions furnished by any person in connection with the Contract as said claim becomes due, the CBS may withhold the amount of such claim by the person or persons furnishing such labor, services, materials, supplies, or provisions and deduct the amount thereof from funds, due or to become due said Contractor by the CBS as provided herein. The deduction for any such amounts because of claims in the manner herein authorized will not, however, relieve the Contractor or his surety from his or its obligations with respect to any unpaid claims. Sums withheld for the purpose named herein will be paid to the Contractor upon certifications that said claims have been paid. The CBS may, at its sole election and without liability to the Contractor or any third party, deposit any sums withheld pursuant to this Article 6.19 with the Clerk or Court for the First Judicial District for resolution of the Contractor and his Subcontractor's competing claim to said sums. In no case shall the CBS make payment on any claim directly to the Subcontractor or supplier.

Article 6.20 Suits of Law Concerning the Work

Should a suit of law be entered into either by the Contractor or his Surety against the CBS or by the CBS against the Contractor or his Surety, the suit of law shall be tried in the First Judicial District of the State of Alaska.

If one of the questions at issue is the satisfactory performance of the work by the Contractor and should the appropriate court of law judge the work of the contractor to be unsatisfactory, the Contractor or his Surety shall reimburse the CBS for all legal and all other expenses (as may be allowed and set by the court) incurred by the CBS because of the suit of law and, further, it is agreed that the CBS may deduct such expense from any sum or sums then or that may become due the Contractor under the Contract.

If any clause or condition of the Contract is held as a matter of law to be unenforceable or unconscionable, the remainder of the Contract shall be enforceable without such clause.

Article 6.21 State of Alaska Prevailing Wage Scale

The Contractor shall comply with the provisions of Title 36, Chapter 05 of the Alaska Statutes requiring the Contractor to pay not less than the current prevailing rate of wages.

Wages may not be less than those stated in the advertised specifications regardless of the contractual relationship between the Contractor or Subcontractors and laborers, mechanics, or field surveyors. The scale of wages to be paid shall be posted by the Contractor in a prominent and easily accessible place at the site of the work. The CBS may withhold so much of the accrued payments as determined by the State of Alaska Department of Labor, necessary to pay laborers, mechanics, or field surveyors employed by the Contractor or Subcontractor the difference between (a) the rates of wages required by the Contract to be paid laborers, mechanics, or field surveyors in the work, and (b) the rates of wages in fact paid to laborers, mechanics, or field surveyors when less than the wages required by the Contract.

If it is found that a laborer, mechanic, or field surveyor employed by the Contractor or Subcontractor has been or is being paid a rate of wages less than the rate of wages required by the Contract to be paid, the State or its Political Subdivision may, by written notice to the Contractor, terminate his right to proceed with the work or the part of the work for which there is a failure to pay the required wages and to prosecute the work to completion by Contract or otherwise, and the Contractor and his sureties are liable for excess costs for completing the work.

Article 6.22 Equal Employment Opportunity

The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, national origin, ancestry, age, marital status, or who is a “qualified individual with a disability” (as that phrase is defined in the Americans with Disabilities Act of 1990). The Contractor will take affirmative action to insure that applicants are employed and that employees are treated during employment without regard to their race, color, religion, national origin, ancestry, age, sex, marital status, or mental or physical impairment/disability. Such action shall include without limitation: employment, upgrading, demotion, or transfer, recruitment or recruiting advertising, lay-off or termination, rates of pay or other forms of compensation, and selection for training including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provision of this nondiscrimination clause.

SECTION 10.07 MEASUREMENT AND PAYMENT

Article 7.1 Method of Measurement and Computation

All work completed under the Contract shall be measured by the Engineer according to United States standard measures. The methods of measurement and computation to be used in the determination of the quantities of materials furnished and the quantities of work performed under the Contract shall be the methods outlined in these specifications or by those methods generally recognized as good engineering practice, which, in the opinion of the Engineer, give the greatest accuracy consistent with practicable application.

When any vehicle delivers to the project classified fill or backfill of any kind, bedding material, leveling course, or pavement materials, the driver of the vehicle shall give to the Inspector a legible “original” weight ticket with the following information:

1. Vehicle identification number.
2. Tare weight of the vehicle(s) (Tare means the empty weight of the haul vehicle)
3. Gross weight of the loaded vehicle(s) as registered on the scale.
4. Sequential ticket number, date, pay item in words, and project location.
5. Pit location and name of scale operator

The CBS will not pay for that portion of the load in excess of the legal gross weight.

Vehicle(s) shall be tared a minimum of once daily by the scale operator. The Engineer may request additional tares to be done at any time the scale is operational. The Engineer may also require that he be present when tares are done.

If, at the material source, the Contractor does not have a computer-generated or machine printed weight ticket system, the Contractor shall furnish competent scale operators to weigh all materials measured and paid for on a weight basis. The scale operator(s) shall operate the scale (s) and keep records as directed by the Engineer, including the information as listed in the above five items. No direct payment will be made for furnishing scale operator(s), equipment, and expendables required, the costs thereof being considered an incidental Contractor obligation. The accuracy of all scales, both private and commercial, is the responsibility of the Contractor. The Contractor shall maintain scales according to the specifications, tolerances and regulations for commercial weighing and measuring devices contained in the National Bureau of Standards, Handbook 44, as adopted by Alaska Statute, Section 45.75.50 (d).

Article 7.2 Scope of Payment

The Contractor shall accept the compensation as herein provided as full payment for the Work. The Contractor shall do all things necessary to perform and to complete the Work according to the Contract Documents, including but not limited to furnishing all labor, tools, implements, machinery, supplies, materials, water, heat, utilities, transportation, and permits necessary to perform the Work. The Contractor shall be responsible for all loss, damage, or liability arising from the nature of the Work or from the action of the elements or from any unforeseen difficulties which may be encountered. Work paid for under one item will not be paid for under another item.

The contract price shall constitute full compensation for furnishing all plant, labor, equipment and materials, and performing all operations required to complete the Work as specified and shown on the drawings or otherwise directed. Notwithstanding the omission or mention of any incident or incidental work, the contract price and payment shall also constitute full compensation for all work incident or incidental to completion of the items, unless such work is otherwise specifically mentioned for separate payment under another bid item. In the event any work is required by the specifications or by the bidding schedule, and is not directly incident or incidental to the completion of any such items, the contract price or prices for all enumerated items shall also constitute full compensation of such work. No separate payment will be made for any item that is not specifically set forth in the Bid Schedule, and all costs therefor shall be included in the prices named in the Bid Schedule for the various appurtenant items of work.

In this section, the terms “construct, install, erect, place, and prepare”, shall be construed to mean that the bid item(s) is/are complete, in place, and approved by the Engineer.

Article 7.3 Quantities and Unit Price

a. Lump Sum

The Contractor shall include in the Contract sum all allowances named in the Contract Documents for items (or for the entire work) which are to be paid under a lump sum price and shall cause the work so covered to be done for such sums. Should the Engineer direct that additional work be required or work deleted under a lump sum price item, the Contract sum will be adjusted therewith by negotiation. No demand for expense or profit other than those included in the lump sum price will be allowed.

b. Unit Prices

The total amount to be paid under the Contract for items for which unit prices are named will be calculated on the basis of the unit prices named in the Bid for the quantities of work actually incorporated into the finished project.

Article 7.4 Payment for Force Account (Extra) Work

When extra work is ordered by the Engineer to be done on a force account basis by the Contractor, such work will be paid for on the basis of actual cost to the Contractor plus an allowance for overhead and profit.

ALLOWABLE OVERHEAD AND PROFIT: When the value of change order work is determined by the lump sum method or by the time and materials method, the following definitions and percentages shall apply.

Direct costs are defined as the net cost to Contractor to accomplish a given change. Costs of bonds and insurance associated with the change shall be applied after addition of indirect costs.

Indirect costs are defined as general operational charges relating to the accomplishment of a given change, including but not limited to small tools, incidental job burdens and general office expense.

Overhead and Profit: Allowances for all indirect costs shall be identified as combined overhead and profit and shall not exceed nor be less than the percentages in the following schedule:

Additive work:

(1) Prime Contractor:

(a) 15% of the direct costs of own work in excess of \$1000.00; 20% under.

(b) 8% of the direct costs of work performed by subcontractors not including subcontractor's overhead and profit.

(c) 8% of the direct costs of equipment that requires furnishing and delivery only.

(2) Subcontractor:

(a) 15% of the direct costs of own work in excess of \$2500.00; 20% under.

(b) 8% of the direct costs of work performed by subcontractors not including subcontractor's overhead and profit.

(c) 8% of the direct costs of equipment that requires furnishing and delivery only.

Deductive work:

Prime Contractor: 4% of the direct cost of deleted own work.

The percentage allowance to be made to the Contractor (or Subcontractor) will be made on all of the items as follows:

Actual cost for labor used in the work will be made at the rates actually paid plus direct overhead on labor such as but not limited to welfare or fringe benefit payments, social security, accounting, insurance, etc., to the laborers and foremen by the Contractor or Subcontractor unless these rates are in excess of the current local prevailing wage rates, in which event, payment will be made at the local prevailing wage rate. The time allowed will be the number of hours worked directly on force account operation.

Actual cost for purchased materials, equipment, and supplies used on force account work will be made at the prices billed to the Contractor or Subcontractor by the supplier, less all discounts. The Contractor or his Subcontractor shall take advantage of all possible discounts on bills for materials and supplies, and such discounts may be subtracted from the total amounts of bills regardless of any failure of the Contractor or Subcontractor to take advantage of same. Freight and express on materials and supplies will be considered to be a part of the cost and will be paid for as materials and supplies.

Materials and supplies produced by the Contractor or Subcontractor will be paid for at prices to be agreed upon between the Contractor and the Engineer, which prices will be no greater than the prices at which the materials and supplies can be obtained elsewhere.

Where the use of rental equipment is authorized by the Engineer, rental on such equipment used will be based on the rates actually paid by the Contractor or Subcontractor unless these rates are in excess of the current local rates, or unless the equipment is owned by the Contractor or Subcontractor, in either of which events payments will be made at the rates to be agreed upon between the Contractor and the Engineer prior to beginning work, which rates will in no case be greater than the current local rates.

For equipment rented on a daily or hourly basis, rental will be allowed for only those days or hours during which the equipment is in actual use. For equipment rented on a monthly basis, straight time rental will be allowed from the day the equipment is first used on the particular piece of force account work until and including the last day on which it is used on the particular work, provided the equipment is not used on other work during the period, and provided further that the equipment is not idle for a continuous period of more than six (6) days. No rental will be allowed for any parts of idle periods of lengths greater than six days or for any time during which the equipment is used on other work.

The rental allowed for equipment will in all cases be understood to cover all fuel, supplies, repairs, and renewals and no further allowance will be made for those items unless specific agreement to that effect is made in writing before the work is commenced. Individual pieces of equipment having a value of five hundred dollars (\$500) or less will be considered to be tools or small equipment, and no rental will be allowed on such.

The percentage allowances made to the Contractor in accordance with the terms outlined above will be understood to be reimbursement and compensation for all superintendence, use of tools and small equipment, overhead expenses, bond cost, insurance premiums, profits, indirect costs and losses of all kinds, and all other items of cost not specifically designated herein as items involved are furnished or incurred by the Contractor or by the Subcontractor. No other reimbursement, compensation or payment will be made for any such services, costs or other items.

Should any percentage allowance or other corresponding allowance be made by the Contractor to a Subcontractor (other than specified herein), in connection with force account work, such allowance shall be at the sole expense of the Contractor and the Contractor will not be reimbursed or otherwise compensated for the same by the CBS.

Only efficient and competent laborers and foremen shall be employed on force account work, and only tools and equipment in good condition and suitable for the work shall be used. The Engineer shall have authority to dismiss from force account work any laborer or foreman whose efficiency is, in his opinion, below that of the average of the Contractor's forces, and to refuse to allow the use of tools and equipment which, in his opinion, are not suitable for the work. Laborers and foremen dismissed and/or tools and equipment rejected shall be replaced by the Contractor to the satisfaction of the Engineer.

Article 7.5 Force Account Bills

Bills for force account work must show in payroll form the dates, names, hours worked each day, rates of pay, and amounts paid to each individual employed on such work, and must give in detail the nature of the work done by each. The equipment used, hours of operation and agreed rates must also be shown. Bills for materials must be fully itemized, showing dates of delivery, quantities, unit prices, amounts, and discounts, and must be accompanied by receipted invoices covering every item.

All bills for payment on force account work must be submitted in triplicate, must state the number of the Contract under which the work was performed, and must be approved by the Engineer. Failure to present an estimate within thirty (30) days after the close of the month in which the work covered was performed shall constitute a waiver on the part of the Contractor of his right to present such bill thereafter or to receive payment therefor.

Article 7.6 Progress Payments

During the progress of the work the Contractor may request progress payments for work done during the preceding calendar month. Such request must be accompanied by an updated progress schedule if requested by the Engineer. Progress payments may include reimbursement for materials stored at an approved site provided proof of payment by the Contractor is given.

Applications for payment shall be based on Contractor's submitted schedule of values, as approved by Owner. Schedule of values shall be prepared in such form and supported by such data as may be required by Owner to substantiate its accuracy prior to Contractor's first application for payment. The schedule of values shall include quantities of work, unit prices and other items comprising the contract price. It shall subdivide the work into each component part in sufficient detail to serve as the basis for progress payments during construction. Applications for payment for Unit Price Work will be based on the number of units completed.

With each application for progress payment, Contractor shall provide a notarized schedule to Owner showing all work which has been performed to date together with the value thereof, and the percentage of work completed. The application for payment shall include columns identifying the "Original Contract Amount", "Current Period Amount", and "Totals to Date".

Progress payments shall be made monthly. Each application for payment shall be made no later than the tenth day of each month for work performed during the preceding month. Progress Payment requests shall be submitted to Engineer for his analysis and recommendation to Owner.

The estimates upon which partial payments are based are not represented to be accurate estimates, and all quantities shown therein are subject to correction in the final estimate. If the Contractor uses such estimates as a basis for making payment to Subcontractors, he does so at his own risk, and he shall bear all loss that may result.

The making of partial payments under the Contract, either before or after the date set for completion of the work, shall not operate to invalidate any of the provisions of the Contract or to release the surety.

At the time payment is made for any materials which have been stored at or near the site, the Ownership of such materials shall be vested in the CBS, and they shall remain in storage until used on the work. Such materials shall not be used on other work.

After receipt from Engineer of the Certificate for Payment, Owner shall make payment to Contractor within thirty (30) days. Owner may, at his option, retain up to 10% of the full amount of the Certificate for Payment plus lump sum amounts for material and equipment not properly stored, or subject to damage prior to use. Amounts retained by Owner may be held by Owner until project completion. If the project involves grant money or the City and Borough has entered into a written contract with the state to provide state funds, payment will be made in accordance with AS 36.90.200? 36.90.270.

Owner may withhold additional sums of money from progress payments in an amount sufficient to safeguard and protect Owner against any apparently meritorious claims against Contractor by any party other than Owner, and for any work that Owner ascertains to be defective or not meeting the requirements of the contract documents.

The Engineer may withhold or, on account of subsequently discovered evidence, nullify the whole or any part of any payment certificate to such extent as may be deemed necessary to protect the CBS from loss on account of:

- a. Defective work not remedied.
- b. Claims as provided herein.
- c. Failure of the Contractor to make payments properly to Subcontractors or for material or labor.
- d. A reasonable doubt in the opinion of the Engineer that the Contract can be completed for the balance then unpaid.
- e. Damage to another Contractor or Subcontractor.
- f. Unsatisfactory prosecution of the work by Contractor.
- g. Errors in partial payment requests.
- h. Bankruptcy, receivership or insolvency of, or the pendency of such proceedings against the Contractor.
- i. Costs of the CBS for engineering or other work as provided in the Contract Documents to be reimbursed to the CBS by the Contractor.
- j. Failure of the Contractor to complete any part of the construction in accordance with the Construction Schedule.

Article 7.7 Advances on Materials

For materials delivered and held in storage upon the work (or near the site of the work if approved by the Engineer), allowances will be made in the partial payments to the Contractor. These allowances shall be in amounts not exceeding one hundred percent (100%) of the net cost to the Contractor of the material f.o.b. the work site and from such allowances there shall be retained the percentages regularly provided for in connection with partial payments.

At the option of the Engineer, no allowances for materials shall be made on any partial estimate unless the total allowable value for all materials on hand is at least one thousand dollars (\$1,000) and no allowance shall be made upon any single class of material the value of which is not at least five hundred dollars (\$500). The inventory of materials for which advances are requested shall be kept to a reasonable size as approved by the Engineer. No allowance shall be made upon fuels, supplies, forms, lumber, falsework,

or other materials, or on temporary structures of any kind, which will not become an integral part of the finished construction.

As a basis for determining the amount of advances on material, the Contractor shall make invoices available to the Engineer, together with evidence of payments, insurance, freight bills, and other information concerning the materials in question, as the Engineer may request. Should there be reasonable evidence, in the opinion of the Engineer, that the Contractor is not making prompt payments for material on hand, allowances for material on hand will be omitted from partial payment.

Article 7.8 Allowance for Materials Left on Hand

Materials not required by the unit or lump sum prices named in the bid but delivered to the work at the order of the Engineer but left unused due to changes in plans, will, if the materials are not practicably returnable for credit, be purchased from the Contractor by the CBS at an actual cost (without percentage allowance or profit), and shall thereupon become the property of the CBS.

Article 7.9 Final Estimate and Payment

Upon completion of the work, final inspection, and issuance of a Certificate of Completion by the CBS, the Engineer will accept request for the Final Payment in accordance with the schedule outlined in Article 7.6 Progress Payments.

When Contractor considers the work ready for Final Completion, he shall forward to Project Representative an application for final payment including (1) an affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the work have been paid or otherwise satisfied, (2) consent of surety, if any, to payment, and, (3) irrevocable, notarized proof of payment and relinquishment of claim against Owner, issued by every subcontractor (whether or not in privity with Contractor), material supplier and other party who might assert a claim against Owner (4) The Contractor shall include with his final pay estimate request a letter of certification from the Alaska Department of Labor that all employee's wages and employment security taxes have been paid to his employees and the employees of his subcontractors. Project Representative and Owner shall promptly inspect the work to see that it is fully performed and complete, that all portions of the work are acceptable and that the contract is fully performed. After Project Representative has made a determination that these requirements have been met, he shall prepare and recommend that Owner issue a Certificate of Final Completion and Final Payment.

Engineer's approval of Final Payment constitutes an additional representation by Engineer to Owner that to the best of Engineer's knowledge and information, all conditions that Contractor must fulfill prior to being entitled to Final Payment have in fact been fulfilled in accordance with the contract documents

If any party refuses to relinquish its claim, or if Owner considers that any item or portion of the work: (1) is of doubtful acceptability under the contract documents; or (2) may diminish the value of the work; or (3) may prove to be ultimately unreliable; or (4) may prove to be less functional than required by the intent of the contract, then Owner, in lieu of refusing Final Payment to Contractor, may allow Contractor to furnish a bond in a form and in an amount satisfactory to indemnify Owner against losses occasioned thereby. If any additional costs to settle the claim or to correct work of doubtful quality accrue to Owner in excess of the indemnity available to Owner, Contractor shall refund to Owner all differences and costs which Owner might be compelled to pay, including all litigation costs and reasonable attorney fees.

Acceptance of final payment by Contractor constitutes an explicit waiver of all claims that Contractor might assert against Owner except those previously made in writing and identified by Contractor as unsettled at the time of the Application for Final Payment.

Final Payment to Contractor shall constitute a waiver of all claims which Owner might assert except those arising from: (1) unsettled claims; (2) faulty or defective work (3) failure of the work to comply with the requirements of the contract documents; (4) warranties required by this contract or that by their terms do not expire upon completion of the contract.

Final payment shall not be made until the Certificate of Compliance has been received as per Section 10.08, Certificate of Compliance.

Final payment shall be subject to the conditions of the Performance and Payment Bond, legal and contractual rights of the CBS, required warranties, and correction of faulty construction after final payment. The CBS shall have the right to retain from any payment then due the Contractor, so long as any bills or claims remain unsettled and outstanding, a sum sufficient, in the opinion of the CBS, to provide for the payment of the same. It is also understood and agreed that, in case of any breach by the Contractor of the provisions hereof, the CBS may retain from any payment or payments, which may become due hereunder, a sum sufficient, in the opinion of the CBS, to compensate for all damages occasioned by such breach, including in such damages any damages arising out of delay on the part of the Contractor.

Article 7.10 Suspension of Payments

No partial or final payment shall be made as long as any order made by the Engineer to the Contractor in accordance with the specifications remains in noncompliance.

Article 7.11 Correction of Work After Final Payment

Neither the final certificate of completion nor final payment nor progress payment shall relieve the Contractor from responsibility for paying all costs resulting from faulty materials or workmanship supplied under this Contract, and unless otherwise specified, he shall remedy any defects due thereto and pay for any damage to other work resulting therefrom, which appear within a period of one year from the date of final acceptance. The CBS shall give notice of observed defects with reasonable promptness. The Contractor shall initiate corrective action within five (5) days after written notification from the CBS. The Contractor's Surety will be notified of any existing defects not corrected within the above specified time.

Article 7.12 Payments

Payments under the Contract shall be paid in cash by the CBS unless otherwise provided by the Special Provisions of these specifications.

SECTION 10.08 CERTIFICATE OF COMPLIANCE

No final payment shall be made until the Contractor shall file with the Engineer, prior to acceptance of the work, a notarized Certificate of Compliance in the form substantially as follows: "I (we) hereby certify that all work has been performed and materials supplied in accordance with the plans, specifications and Contract Documents for the above work, and that:

Not less than the prevailing rates of wages, as required by the Alaska State Statute, have been paid to laborers, workmen, mechanics, or others employed on this work;

There have been no unauthorized substitutions of Subcontractors; nor have any subcontracts been entered into without the names of the Subcontractors having been submitted to the Engineer prior to the start of such subcontractor work;

No Subcontract was assigned or transferred or performed by any Subcontractor other than the original Subcontractor, without prior notice having been submitted to the Engineer together with the names of all Subcontractors;

All claims for material and labor and other service performed in connection with these specifications have been paid;

All monies due the State Industrial Accident Fund, the State Unemployment Compensation Trust Fund, the State Tax Commission, Hospital Associations and/or others have been paid."

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STANDARD GENERAL PROVISIONS

SECTION 15.01 MOBILIZATION/DEMOBILIZATION

Article 1.1 Scope of Work

This item shall consist of preparatory work and operations, including, but not limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to the project site; and for all other work and operations which must be performed, or costs incurred, prior to beginning work on the various items on the project, and for similar activities associated with demobilization, including submittals, certificates, reports, warranties, etc.

Article 1.2 Method of Measurement

Payment for mobilization/demobilization will be made in partial payments as follows:

1. When 4 percent of the original contract amount is earned from other bid items 40% of the amount of mobilization, or 4 percent of the original contract amount, whichever is lesser, will be paid.
2. When 8 percent of the original contract amount is earned from other bid items, 80% of the amount of mobilization, or 8 percent of the original contract amount, whichever is lesser, will be paid.
3. Any remaining balance of the amount bid for mobilization and demobilization will be paid in the final payment for work under this contract.

Article 1.3 Basis of Payment

Mobilization will be paid at the contract lump sum bid. No adjustments shall be made in the contract price for mobilization/demobilization due to overruns in pay item quantities.

Payment will be made under:

ITEM	UNIT
Mobilization/Demobilization	Lump Sum

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CONSTRUCTION SPECIFICATIONS FOR EARTHWORK

SECTION 20.01 GENERAL

Article 1.1 Scope of Work

The Work covered by these Specifications consists of providing all plant, labor, equipment, supplies, material, transportation, handling, and storage, and performing all operations pertaining to the: 1) Construction of subbase for parking lots, streets, alleys, curbs, gutters, sidewalks and bike trails, 2) Construction for all trench excavation, backfill, bedding, and sub-bedding material for utility installation; and 3) Excavation and backfill for building structures and retaining walls.

Article 1.2 Definitions

a. Backfill

Material placed in an excavated area.

b. Bedding

Ground or support in which pipe is laid.

c. Rock Excavation

Rock excavation shall involve igneous, metamorphic and sedimentary rock that cannot be excavated without blasting or the use of rippers. Rock is defined as bedrock and boulders in excess of four (4) cubic yards.

d. Borrow

Material used as fill and/or backfill which is obtained from a source other than required excavation.

e. Compaction

Tamping by hand or machine to achieve required density in soils.

f. Disposal Site

Any area where waste from construction is placed.

g. Excavation

Area or material removed to provide a suitable base for improvement.

h. Fill

Fill is considered to be material placed above the original or natural ground line.

i. Non-Frost Susceptible Material

Non-organic soil containing less than 3% by weight of grains smaller than .02 mm obtained from minus 3" material.

j. Subbase

The subbase is that material which is placed above the subgrade and below the leveling course.

k. Subgrade or Bottom Excavation

The subgrade is that material below the bottom of excavation and upon which the subbase material is placed.

l. Trench

Any excavation for a utility or drainage system.

m. Unsuitable or Unusable Material

Unsuitable or unusable material may consist of any material which in the opinion of the City is inadequate for use in the proposed construction.

Article 1.3 Applicable Standards

The latest revision of the following standards of the American Society for Testing and Materials (ASTM) and the American Association of State Highway Transportation Officials (AASHTO) are hereby made a part of these specifications:

ASTM C-29	Test for Unit Weight of Aggregate
ASTM C-117	Test for Materials Finer than No. 200 Sieve in Aggregates by Washing
ASTM C-131	Test for Resistance to Abrasion of Small Size Coarse Aggregate by Use of the Los Angeles Machine
ASTM C-136	Test for Sieve or Screen Analysis of Fine and

	Course Aggregates
ASTM D-422	Test for Particle Size Analysis of Soil
ASTM D-424	Test for Plastic Limit and Plasticity Index of Soils
AASHTO M-147	Materials for Aggregate and Soil-Aggregate Subbase, Base, and Surface Courses
AASHTO T-180-D	Test for Moisture-Density Relations of Soils
AASHTO T-205	Test for Field Determination of Density of Soil In-Place
AASHTO T-238	Test for Density of Soil In-Place by Nuclear Method

Article 1.4 Equipment

All equipment, tools, and machines used in the performance of the Work covered by these Specifications shall be subject to the approval of the City and shall comply with all applicable safety requirements. All equipment used on the project shall be adequately maintained and shall be the proper equipment for the Work being accomplished so as to produce the result required by the Contract Documents.

Article 1.5 Compaction Standards

The required density of fill and backfill shall meet the requirements as outlined in Section 20.05 Classified Fill and Backfill, Article 5.3 Construction, and Section 20.14 Mechanical Compaction, Article 14.2 Construction, of this Division. In areas outside of road rights-of-ways, the density shall be as required by the Contract Documents or as directed by the City.

Where compaction density is specified, the maximum density shall be determined in accordance with the current requirements of AASHTO Standard Method T-180-D.

The Diameter of the test mold in AASHTO T-180 Method D limits the size of particles which may be included in the test to that passing the 3/4-inch sieve. In those instances where the particles are retained on the 3/4-inch sieve, a correction must be applied to the standard laboratory density prior to calculating the percent compaction. To expedite field result the plus 3/4-inch material may be sieved wet and the weight computed as a percent of the total weight of the material from the hole. The corrected laboratory density shall be computed in each instance by the formula:

$$\text{Corrected Lab Density} = \frac{62.4}{\frac{A}{C} + \frac{62.4(B)}{rD}}$$

Where: A = Percent by weight of original material retained on the 3/4" sieve, expressed as a decimal.

B = Percent by weight of original material passing the 3/4" sieve, expressed as a decimal.

C = Specific gravity of +3/4" material (apparent specific gravity) as determined by AASHTO T-85.

D = Uncorrected laboratory density (minimum 3/4" material).

r = Coefficient with value depending A, as follows:

for $A = 0.18$ or less, $r = 1.00$

$A = 0.19$ or more, $r = 1.036 - 0.2A$

Article 1.6 Subsurface Investigation

Information pertaining to subsurface exploration, borings, test pit locations, and other preliminary investigation may appear in the Bidding Documents or be available at selected locations for review by the Bidder. This information was acquired for design purposes only and is not considered adequate for construction. The Owner does not warrant the correctness of the soils investigation or of any interpretation, deduction, or conclusion given in the report relative to subsurface conditions. The Bidder shall make his own deductions and conclusions as to the nature of the materials to be excavated, the difficulties of making and maintaining the required excavations, the difficulties which may arise from subsurface conditions, and of doing any other Work affected by the subsurface conditions, and shall accept full responsibility thereof.

Article 1.7 Weather Limitations

Unless otherwise authorized by the Engineer, fill and backfill material, subbase, and base course shall not be placed when the atmospheric temperature is below 35 degrees Fahrenheit. When the temperature falls below 35 degrees Fahrenheit, it shall be the responsibility of the Contractor to protect all areas of completed Work against any detrimental effects. Any areas of Work not completed in accordance with the Contract Documents that are damaged by weather shall be reconditioned, reshaped, and recompact by the Contractor in conformance with the requirements of the Contract Document without additional cost to the Owner.

Article 1.8 Underground Utilities

Underground utilities shall be continuously supported during backfill placement and compaction. During backfill placement and compaction, geotextile fabric shall be placed with a minimum 12-inch separation from underground utilities, unless directed otherwise by the Engineer.

SECTION 20.02 CLEARING AND GRUBBING

Article 2.1 General

The Work under this Section consists of performing removal of all vegetation, brush, trees, logs, tree stumps, roots, and root mat to a Contractor provided disposal site and the preservation from damage of all items designated to remain. Limits of clearing and grubbing shall be in conformance with right-of-way easements, and stipulations, and as staked by the Engineer.

Article 2.2 Construction

The Contractor shall do all clearing and grubbing necessary in the construction of roadways, bike trails, and utilities. Trees, brush, roots, and root mat removed in the clearing, and grubbing operations shall be hauled to a disposal site provided by the Contractor.

Article 2.3 Measurement

The measurement of clearing and grubbing shall be by the acre or portion thereof as staked by the Engineer or by lump sum for the areas shown on the drawings.

Article 2.4 Basis of Payment

Payment for this Work shall be in accordance with Division 10.00 Standard General Provisions, Section 10.07 Measurement and Payment, of this Specification, and shall include full payment for all Work described in Section 20.02.

Payment shall be made under one of the following units:

ITEM	UNIT
Clearing and Grubbing	Acre
Clearing and Grubbing	Lump Sum

SECTION 20.03 CLEARING

Article 3.1 General

The Work under this Section consists of clearing the areas staked by the Engineer or shown on the drawings of all logs, trees, brush, and other vegetation, and removal to a Contractor provided disposal site, and the preservation from damage of all items designated to remain.

Article 3.2 Construction

The Contractor shall perform all clearing necessary within the areas staked by the Engineer. All stumps shall be cut off a maximum of two inches (2") above the ground. With prior approval of the Engineer, chipping may be an acceptable alternate to clearing and hauling away of spoils.

Clearing for bike trails - Overhanging limbs shall be pruned and treated to give a 6-foot clear corridor on either side of the centerline with a 9-foot clearance above finished trail. Where filter fabric is specified, the stumps shall be cut flush with existing ground, or fill material may be placed to create a level surface for fabric placement.

Clearing for sidewalks/curb ramps - Overhanging limbs and other vegetation shall be pruned and treated to give full clearance of the sidewalk to a minimum height of 9' above the outside edges of the sidewalk.

Article 3.3 Measurement

The measurement of clearing shall be measured by the acre or portions thereof as staked by the Engineer or as shown on the drawings. On a lump sum basis, measurement will not be made. Clearing for bike trails shall be measured by lineal feet along the centerline of the trail.

Clearing for sidewalks shall be measured by linear feet along the centerline of the sidewalk.

Article 3.4 Basis of Payment

Payment for this Work shall be in accordance with Division 10.00 Standard General Provisions, Section 10.07 Measurement and Payment, of this Specification, and shall include full payment for all Work described in Section 20.03.

Payment shall be made under the following units:

ITEM	UNIT
Clearing	Acre
Clearing for Bike Trail	Linear Feet
Clearing	Lump Sum

Clearing for Sidewalk/Curb Ramp

Linear Feet

SECTION 20.04 EXCAVATION FOR TRAFFIC WAYS

Article 4.1 General

This item consists of furnishing all plant, labor, equipment, supplies, and material in performance of all operations pertaining to the excavation of unsuitable and/or surplus material for street, alleys, access roads, parking lots, sidewalks, curbs, gutter, and bike trails.

Article 4.2 Survey Stakes

The Engineer will place control stakes on each side of, and beyond the limits of, the proposed excavation. Stakes will be set at grade breaks and on even grades at intervals not to exceed fifty (50) feet, with additional stakes on vertical curves. These shall be marked with the station, offset, and show the cut or fill to centerline or grid design grade.

Article 4.3 Miscellaneous

Public property lying within the right-of-way, such as signs and markers, that interferes with construction shall be removed and reset at the time and place as directed by the Engineer. Any damage by the Contractor shall be repaired or the item replaced in kind at the Contractor's expense.

Existing culverts to be salvaged shall be removed in a workman-like manner and delivered to a site as directed by the Engineer.

A disposal site for non-salvageable materials shall be provided by the Contractor.

All existing valve boxes, cleanouts, manholes, etc., shall be located and exposed by the Contractor and carefully protected during the course of the Work. The Contractor, in conjunction with the Engineer, shall check all utilities prior to the start of the construction and record their condition. All manholes, catch basins, cleanouts, etc., will be checked for damage resulting from the Contractor's operation prior to final acceptance by the Owner. The Contractor is responsible for restoring all existing utilities to pre-existing conditions, and shall coordinate with the affected utility in having any necessary repairs completed.

All existing utilities requiring adjustment to grade shall be adjusted by the Contractor in accordance with the applicable Standard Details. Payment for such adjustment shall be as specified under the applicable section of these Specifications.

Article 4.4 Unusable and Usable Excavation

Unusable excavation shall consist of all excavation which is excess or not suitable for classified fill or backfill as determined by the Engineer.

Usable excavation shall consist of material from excavation that is designated by the Engineer as suitable for fill or backfill.

If usable soil conditions are encountered at elevations different from those indicated on the Drawings, the Engineer may direct, in writing, that the excavation be carried to elevations either above or below those specified.

Any unauthorized excavation beyond the specified lines, grades, and cross sections shall be filled with classified fill or backfill and compacted without additional cost to the Owner. The Contractor shall control the banks of all excavated areas as necessary to prevent movement of soil in areas supporting existing foundations, slabs, poles or other structures.

Where unusable soils are encountered in the subgrade within the specified depth below finish grade, as indicated on the Drawings, the Contractor shall excavate to a depth such that usable soils are uncovered or the depth below finished grade as directed by the Engineer. The excavations shall be uniformly shaped so that classified backfill material can be properly placed and compacted. The area shall be feathered to adjoining areas where usable material is found. Excavated area shall not be backfilled until the Engineer has taken cross sectional elevations and measurements of the area excavated.

It shall be the responsibility of the Contractor during construction to keep all embankments and excavation well shaped and drained. The subgrade shall be maintained, compacted in cut sections if required, and kept free of leaves, sticks, or other debris.

The Contractor shall perform whatever work necessary to prevent flow and accumulation of surface water or ground water in excavations. Unless otherwise provided in the Special Provisions, all Work associated with pumping or dewatering shall not be paid for directly, but shall be considered as subsidiary obligation of the Contractor.

Article 4.5 Utilization or Disposal of Excavated Material

Excavated material conforming to the specifications for fill and backfill shall be used where practical for fill and backfill as directed by the Engineer. When this material is used, it shall be considered usable excavation. Usable excavation shall be compacted in accordance with Section 20.14 Mechanical Compaction, of this Division. When not used on the Project site, the material shall be hauled away and treated as unusable excavation. Unless otherwise specified in the Special Provisions, the Contractor will not be required to transport usable excavation from one schedule of a Contract for use in another schedule of the same Contract unless they are continuous or adjacent.

Article 4.6 Excavation

The Contractor shall utilize whatever methods and equipment necessary to excavate to the limits designated by the Drawings and Specifications and authorized by the Engineer, except that no

equipment or method may be utilized that because of its action deteriorates the subgrade making additional excavation necessary beyond the limits originally authorized.

Article 4.7 Measurement

The measurement of excavation will not include water or other liquids but will include topsoil, mud, muck, or other similar semi-solid material which cannot be drained or pumped away.

Usable excavation will be measured per cubic yard in place by cross section or at the option of the Engineer per cubic yard by truck count. Computation of truck volumes will be by actual measurement to arrive at truck loading, adjusted by an appropriate swell factor.

Unusable excavation will be measured per cubic yard by cross section, or per ton; or at the option of the Engineer per cubic yard by truck count. Computation of truck volumes will be by actual measurement to arrive at truck loading, adjusted by an appropriate swell factor.

Cross-section measurement of usable or unusable excavation shall be based on in-place volumes as determined by the average end areas of cross sections. Where impractical to measure material by the average end area method, the Engineer may approve other acceptable methods involving three-dimensional measurements.

For all scale measured quantities, the Contractor shall furnish a scale certified by the State of Alaska for weighing excavation at a location agreeable to the Engineer. Weight tickets will be serialized and witnessed at the time of weighing by a Contractor-furnished weighman. The Engineer may at any time verify load weights and weighing process. Tickets shall be presented for each load at time of delivery to the Engineer or his designated representative.

Article 4.8 Basis of Payment

Payment for this Work shall be in accordance with Division 10.00 Standard General Provisions, Section 10.07 Measurement and Payment, of this Specification, and shall include full payment for all Work described in Section 20.04.

Payment shall be made under the following units:

ITEM	UNIT
Usable Excavation	Cubic Yard
Unusable Excavation	Cubic Yard
Unusable Excavation	Ton
Usable Excavation (bedrock)	Cubic Yard

SECTION 20.05 CLASSIFIED FILL AND BACKFILL

Article 5.1 General

The Work under this Section consists of performance of all operations pertaining to the placement of classified fill and backfill.

Article 5.2 Material

Classified fill and backfill shall contain no lumps, frozen material, organic matter, or other deleterious matter. It shall have a plasticity index not greater than six (6) as determined by ASTM D-424 and shall conform to one of the following types as required by the Drawings and Specifications:

- a. Subbase, Grading B

Materials furnished by the Contractor for use as Subbase, Grading B shall be graded within the limitations of Table I delineated below.

TABLE I

<u>U.S. Std. Sieve</u>	<u>Cumulative % Passing by weight</u>
2"	100
3/4"	70-100
#4	30-70
#10	20-50
#40	10-30
#200	*2-6

* In addition to the grading limits listed above, the fraction of material passing the #200 sieve shall not be greater than 15% of that fraction passing the #4 sieve.

- b. Selected Material, Type A

Materials furnished by the Contractor for use as Selected Material, Type A classified fill and/or backfill shall contain no muck, frozen material, roots, sod or other deleterious matter. It shall be well-graded sand, gravel, or shot rock with a maximum particle size of 12" in diameter and a plasticity index not greater than 6 as determined by AASHTO T 90. It shall have 20-55% by weight of particles passing the #4 sieve and not more than 6% by weight of particles that pass the #200 sieve as determined by AASHTO T-27/T-11. Percents passing will be determined on minus 3-inch material.

Article 5.3 Construction

The subgrade shall be cleared of all debris and organic material. All depressions or holes below the general area surface level, whether caused by removal of debris or unacceptable material, or otherwise, shall be backfilled with approved material and compacted to specified density and to a level, uniform surface before the placement of other layers. Embankment shall not be placed on frozen ground, nor on ground having a slope greater than one vertical to four horizontal (slope 1:4).

The specified material shall be constructed at the locations and to the lines and grades indicated on the Drawings. The material shall be placed and spread uniformly in successive layers not exceeding twelve (12) inches (or maximum particle diameter) in loose thickness. The Engineer may approve lifts of greater thickness provided the equipment and method used will consistently achieve the specified density. The layers shall be carried up full width from the bottom of the fill to avoid the necessity of widening the edges after the center has been brought to grade. Each layer shall be compacted to not less than ninety-five (95) percent of the maximum density at optimum moisture as determined by the method of testing noted in Section 20.01 General, of this Division. Reasonable time shall be provided the Engineer to make field density determinations prior to placement of successive layers of material.

Blading, rolling, and tamping shall continue until the surface is smooth, free from waves and irregularities, and conforms to elevations shown on the Drawings. If at any time the material is excessively wet, it shall be aerated by means of blade graders, harrows, or other suitable equipment until the moisture content is satisfactory. The surface shall then be compacted and finished as specified above.

Portions of any layer in which the embankment material becomes segregated shall be removed and replaced with satisfactory material or shall the Engineer direct, be added to and remixed to secure proper gradation. No separate payment will be made for any material removed or re-graded in areas where material becomes segregated. Oversize material shall be removed.

The Engineer may permit lifts in excess of 12" thickness when fill or backfill is placed over swampy or saturated ground, or where he is satisfied that the Contractor's method and equipment will consistently produce the specified density.

Embankments for bike trail sections will be brought to grade in one (1) single lift for embankments less than eighteen (18) inches to finish grade. Trail embankments over eighteen (18) inches shall be brought to grade in lifts as directed by the Engineer.

Article 5.4 Measurement

Classified fill or backfill material, obtained from borrow pits, will be measured per ton (2000 lbs.) or per cubic yard (cy) of material in place in accordance with these Specifications.

Per ton measurement may include moisture up to a maximum of 4.0% of dry weight of the material. When tests by the Engineer indicate that moisture contents in excess of 4.0% may be occurring

consistently, the frequency of testing will be increased as necessary and the results averaged over a period of one week. When this average is greater than 4.0%, the tonnage, as measured over the above period, shall be reduced by the difference. No credit will be due the Contractor when moisture content is less than 4.0%. Testing will be done in accordance with standards previously provided. Classified fill or backfill will be weighed on a scale certified by the State of Alaska. Weight tickets will be serialized and witnessed at the time of weighing by a Contractor-furnished weighman. The Engineer may, at any time, verify load weights and the weighing process. The Contractor and the Engineer shall verify daily the quantity of material delivered to the Project site. Weight tickets not presented at time of delivery will require special verification by the Contractor before payment can be made.

Where measured by the cubic yard, classified fill or backfill shall be measured in place by the average end area method. Where impractical to measure material by the average end area method, the Engineer may approve other acceptable methods involving three-dimensional measurements.

Where excavation of unsuitable material beyond the lines and grades shown on the plans is ordered in writing, the measurement of classified backfill will include the material required for replacement. No measurement will be made for quantities placed beyond the lines and grade authorized or for quantities placed outside the limits of required excavation.

Article 5.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10.00 Standard General Provisions, Section 10.07 Measurement and Payment, of this Division described in Section 20.05.

Payment shall be made under the following units:

ITEM	UNIT
Selected Material, Type A Classified Fill and Backfill	Ton
Subbase, Grading B Classified Fill and Backfill	Ton
Selected Material, Type A Classified Fill and Backfill	Cubic Yard
Subbase, Grading B Classified Fill and Backfill	Cubic Yard

SECTION 20.06 BASE COURSE, GRADING D-1

Article 6.1 General

The Work under this Section consists of performing all operations necessary to complete construction of the base course on the prepared subbase.

Article 6.2 Material

Base Course, Grading D-1 shall be crushed stone or crushed gravel, consisting of sound, tough, durable pebbles or rock fragments of uniform quality, shall be free from clay balls, vegetable matter or other deleterious matters and shall meet the following requirements:

<u>PROPERTY</u>	<u>TEST METHOD</u>	<u>MATERIAL REQUIREMENT</u>
Percent of Wear	AASHTO T 96	50 max.
Degradation Value	ATM T-13	45 min.
Percent Fracture	ATM T-4	70 min.
Plastic Index	AASHTO T 90	6 max.

a. Gradation

Base Course, Grading D-1 shall conform to the following gradation limits:

<u>SIEVE SIZE</u>	<u>PERCENT PASSING BY WEIGHT</u>
1"	100
3/4"	70-100
3/8"	50-80
No. 4	35-65
No. 8	20-50
No. 40	8-30
No. 200	*0-6

*In addition to the grading limits stipulated above, fractions passing the No. 200 sieve shall not be greater than 75% of the fractions passing the No. 40 sieve.

Article 6.3 Construction

The base course shall be placed to the lines, grades, and thicknesses shown on the Drawings and shall consist of the materials hereinbefore specified. The base course shall provide a smooth stabilized surface on which to place the pavement.

a. Preparation of Subbase

Subbase preparation shall consist of dressing, shaping, wetting, and compacting of the subbase to a minimum density of 95% in accordance with Section 20.01 General, Article 1.5 Compaction Standards, of this Division. Surfaces shall be cleaned of all foreign substances and debris. Any ruts or soft yielding spots that may appear in the subbase surface shall be corrected by loosening, removing and adding approved material, reshaping, and re-compacting the affected areas to the line, grade, and to the specified density requirements.

b. Surveying

Subbase and base course control stakes shall be wooden blue tops set to finish subbase. The subbase bluetops will be the reference used by the Contractor to set top of base course. Subbase bluetops shall be set at breaks in grade and on even grade at intervals not to exceed fifty (50) feet, with additional stakes at vertical curves. Side control will be from the lip or gutter, or, in the case of strip paving, additional blue tops shall be provided.

c. Placing

The approved base course material shall be deposited and spread in a uniform layer to the required contour and grades and to such loose depth that when compacted to the density required will achieve the specified thickness. The material shall be spread uniformly on the prepared subbase from moving vehicles or spreading boxes, then leveled to the required contour and graded with blade graders. Portions of the layer which become segregated in spreading shall be remixed to the required gradation.

d. Compacting

The base course shall be compacted to at least 95 percent of maximum density. In all places not accessible to the rolling equipment, the mixture shall be compacted with tamping equipment specified hereinbefore. Blading, rolling and tamping shall continue until the surface is smooth and free from waves and inequalities. If at any time the mixture is excessively moistened by rain, it shall be aerated by means of blade graders, harrows or other approved equipment until the moisture content is such that the surface can be recompact and finished as above. The finished base course shall be maintained by the Contractor in the above condition until the pavement is applied.

e. Smoothness Test

The surface of the base course, when finished, shall not show any deviation in excess of 3/8-inch when tested with a ten (10) foot straight-edge applied parallel with and at right angles to the centerline of the area to be paved. Any deviation in excess of this amount shall be corrected by loosening, adding, or removing material and reshaping and compacting to satisfy the above requirement.

Article 6.4 Measurement

Base Course, Grading D-1 will be measured per ton (2000 lbs.) or per cubic yard (cy) of material in place in accordance with these Specifications.

Per ton measurement may include moisture up to a maximum of 4.0% of dry weight of the material. When tests by the Engineer indicate that moisture contents in excess of 4.0% may be occurring consistently, the frequency of testing will be increased as necessary and the results averaged over a period of one week. When this average is greater than 4.0%, the tonnage, as measured over the above period, shall be reduced by the difference. No credit will be due the Contractor when moisture content is less than 4.0%. Testing will be done in accordance with standards previously provided. Base Course, Grading D-1 will be weighed on a scale certified by the State of Alaska. Weight tickets will be serialized and witnessed at the time of weighing by a Contractor-furnished weighman. The Engineer may, at any time, verify load weights and the weighing process. The Contractor and the Engineer shall verify daily the quantity of material delivered to the Project site. Weight tickets not presented at time of delivery will require special verification by the Contractor before payment can be made.

Where measured by the cubic yard, Base Course, Grading D-1 shall be measured in place by the average end area method. Where impractical to measure material by the average end area method, the Engineer may approve other acceptable methods involving three-dimensional measurements.

Article 6.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10.00 Standard General Provisions, Section 10.07 Measurement and Payment, of this Specification, and shall include full payment for all Work described in this Section 20.06.

Payment shall be made under the following unit:

ITEM	UNIT
Base Course, Grading D-1	Ton
Base Course, Grading D-1	Cubic Yard

SECTION 20.07 TRENCH EXCAVATION AND BACKFILL

Article 7.1 General

The Work under this Section consists of providing all materials and performance of all operations pertaining to items of work involved in excavation, bedding, backfill, and compaction of trenches. When unsuitable or surplus material is removed from the job site, it will be paid for under the appropriate item. When material is imported, it will be paid for under the appropriate item.

The Contractor is subject to the same utilities check requirements as described under Section 20.04 - Excavation for Traffic ways, Article 4.3 Miscellaneous, of this Division.

Article 7.2 Trench Excavation and Backfill - Description

This Work shall consist of all excavation and backfill of trenches as specified for pipe installation and all other miscellaneous items as specified in this section.

a. Trench Section

Trench depth shall be as shown on the Drawings specified, and as staked in the field. Trench width at or below the top of the pipe shall be of a width that will allow compaction equipment to be utilized at the sides of the pipe. Trenches shall be of the necessary width for proper laying of pipe, conduit, or cable and the banks shall be sloped so as to conform to the prevailing safety requirements.

Trench depth shall be excavated not less than 6 inches below the barrel of the pipe unless otherwise directed by the Engineer. Where maximum trench width is limited, as shown on the plans, the Contractor shall provide trench shoring or supports systems as necessary to insure that the trench width does not exceed the established limits. The Contractor shall erect and maintain continuous trench barricades to prevent access around all excavations left open at the end of the work day. The Contractor shall provide and maintain adequate barricades to insure public safety at all times during the prosecution of the Work. All excavated material shall be stockpiled on geotextile fabric to limit damage to the existing vegetation.

Article 7.3 Construction

a. Trench Excavation

The Contractor shall perform all excavation of every description and whatever substance encountered including rock. Excavation will be to the extent indicated on the Drawings, and as staked in the field. All excavated materials for backfill shall be placed in an orderly manner and placed at a distance from the trench section that conforms to all State and/or Federal Safety codes.

All excavated organic or other unsuitable backfill materials shall be placed in a similar manner, but shall be kept separate from all excavated sandy, silty, or gravelly material. In addition, excavated materials suitable for bedding, sub-bedding or Selected Material, Type A shall be stockpiled separate from each other.

Time is of the essence; therefore, the Contractor shall not begin excavation of the trench until all materials, equipment, and personnel are present to complete the Work in the most expedient manner. Not more than two hundred (200) feet of trench shall be open in advance of pipe or conduit installation unless authorization, in writing, is obtained from the Engineer. Unless otherwise indicated in the Drawings and Specifications, all excavation will be open cut. There shall be no more than 10 feet of open trench at the end of the Work day, unless approved by the Engineer.

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 to prevent material from sloughing or sliding back into the trench; except that when the trench is in a traveled roadway the Engineer may require removal and temporary storage of excavated material elsewhere.

Material unsuitable for use as backfill shall be hauled to a Contractor furnished disposal site off the project, unless otherwise directed in writing by the Engineer. The Contractor is responsible for securing waste disposal sites if none are indicated on the plans. 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.

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.

If explosives are used, the Contractor shall obtain all necessary permits and comply with all pertinent regulations. All utility companies shall be informed a minimum of 48 hours prior to the use of explosives in the vicinity of their facilities.

Where rock is encountered, it shall be removed as shown on the Drawings or as directed by the Engineer, and shall be replaced with approved material.

b. Dewatering of Trench

Trench de-watering shall be required to protect adjacent utilities and property and to successfully install the new utility lines. Contractor shall dispose all water from trench de-watering in accordance with CBS requirements, and an ADEC-approved de-watering plan. All ground water shall be screened to prevent debris from entering creeks, lakes, ponds, wetlands areas, and drainage systems. When de-watering is

required during the course of construction, Contractor shall submit an ADEC-approved de-watering plan and permit prior to any de-watering activity.

Acceptance of Contractor's De-watering Plan by the Engineer shall not relieve Contractor of his/her responsibilities for the exercise of reasonable precaution, sound engineering judgment, prudent construction practices, overloading or misuse of existing or new structures, the adequacy and safety of any such works, and potential damage or undermining of existing or completed works.

c. Bedding

All pipe shall be placed in bedding, as specified.

Bedding material shall conform to the material requirements of C-1 Bedding or D-1 Bedding, Section 20.11 of this Division.

Where bedding material is available from trench excavation, the Contractor shall use care to separate it from unsuitable material. Bedding material shall be placed under and around the pipe in lifts not to exceed 6", and compacted to 95% of maximum density. In no case shall bedding material be placed above the spring line of the pipe in a single lift.

Where bedding materials are encountered in the trench bottom, the trench shall be accurately graded to provide uniform bearing and support for each section of the pipe for its entire length, except for the portion of the pipe sections where it is necessary to excavate for the bell holes and other type joints and for the proper sealing of the joints. Bell holes and depressions for joints shall be dug after the trench bottom has been graded and, in order that the pipe will rest on the prepared bottom for as nearly its full length as practical, bell holes and depressions shall be only of such length, depth, and width as required for properly making the particular type of joint. Where unsuitable material such as, but not limited to hard pan or rock is encountered, the trench shall be over-excavated so a minimum of six inch depth of bedding material is required to bring the trench bottom up to the specified grade. This bedding material shall be compacted to 95% of maximum density prior to the installation of the pipe. If the Engineer determines that excavated material is unsuitable for bedding, he may direct the Contractor to "Furnish Bedding Material."

d. Trench Backfill

Trench backfill is defined as the placement of material above the level of bedding material. Material for backfill shall be obtained from trench excavation if the material is suitable or conforms to the specifications for backfill. If the Engineer determines that excavated material is unsuitable for trench backfill, he may direct the Contractor to "Furnish Imported Trench Backfill." The backfill and/or imported backfill shall be compacted to 95% of optimum density within road prisms and 90% elsewhere, as determined by AASHTO T 180-D. Lifts shall not exceed eight 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 the project. Backfill shall not contain broken

bituminous pavement or Portland Cement Concrete, and shall be placed in accordance with Article 5.3 of Section 20.05 of this Division.

e. Cleanup

This item consists of cleanup and finishing of all construction areas to their original condition or better. All Work shall be in accordance with Division 10.00 Standard General Provisions, Article 5.25 Final Trimming of Work, of this Specification.

Article 7.4 Measurement

Measurement of trench excavation and backfill will be per linear foot of horizontal distance for the various depths as set forth in the Bid Schedule. On sanitary sewer and storm drain construction, measurement will be from center to center of manholes, from center of manhole to center of catch basins, from center of manhole to center of cleanout wye, from center of manhole to end of outfall piping. On all other construction, measurement will be from station to station as shown on the Drawings. Trench depth shall be measured from original ground to the bottom of bedding along centerline of pipe. If the trench excavation is performed under the same Contract with a roadway project, the depth of trench shall be measured from the bottom of bedding to the subgrade as it exists after the excavation necessary under the roadway project is complete.

Article 7.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10.00 Standard General Provisions, Section 10.07 Measurement and Payment, of this Specification and shall be full payment for Work described in section 20.07.

Payment shall be made under the following units:

ITEM	UNIT
Trench Excavation and Backfill (various depths)	Linear Foot
Trench Excavation and Backfill (various depths)	Cubic Yard
Trench Excavation and Backfill (all depths)	Linear Foot
Trench Dewatering	Lump Sum

SECTION 20.08 TRENCH EXCAVATION, BACKFILL AND COMPACTION FOR WATER SERVICE CONNECTIONS

Article 8.1 General

The Work under this Section consists of performing all operations necessary for excavation, backfill, and compaction required for water service connections and all other miscellaneous items as specified in this section. All mains shall be chlorinated, flushed, and pressured tested by the Contractor before service connections are made.

The connection to a CBS Water Utility main water supply shall be installed in a manner consistent with the Standard Details. A water service line shall not cross property lines of adjoining lots. The key box shall be installed no closer than (5') five feet from adjoining property lines. The permit shall be posted and available at the time of inspection. Installation of water service connection shall be in accordance with Division 60.00 Standard Construction Specifications for Water Systems.

Article 8.2 Construction

a. Excavation

Excavation for water service connections shall be unclassified and the Contractor shall excavate all substances encountered to the depth required for the connections. However, if rock is encountered in the trench section other than as shown on the Drawings, additional measurement and payment for rock excavation will be in accordance with Section 20.07, Articles 7.4 and 7.5.

Depth for water service connections shall be a minimum of five (5) feet below proposed street grade. Variations in depth from the depth stated above will not be grounds for additional payment. It shall be the Contractor's responsibility to familiarize himself with the depth of water mains for the project. That portion of the right-of-way that extends from the main to the curb stop will be excavated in such a manner that will allow the service connection to be installed horizontally (no slope). The Contractor shall excavate for water connections in such a manner that the excavation is 90 degrees to the street line, whenever possible. The ditch shall be long enough to allow the valve box to be set 1-foot inside the right-of-way from the property line.

Trenches shall be of sufficient width at the bottom to allow for laying of the particular service (minimum two and one-half (2-1/2) feet for single service). Excavation of all fill materials to virgin ground is required to provide safety for workmen utilizing the trench.

The Contractor shall expose the mains to be tapped for distance of four (4) feet in length. Excavation on both sides of the pipe shall be carried to the bottom of the pipe. Excess excavation below required level shall be backfilled with Subbase, Grading B or Selected Material, Type A and compacted at the Contractor's expense as directed by the Engineer.

Sewer and water service pipes maybe installed in a common trench whenever the two pipes are separated by a distance of thirty-six (36) inches horizontally and when the trench width is such that not less than one horizontal foot of compacted backfill is maintained between the pipe and the trench wall.

The Contractor shall be responsible for, and shall bear expenses incurred, in the event that a main should be damaged during excavation or backfilling. The CBS Water Utility will repair all damaged mains; however, the Contractor shall bear the cost of all material, labor, and other expenses thereof.

It shall be the responsibility of the Contractor during construction to keep all embankments and excavation well shaped and drained. The subgrade shall be maintained, compacted in cut sections if required, and kept free of leaves, sticks, and other debris.

The Contractor shall perform whatever work necessary to prevent flow and accumulation of surface water or ground water in trenches. Unless otherwise provided in the Special Provisions, all Work associated with pumping or dewatering shall be considered a responsibility of the Contractor and shall be accomplished at no additional cost to the Owner.

When it is specifically called for on the Drawings or in the Special Provisions of the Contract, the Contractor shall submit as a part of his proposal the method to be used in the dewatering of the trench section.

b. Backfill

At such time as the Engineer may direct, but only after the service lines and appurtenances have been properly completed and inspected, the trenches and appurtenant structures shall be backfilled. The backfill material, free from clods or boulders, shall be placed by the Contractor in conformance with the codes and regulations of the City. Bedding and backfill shall be placed and compacted in conformance with Section 20.07 Trench Excavation and Backfill, of this Division.

The Contractor shall exercise due care in backfilling to keep the service valve box vertical and in place. In the event the service valve box is displaced, the Contractor will be required to excavate and restore the service valve box to proper position. Any Work necessary to restore the service valve box to proper position will be performed at the Contractor's expense.

The material shall be placed and spread uniformly in successive layers not exceeding twelve (12) inches in loose thickness. The Engineer may approve lifts of greater thickness provided the equipment and method used will consistently achieve the specified density. The layers shall be carried up full width from the bottom of the trench to avoid the necessity of widening the edges after the center has been brought to grade. Each layer shall be compacted to not less than 95% of the maximum density at optimum moisture as determined by the method of testing noted in Section 20.01 General, of this Division. Reasonable time shall be provided the Engineer to make field density determinations prior to placement of successive layers of material.

The maximum dimensions of any particle of the embankment material shall not be greater than two-thirds (2/3) of the compacted thickness of the layer in which it is placed. The top six (6) inches of embankment material for streets shall be Base Course, Grading D-1. Oversize material shall be removed. Portions of any layer in which the embankment material becomes segregated shall be removed and replaced with satisfactory material or shall be added to and remixed to secure proper gradation as directed by the Engineer. No separate payment will be made for any material removed or re-graded in areas where material becomes segregated.

The Engineer may permit lifts in excess of 12" thickness when fill or backfill is placed over swampy or saturated ground, or where he is satisfied that the Contractor's method and equipment will consistently produce the specified density. No frozen material shall be used for backfill. Backfill shall not be placed in frozen trench.

c. Notification

The Contractor shall notify the Engineer and the CBS Water Department (48) hours before starting excavation (excluding Saturday, Sunday and holidays) on all service connection requests.

Article 8.3 Measurement

Trench excavation, backfill and compaction for water service connections shall not be measured for payment.

Article 8.4 Basis of Payment

Trench excavation, backfill and compaction for water service connections shall be incidental to Water Service Connection. There shall be no separate basis of payment for this item.

SECTION 20.09 FURNISH IMPORTED TRENCH BACKFILL

Article 9.1 General

The work under this Section consists of performing all operations necessary to furnish imported trench backfill.

Article 9.2 Construction

The Engineer shall order in writing the amount and type of backfill material to be transported to the Project site. No payment will be made for backfill material under this item that has not been ordered in writing. Material hauled to the Project site shall meet the requirements for the type specified as outlined in Section 20.05 Classified Fill and Backfill, Article 5.2 Material, of this Division.

Article 9.3 Measurement

Imported Trench Backfill will be measured per ton (2000 lbs.) or per cubic yard (cy) of material in place in accordance with these Specifications.

Per ton measurement may include moisture up to a maximum of 4.0% of dry weight of the material. When tests by the Engineer indicate that moisture contents in excess of 4.0% may be occurring consistently, the frequency of testing will be increased as necessary and the results averaged over a period of one week. When this average is greater than 4.0%, the tonnage, as measured over the above period, shall be reduced by the difference. No credit will be due the Contractor when moisture content is less than 4.0%. Testing will be done in accordance with standards previously provided. Imported Trench Backfill will be weighed on a scale certified by the State of Alaska. Weight tickets will be serialized and witnessed at the time of weighing by a Contractor-furnished weighman. The Engineer may, at any time, verify load weights and the weighing process. The Contractor and the Engineer shall verify daily the quantity of material delivered to the Project site. Weight tickets not presented at time of delivery will require special verification by the Contractor before payment can be made.

Where measured by the cubic yard, Imported Trench Backfill shall be measured in place by the average end area method. Where impractical to measure material by the average end area method, the Engineer may approve other acceptable methods involving three-dimensional measurements.

Article 9.4 Basis of Payment

Payment for this Work shall be in accordance with Division 10.00 Standard General Provisions, Section 10.07 Measurement and Payment, of this Specification, and shall be full payment for Work described in Section 20.09.

Payment shall be made under the following unit:

ITEM	UNIT
Furnish Imported Trench Backfill (Type)	Ton
Furnish Imported Trench Backfill (Type)	Cubic yard

SECTION 20.10 FURNISH SUB-BEDDING

Article 10.1 General

The Work under this section consists of performing all operations necessary for excavation, backfilling and compacting trenches and sub-bedding materials.

Article 10.2 Materials

Sub-bedding material for backfill shall consist of Subbase, Grading B or Selected Material, Type A Classified Fill and Backfill, as specified.

Article 10.3 Construction

If, in the opinion of the Engineer, the trench material at the bottom of bedding does not furnish a suitable foundation, he may order, in writing, the removal of the unsuitable material to whatever depth he determines, and its replacement with sub-bedding material from borrow. Sub-bedding material shall be placed the full width of trench, in lifts not to exceed 12" in thickness and compacted to 95% of maximum density.

In the event of unauthorized over-excavation, the Contractor shall backfill with sub-bedding material to the proper grade and compact to 95% of maximum density for the full length of the over-excavated trench, all at no additional expense to the Owner.

Article 10.4 Measurement

Where the Contractor is ordered to remove unsuitable material below grade and replace it with sub-bedding material, the material shall be paid for on a cubic yard or ton basis in accordance with Section 20.09 Furnish Imported Trench Backfill.

Article 10.5 Basis of Payment

Payment for the Work shall be in accordance with Division 10.00 Standard General Provisions, Section 10.07 Measurement and Payment, of this Specification, and shall include full payment for all Work described in Section 20.10.

Payment shall be made under the following unit:

ITEM	UNIT
Furnish Sub-Bedding (Type)	Cubic Yard
Furnish Sub-Bedding (Type)	Ton

SECTION 20.11 FURNISH BEDDING MATERIAL

Article 11.1 General

The Work under this Section consists of performance of all operations pertaining to providing Bedding Material for underground utilities.

Article 11.2 Materials

Materials furnished by the Contractor for use as Bedding Material shall conform to the following types as specified:

- 1) C-1 Bedding Material: Aggregate shall be crushed stone or crushed gravel and shall consist of sound, tough, durable pebbles or rock fragments of uniform quality. All material shall be free from clay balls, vegetable matter or other deleterious matters. In addition, aggregate shall meet the following requirements:

<u>PROPERTY</u>	<u>TEST METHOD</u>	<u>MATERIAL REQUIREMENT</u>
Percent of Wear	AASHTO T 96	50 max.
Degradation Value	ATM T-13	45 min.
Percent Fracture	ATM T-4	70 min.
Plastic Index	AASHTO T 90	6, max.

GRADATION

C-1 Bedding Material shall conform to the following gradation limits:

<u>U.S. Standard Sieve Size</u>	<u>Percent Passing by Weight</u>
1-1/2 inch	100
1 inch	70-100
3/4 inch	60-90
3/8 inch	45-75
No. 4	30-60
No. 8	22-52
No. 40	8-30
No. 200	0-6

- 2) D-1 Bedding Material shall meet the material requirements for Base Course, Grading D-1 under Section 20.06 Base Course, Grading D-1 of this Division.

Article 11.3 Construction

Placement of Bedding Material shall conform to the requirements of Section 20.07 Trench Excavation and Backfill of this Division.

Article 11.4 Measurement

Bedding will not be measured for payment, but will be considered incidental to other items of the contract.

Article 11.5 Basis of Payment

There shall be no separate basis of payment for this item.

SECTION 20.12 FURNISH FILTER MATERIAL

Article 12.1 General

This Work under this Section consists of performance of all operations pertaining to providing filter material for French drains.

Article 12.2 Materials

Filter material shall be gravel or sand consisting of crushed or naturally occurring granular material. It shall be free of clay particles and conforming to the following gradation requirements.

REQUIREMENTS FOR GRADING OF FILTER MATERIAL GRADATION (% PASSING)

SIEVE	3	2	1-1/2	3/4	3/8	No.4	No.16	No.59	No.100	No.200
TYPE A				100	95-100	45-80	10-30	0-10	0-3	
TYPE B				100		0-5				
TYPE C		100	95-100	0-20	0-5					
TYPE D	100			70-100		40-100	20-80		0-10	0-3

Foundry sand and other material which may be cementitious or not suitable for water percolation shall not be used.

Article 12.3 Construction

Filter material is defined as the material which is placed below, above, and on each side of a perforated pipe to form a subdrain. Filter material may also be used directly in the trenches without a perforated pipe to form a French drain. Refer to Standard Detail 55-2, of these specifications for construction of a subdrain.

Article 12.4 Measurement

Measurement for filter material shall be per ton of material hauled to the job site.

Article 12.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10.00 Standard General Provisions, Section 10.07 Measurement and Payment, of this Specification, and shall include full payment for all Work described in Section 20.12.

Payment for placing filter material for French drains is included in trench excavation and backfill.

Payment for furnishing and placing filter material for subdrains is included in payment for subdrains.

Payment for this item includes furnishing the required type of filter material.

Payment shall be made under the following unit:

ITEM	UNIT
Filter Material (Type)	Ton

SECTION 20.13 DISPOSAL OF UNUSABLE OR SURPLUS MATERIAL

Article 13.1 General

The Work under this Section consists of performing all operations pertaining to the disposal of unusable or surplus material encountered in the trench excavation. This material may include peat, roots, large rocks, unstabilized soil, cesspools, privy pits or any other material, which in the opinion of the Engineer is objectionable for use as fill or backfill.

Article 13.2 Construction

The Contractor shall use care in separating unusable material from usable material. When unusable material shall be disposed of, the Engineer will order the same in writing, stating the limitations of this Work. Should the trench be, in the opinion of the Engineer, wider than is necessary for the safety of the workmen, a deduction may be made for the excess width. Payment will not be made for disposal of unusable material unless the material is moved in excess of 100 feet from the excavation.

a. Cesspools, Privy Pits and Septic Tanks

If cesspools and privies are encountered in right-of-way areas and have to be removed to allow construction of sewers, the following procedures for removal are to be used.

In the case of a privy encountered, the Contractor shall remove the privy from the right-of-way area and set it over onto the private property where the privy belongs.

In the case of septic tanks, cesspools and privy pits, the liquid sewage and sludge from the cesspool or privy pit shall be pumped into a watertight container and disposed of at a designated manhole. Care shall be exercised in transporting cesspool and privy pit liquids and sludge so that spillage does not occur during transportation and disposal.

The Contractor shall then remove the remaining sludge, cesspool and privy pit logs or cribbing, and any saturated gravel remaining in the trench area, and shall dispose of this material at the Municipal Landfills.

Disposal of this material will be coordinated with the Engineer, in order that the materials disposed of can be covered with fill material by others at the landfill site immediately after it is dumped. Care shall be exercised in transporting this material so that spillage does not occur during transportation and disposal.

Article 13.3 Measurement

The method of measurement for this item will be per cubic yard measured by truck count or by cross section measurement before and after removal of unusable materials. Unless otherwise noted in the Bid Schedule, measurement will be by truck count.

Article 13.4 Basis of Payment

Payment for this Work shall be in accordance with Division 10.00 Standard General Provisions, Section 10.07 Measurement and Payment, of this Specification, and shall include full payment for all work described in Section 20.13.

Payment shall be made under the following unit:

ITEM	UNIT
Disposal of Unusable or Surplus Material	Cubic Yard

SECTION 20.14 MECHANICAL COMPACTION

Article 14.1 General

The Work under this Section consists of the performance of all operations pertaining to mechanically compacting backfill to the specified density.

Article 14.2 Construction

Backfill under traffic and building structures and trench backfill in the public rights-of-way from twelve (12) inches over the top of the pipe to the surface shall be compacted to ninety-five (95) percent of maximum density, unless otherwise noted and approved by the Engineer.

The backfill material shall be placed in horizontal lifts not exceeding twelve (12) inches in thickness and compacted. Any excavations improperly filled shall be reopened to the depth required for proper compaction, then refilled and compacted at the Contractor's expense. The use of water in excess of the quantity required to obtain specified density (optimum moisture content) to settle or compact the backfill will not be permitted.

Mechanical compaction shall be incidental.

SECTION 20.15 PIPE CASING

Article 15.1 General

The Work under this Section consists of performing all operations necessary for furnishing and placing a casing by jacking and/or augering under a roadway.

Article 15.2 Materials

Materials shall be as required by the Contract Documents.

Article 15.3 Construction

Method of augering or jacking a casing shall be optional to the Contractor, except that prior to commencing jacking or augering operations, the Contractor will be required to furnish evidence to the Engineer to show that his planned method of jacking and augering has worked satisfactorily in other areas under similar conditions. The excavation at both ends of the boring shall be included under the Furnish and Install Pipe Casing Pay Unit.

A vertical and horizontal tolerance shall be as shown on the Drawings, provided that the Contractor will be responsible, and use such fittings as are required to adjust alignment and grade to accomplish the connections.

The pipe within the casing shall be arrested from movement by sand filling or wood slats and banding according to the Standard Detail of this Specification.

Article 15.4 Measurement

Measurement shall be from end to end of casing acceptably installed and completed. No measurement will be made for trench excavation and backfill where casing is installed. No compensation will be made for casing installations abandoned or aborted due to deviations in excess of allowable tolerances.

Article 15.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10.00 Standard General Provisions, Section 10.07 Measurement and Payment, of this Specification and shall include full payment for all Work described in this Section 20.15, including arrestment of pipe.

Payment shall be made under the following unit:

ITEM	UNIT
Furnish and Install Casing	Linear Foot

**SECTION 20.16 SHORING, SHEETING AND BRACING/SHORING AND SHEETING
LEFT IN THE TRENCH AND PORTABLE**

Article 16.1 General

The Work under this Section consists of all operations pertaining to furnishing and installing sheeting, shoring, and bracing to support the trench section to prevent any movement that might damage adjacent facilities or injure workmen or the public, and the use of portable steel shielding.

Article 16.2 Materials

The Contractor shall obtain approval from an independent Engineer for all sheeting, bracing and shoring materials and/or equipment to be used on the project. Materials used shall be in accordance with Section 1926.651, Subparagraph 1 of the Federal Register, Volume 37, No. 243, page 27553, OSHA Regs., December 1972, or most current OSHA publication.

Article 16.3 Construction

All construction requirements for design, installation, and use of sheeting, shoring, bracing, and shielding shall be in accordance with current safety regulations. All sheeting, shoring, bracing, and shielding shall be designed by a Professional Engineer commissioned by the Contractor. All shop drawings and design data shall be submitted to the Engineer for approval.

When shoring and sheeting is left in the trench, sheeting must be driven lower than the bottom of the pipe and cut off one (1) foot below ground surface. No transverse bracing will be permitted to remain.

Article 16.4 Measurement

Shoring, sheeting and bracing shall be measured in lump sum.

Article 16.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10.00 Standard General Provisions, Section 10.07 Measurement and Payment, of this Specification and shall include full payment for all Work described in Section 20.16.

Payment shall be made under the following units:

ITEM	UNIT
Shoring, Sheeting and Bracing	Lump Sum

SECTION 20.17 REMOVAL OF EXISTING SIDEWALK AND CONCRETE APRON

Article 17.1 General

The Work under this Section consists of all operations pertaining to the removal and disposal of sidewalks and concrete aprons designated for removal, including any wire mesh or steel reinforcement within the concrete sidewalk and apron, in accordance with the limits shown on the Drawings or as directed by the Engineer.

Article 17.2 Construction

Sidewalks or concrete aprons to be removed shall be saw cut or broken at a joint. Broken joints shall be finished, as required by the Engineer, to eliminate jagged edges. The Contractor shall dispose of this material at a Contractor provided area.

Article 17.3 Measurement

Sidewalk and concrete apron removal will be measured in square yards designated for removal.

Article 17.4 Basis of Payment

Payment for this Work shall be in accordance with Division 10.00 Standard General Provisions, Section 10.07 Measurement and Payment, of this Specification and shall include full payment for all Work described in Section 20.17.

Payment shall be made under the following unit:

ITEM	UNIT
Remove Existing Sidewalk or Concrete Apron	Square Yard

SECTION 20.18 REMOVAL OF EXISTING CURB AND GUTTER

Article 18.1 General

The Work under this Section consists of performing all operations pertaining to the removal and disposal of curb and gutter designated for removal, including any wire mesh or steel reinforcement within the curb and gutter, in accordance with the limits shown on the drawings or as directed by the Engineer.

Article 18.2 Construction

Curb and gutter to be removed shall be saw cut or broken at a joint. Broken joints shall be finished, as required by the Engineer, to eliminate jagged edges. The Contractor shall dispose of removed curb and gutter at a Contractor provided disposal area.

Article 18.3 Measurement

Curb and gutter removal will be measured in linear feet removed, measured along the face of the curb.

Article 18.4 Basis of Payment

Payment for this item shall be in accordance with Division 10.00 Standard General Provision, Section 10.07 Measurement and Payment, of this Specification, and shall include full payment for all Work described in Section 20.18.

Payment shall be made under the following units:

ITEM	UNIT
Remove Existing Curb and Gutter	Linear Foot

SECTION 20.19 REMOVAL OF EXISTING PAVEMENT

Article 19.1 General

The Work under this Section consists of performance of all operations pertaining to the removal and disposal of asphaltic pavement in accordance with the limits indicated on the Drawings and as directed by the Engineer.

The Contractor will remove existing pavement (parking areas, driveways, etc.) within the right-of-way to a line one (1) foot back of the proposed improvements during the initial clearing/excavation operations. Further removal will be as directed by the Engineer in order to provide a proper transition between new and existing pavement. The intent is to minimize unnecessary removal of pavement.

All A.C. pavement designated for removal including A.C. pavement placed within the gutter pan shall be removed by the Contractor. Removal of the A.C. pavement within the gutter pan shall be considered incidental to the bid item "Remove Existing Pavement" and no separate payment shall be made.

Article 19.2 Construction

Pavement shall be removed by the Contractor in a manner that will produce a straight, uniform edge along the section removed. The method of producing the straight edge shall be by cutting the section with an air chisel, or other methods approved by the Engineer. The Contractor shall dispose of the removed pavement at Contractor provided disposal area.

Article 19.3 Measurement

Pavement removed will be measured by the square yard of all thicknesses of pavement designated for removal.

Article 19.4 Basis of Payment

Payment for this Work shall be in accordance with Division 10.00 Standard General Provisions, Section 10.07 Measurement and Payment, of this Specification, and shall include full payment for all Work described in Section 20.19.

Payment shall be made under the following unit:

ITEM	UNIT
Remove Existing Pavement	Square Yard

SECTION 20.20 REMOVAL OF EXISTING TREES

Article 20.1 General

The Work under this Section consists of the performance of all operations pertaining to the removal and disposal of trees thirty (30) inches or greater in circumference measured at a point one (1) foot above the natural ground. This item will not be a pay item if clearing or clearing and grubbing is included in the Bid Schedule.

Article 20.2 Construction

Trees of the size described above which interfere with construction under this Contract shall be disposed of at a disposal site provided by the Contractor.

Removal and disposal of all trees less than thirty (30) inches in circumference one (1) foot above the natural ground will be considered an incidental part of the excavation unless either the items clearing and/or clearing and grubbing are included in the Bid Schedule.

Article 20.3 Measurement

Removal of trees in the size range described will be measured as units.

Article 20.4 Basis of Payment

Payment for this Work shall be in accordance with Division 10.00 Standard General Provisions, Section 10.07 Measurement and Payment, of this Specification, and shall include full payment for all Work described in Section 20.20.

Payment shall be made under the following units:

ITEM	UNIT
Tree Removal	Each

SECTION 20.21 GRADING EXISTING SURFACES

Article 21.1 General

The Work under this Section consists of performing all operations necessary to shape the existing ground prior to placement of the fill or surfacing material.

Article 21.2 Construction

To the extent indicated on the Drawings, and as directed by the Engineer, the Contractor shall grade the existing ground. Material removed from the high areas shall be used to fill the depressions. Where the existing ground has a slope greater than one vertical to four horizontal, the surface of such ground shall be plowed, steeped or broken up in such a manner that graded material will blend with the existing surface.

On trails, the graded material shall be compacted to 85% of the maximum density; for roads the required compaction shall be 90% of the maximum density. Graded material which is excessively wet shall be aerated by means of blade graders, harrows, or other suitable equipment until the moisture content is satisfactory.

When the bid item is "Grading Existing Surfaces," no separate payment will be made for "usable excavation."

Article 21.3 Measurement

Measurement for grading shall be per lineal foot along the centerline of the constructed trail or roadway.

Article 21.4 Basis of Payment

Payment for this Work shall be in accordance with Division 10.00 General Provisions, Section 10.07 Measurement and Payment, of this Specification, and shall include full payment for all Work described in Section 20.21.

Payment shall be made under the following unit:

ITEM	UNIT
Grading Existing Surfaces	Linear Foot

SECTION 20.22 GEOTEXTILE FABRIC FOR EMBANKMENT SEPARATION

Article 22.1 Description

The Work under this Section shall consist of furnishing and installing Nonwoven or Woven Geotextile for embankment separation in a manner and at locations as shown in the plans or as directed by the Engineer.

Article 22.2 Materials

- a. The geotextile shall be constructed from long chain polymeric filaments such as polypropylene, polyethylene, polyester, polyvinylidene chloride or polyamide formed into a stable network such that the filaments or yarns retain their relative position to each other. The geotextile shall be inert to commonly encountered chemicals and shall be free from defects.
- b. Nonwoven geotextile may be formed by the needle punched, spun-bonded or melt-bonded process.
- c. Woven geotextile shall be a pervious sheet of yarn woven into a uniform pattern with distinct and measurable openings. Edges of the cloth shall be salvaged to prevent the outer yarn from pulling away from the cloth.
- d. The geotextile supplied shall meet the physical and mechanical properties listed below:

Geotextile Requirements

<u>Geotextile Property</u>	<u>Test Method</u>	<u>Separation</u>
Tensile Strength, lbs., min.	ASTM-D-4632	180
Elongation, %	ASTM-D-4632	30
Burst Strength, psi.	ASTM-3786	400
Trapezoid Tear, lbs.	ASTM-D-4533	70
Puncture Strength, lbs.	ASTM-D-4833	70
Permittivity, Sec ⁻¹	ASTM-D-4491	0.02

Ultraviolet Degradation, % (3)	ASTM-D-4355	70
Apparent Opening Size	ASTM-D-4751	30/70

1. Acceptance of geotextile material is to be determined according to ASTM-D-4873.
2. Contracting agency may require a letter from the manufacturer certifying that its geotextile meets specification requirements.
3. Percent of tensile strength retained (ASTM-D-4632) after conditioning of 500 hours per ASTM 4355.

Article 22.3 Construction

a. Surface Preparation

Before placing the fabric (geotextile), the surface, on which fabric is to be placed, shall be prepared by removal of all stumps, boulders and other sharp objects. All holes and large ruts shall be filled with material as shown on the plans or as approved by the Engineer. Removal of stumps, boulders and sharp objects shall be considered incidental to this item. Material used to fill ruts and holes shall be paid for at the unit price for the type material used, as shown on the plans or as approved by the Engineer.

b. Fabric Laying

Fabric shall be unrolled directly onto the prepared surface. Fabric shall be joined with adjacent pieces of fabric by sewing or overlapping. If fabric is sewn, the fabric shall have all seams sewn by butterfly or J- seams and shall develop a minimum of 85 percent of the specified strength. Seams shall be sewn with a double-thread chain-lock stitch. High-strength polyester, polypropylene or Kevlar thread shall be used. The seam shall be 1-1/2" (+ 1/4") from the outside edge of the geotextile. Should overlapping of adjacent sections of fabric be used, the sections shall be overlapped a minimum of 3 feet or as shown the plans.

c. Material Placing and Spreading

Following placement of the fabric on the prepared surface, material of the type shown the plans 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 1 foot or depth shown the plans shall be maintained at all times between the fabric and the wheels or tracks of the construction equipment. At no time shall equipment operate on the

unprotected fabric. The material shall be spread in the direction of the fabric overlap. Special care shall be given to maintain a proper overlap and fabric continuity.

d. Fabric Repair

If the fabric should be torn for any reason, the aggregate material shall be cleaned from the fabric. The torn area shall be overlain with fabric with a minimum three foot overlap around the edges of the torn area. Care should be taken that the patch remains in place when material is placed over the affected area.

Article 22.4 Method of Measurement

The amount of geotextile to paid for shall be the number of square yards of ground surface covered by fabric as shown on the plans or as approved by the Engineer. Overlapping of fabric will be considered as incidental.

Article 22.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10.00 Standard General Provisions, Section 10.07 Measurement and Payment of these Specifications and shall be made at the contract unit price per square yard. This price shall be full compensation for furnishing all materials, preparation, delivering, and laying the fabric, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Payment shall be made under the following unit:

ITEM	UNIT
Geotextile (Separation)	Square Yard

SECTION 20.23 GEOTEXTILE FABRIC FOR SUBSURFACE DRAINAGE AND RIPRAP LINER

Article 23.1 Description

The Work under this Section shall consist of furnishing and installing Nonwoven or Woven Geotextile for subsurface drainage and riprap liner in a manner and at locations as shown in the plans or as directed by the Engineer.

Article 23.2 Materials

- a. The geotextile shall be constructed from long chain polymeric filament or yarns such as polypropylene, polyethylene, polyester, nylon, polyvinylidene chloride or polyamide formed into a stable network such that the filaments or yarns retain their relative position to each other. The geotextile shall be inert to commonly encountered chemicals and shall be free from defects.
- b. Nonwoven geotextile may be formed by the needle punched, spun-bonded or melt-bonded process.
- c. Woven geotextile shall be a pervious sheet of yarn woven into a uniform pattern with distinct and measurable openings. Edges of the cloth shall be salvaged to prevent the outer yarn from pulling away from the cloth.
- d. The geotextile fabric supplied shall meet the physical and mechanical properties listed below:

Geotextile Requirements

Geotextile Property	Test Method	Subsurface Drainage	Riprap Liner	
			Unprotected ³	Protected ⁴
Tensile Strength, lbs.	ASTM-D-4632	90	200	90
Elongation, %	ASTM-D-4632	N/A	15-70	15-70
Burst Strength, psi.	ASTM-D-3786	125	320	140
Puncture Strength, lbs.	ASTM-D-4833	25	80	40
Trapezoid Tear, lbs.	ASTM-D-4533	25	50	30

Apparent Opening Size	ASTM-D-4751	70 min.	*	*
Seam Strength, lbs.	ASTM-D-4632	N/A	180	80
Permittivity	ASTM-D-4491 (gal/min.ft. ²)	50 (Sec ⁻¹)	0.5 (Sec ⁻¹)	0.5
Ultraviolet Degradation, % (5)	ASTM-D-4355	70	70	70

- *a. Soil with 50% or less particles by weight passing US No. 200 Sieve, AOS less than 0.6mm (greater than #30 US Std. Sieve)
 - *b. Soil with more than 50% particles by weight passing US No. 200 Sieve, AOS less than 0.297mm (greater than #50 US Std. Sieve)
1. Acceptance of geotextile material is to be determined according to ASTM-D-4759.
 2. Contracting agency may require a letter from the manufacturer certifying that its geotextile meets specification requirements.
 3. Unprotected Erosion Control applications are those where fabrics are used under conditions where installation stresses are more severe than Class B, i.e., stone placement height should be less than 3 feet and stone weights should not exceed 250 pounds.
 4. Protected Erosion Control applications are those where fabrics are used in structures or under conditions where the fabric is protected by a sand cushions or by "zero drop height" placement of stone.
 5. Percent of minimum tensile strength (ASTM-D-4632) retained after weathering per ASTM-D-4533 for 500 hours.

Article 23.3 Construction

a. Surface Preparation

Before placing the fabric (geotextile), the surface, on which fabric is to be placed, shall be prepared by removal of all stumps, boulders and other objects. All holes and large ruts shall be filled with material as shown on the plans or as approved by the Engineer. Removal of stumps, boulders and sharp objects shall be considered incidental to this item. Material used to fill ruts and holes shall be paid for at the unit price for the type material used, as shown on the plans or as approved by the Engineer.

b. Fabric Laying

Fabric shall be unrolled directly onto the prepared surface. Fabric shall be joined with adjacent pieces of fabric by sewing or overlapping. If fabric is sewn, the fabric shall have all seams sewn by butterfly or J- seams and shall develop a minimum of 85 percent of the specified strength. Seams shall be sewn with a double- thread chain-lock stitch. High-strength polyester, polypropylene or Kevlar thread shall be used. The seam shall be 1-1/2" (+ 1/4") from the outside edge of the geotextile. Should overlapping of adjacent sections of fabric be used, the sections shall be overlapped a minimum of 3 feet or as shown on the plans.

c. Material Placing and Spreading

Following placement of the fabric on the prepared surface, material of the type shown on the plans 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 1 foot or depth shown the plans shall be maintained at all times between the fabric and the wheels or tracks of the construction equipment. At no time shall equipment operate on the unprotected fabric. The material shall be spread in the direction of the fabric overlap. Special care shall be given to maintain a proper overlap and fabric continuity.

d. Fabric Repair

If the fabric should be torn for any reason, the aggregate material shall be cleaned from the fabric. The torn area shall be overlain with fabric with a minimum three foot overlap around the edges of the torn area. Care should be taken that the patch remains in place when material is placed over the affected area.

Article 23.4 Method of Measurement

The amount of geotextile to be paid for shall be the number of square yards of ground surface covered by fabric as shown on the plans or as approved by the Engineer. Overlapping of fabric will be considered as incidental.

Article 23.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10.00 Standard General Provisions, Section 10.07 Measurement and Payment of these Specifications and shall be made at the contract unit price per square yard. This price shall be full compensation for furnishing all materials, preparation, delivering, and laying the fabric, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Payment shall be made under the following unit:

ITEM

UNIT

Geotextile (Drainage)
Geotextile (Riprap Liner)

Square Yard
Square Yard

SECTION 20.24 RIPRAP

Article 24.1 General

This work shall consist of furnishing and placing a protective covering of stone as shown on the plans or as directed by the Engineer.

Article 24.2 Materials

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. 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% by total weight of the stones shall weigh less than 25 pounds per piece.

Class II

No more than 10% of the stones by total weight shall weigh more than 400 pounds per piece and no more than 15% by weight of the stones shall weigh less than 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 1400 pounds per piece and no more than 15% of the stones 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.

Article 24.3 Construction

A footing trench shall be excavated along the toe of the slope when shown on the plans. The stones shall be handled or dumped into place so as to secure a stone mass of the thickness, height and length shown on the plans, or as staked with a minimum of voids.

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

Riprap protection shall be placed to its full course thickness at one operation and in such manner as to avoid displacing the underlying material. Placing of riprap protection in layers or by dumping into chutes or by similar methods likely to cause segregation will not be permitted.

All material going into riprap protection shall be so placed and distributed that there will be no large accumulation or area composed largely of either the larger or smaller sizes of stone.

Unless otherwise authorized by the Engineer, the riprap protection shall be placed in conjunction with the construction of the embankment with only sufficient lag in construction of the riprap protection as may be necessary to prevent mixture of embankment and riprap material.

The Contractor shall provide a level compact area of sufficient size to dump and sort typical loads of riprap at approved location(s). He shall further dump loads specified in this area and assist the Engineer as needed to sort and measure the stones in the load for the purpose of determining if the riprap is within specifications. Mechanical equipment as needed to assist in this sorting shall be provided by the Contractor at no additional cost to the Owner.

Article 24.4 Method of Measurement

The quantity of riprap to be paid for shall be the number of cubic yards measured by neat line measure, or tons, completed in accepted in place.

Article 24.5 Basis of Payment

The accepted quantity of riprap will be paid for at the contract price per unit of measurement respectively, for each particular pay item listed below that is shown in the bid schedule, complete in place. Excavation and backfill required for placement of riprap will not be paid for directly but will be considered incidental.

When more than one class of riprap is specified for any pay item, letter suffixes shall be included within the parentheses of the item numbers in order to differentiate between the different classes.

Payment will be made under the following item:

ITEM	UNIT
Riprap, Class ()	Cubic Yard
Riprap, Class ()	Ton

SECTION 20.25 DEWATERING

Article 25.1 General

The Work under this Section consists of providing all operations pertaining to the dewatering of Work areas or diversion of surface and subsurface water flows for excavation and backfill during construction operations.

Article 25.2 Materials

Contractor shall be responsible for the Dewatering Plan preparation, selection of materials and equipment, mobilization, operation, maintenance, removal of pumping facilities, piping, etc. used in dewatering operations.

Article 25.3 Construction

All construction requirements for design, installation, and operation of dewatering systems shall comply with current safety and environmental regulations.

Acceptance of Contractor's Dewatering Plan by the Engineer shall not relieve Contractor of responsibility for the exercise of reasonable precaution, sound engineering judgment, prudent construction practices, overloading or misuse of existing or new structures, the adequacy and safety of such Works, and potential damage or undermining of existing or completed Works.

Water resulting from Contractor's dewatering effort may not be pumped or otherwise diverted into existing storm drains unless required permits, including, but not limited to, the Alaska Department of Environmental Conservation and Environmental Protection Agency, are obtained by Contractor. Under no circumstances will Contractor be allowed to divert water from the excavation onto roadways. Contractor shall provide disposal site for excess water and shall be responsible for securing all necessary permits and approvals. Contractor shall provide copies of permits and approvals to the Engineer.

This item shall be incidental; there shall be no basis of payment for dewatering.

SECTION 20.26 UNCLASSIFIED FILL AND BACKFILL

Article 26.1 General

The Work under this Section consists of furnishing all plant, labor, equipment, supplies, and material in performance of all operations pertaining to the excavation, stockpiling on-site, and placement of Unclassified Fill and Backfill.

Article 26.2 Material

Unclassified Fill and Backfill shall be defined as excavated non-organic material that is determined by the Engineer to be unsuitable for Classified Fill and Backfill and suitable for deposition in non-structural fill zones.

Article 26.3 Construction

Excavated material not conforming to the specifications for Classified Fill and Backfill shall be used as Unclassified Fill and Backfill adjacent to the fill-slopes to provide additional slope stability to the fill-slopes.

Excess Unclassified Fill and Backfill not used shall be disposed of at a Contractor-furnished disposal site.

Article 26.4 Measurement

The measurement of excavation will not include water or other liquids, but will include topsoil, mud, muck, or other similar semi-solid material that cannot be drained or pumped away.

Unclassified Fill and Backfill will be measured per cubic yard by cross section.

Cross-section measurement of Unclassified Fill and Backfill shall be based on in-place volumes as determined by the average end areas of cross sections.

Article 26.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10.00 Standard General Provisions, Section 10.07 Measurement and Payment of these Specifications, and shall include full payment for all Work as described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Unclassified Fill and Backfill	Cubic Yard

SECTION 20.27 PAVEMENT ROTOMILLING

Article 27.1 General

The Work under this Section consists of furnishing all plant, labor, supervision, equipment, and material for performing all operations necessary for the removal and disposal of asphaltic pavement to a depth designated with a power-operated profile machine designed for this specific purpose.

Article 27.2 Construction

Pavement shall be removed by rotomilling, planing, or grinding to a final surface smooth enough for temporary traffic and repaving with no additional preparation other than application of a tack coat. Additional rotomilling, grinding, or milling by the power-operated profile machine may be necessary around manhole covers, valve boxes, survey monument cases, etc. The depth of asphalt removal under this Section may vary from 0 inch to 2 inches. If the removed pavement material under this Section contains objectionable material within it, as identified by the Engineer, then Contractor shall dispose of this material in accordance with Section 10.04 Scope Of Work, Article 4.9 Disposal Sites.

Article 27.3 Measurement

Pavement removed by rotomilling, planing or grinding shall be measured by the square yard of pavement designated for and actually removed. No additional payment will be made regardless of depth.

Article 27.4 Basis of Payment

Payment for this Work shall be in accordance with Division 10.00 Standard General Provisions, Section 10.07 Measurement and Payment of these Specifications, and shall include full payment for all Work as described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Pavement Rotomilling	Square Yard

SECTION 20.28 STORMWATER POLLUTION PREVENTION PLAN

Article 28.1 General

This Work shall consist of providing all labor, equipment, materials, and services to prepare, implement, and maintain a Storm Water Pollution Prevention Plan (SWPPP).

Article 28.2 Preparation of SWPPP

Contractor shall prepare an SWPPP in accordance with the Alaska Department of Transportation and Public Facilities "*Storm Water Contractor Guidance for Preparing and Excavating Storm Water Pollution Prevention Plans*," dated October 1993, which will comply with the NPDES General Permits for Storm Water Discharges from Construction Activities that are classified as "Associated with Industrial Activity," as provided in the Clean Water Act, 33 U.S.C. 1251 et seq., as amended by the Water Quality Act of 1987, P.L. 100-4.

The SWPPP shall be signed by the Contractor and each Subcontractor participating in any of the construction activities. The signing of the SWPPP by the Contractor and all Subcontractors is required prior to any services being rendered. The SWPPP shall be kept on-site at the facility which generates the storm water discharge.

The Contractor shall be responsible for maintaining the SWPPP current, which at a minimum shall include any changes in design, the current listing of all Subcontractors who will implement a storm water mitigation measure required by the SWPPP, and a current listing of the construction activities which will implement a mitigation measure of the SWPPP. The Contractor shall also be responsible for conducting inspections in accordance with the Plan, writing inspection reports and appending the reports to the pollution prevention systems outlined in the SWPPP. The General Contractor shall amend the SWPPP through the completion of the project, keeping the Plan current.

Upon completion of the project, the General Contractor shall return the original SWPPP with all amendments and reports to the City and Borough of Sitka (CBS).

The CBS shall retain the SWPPP with all amendments and reports for a period of no less than three (3) years from the date that the site is finally stabilized. This period may be extended by the Environmental Protection Agency (EPA) at any time.

In addition to complying with the requirements of the NPDES General Permits for Stormwater Discharges from Construction Activities that are classified as "Associated with Industrial Activity," all state and local regulatory requirements for the collection, control and discharge of storm water will be complied by the General Contractor and Subcontractors.

All project updates and revisions which affect the SWPPP shall be incorporated as part of the Plan. The Plan Updates/Revisions shall be appended to the Plan.

Additionally, an SWPPP Record of Revision shall be prepared and updated to document any change to the SWPPP, Inspection Report, Project Update or Revision, and construction activities of Contractors/Subcontractors.

Article 28.3 Pre-Construction Activities

The Contractor shall complete a description of the nature of the construction activities and the intended sequence of the construction activities which disturb soils for major portions of the site. The description of a construction activity should include the following information:

1. Type of activity.
2. Estimated dates of the activity (both start and finish dates).
3. Name of Contractor or Subcontractor who is to accomplish the activity.

The description of the Construction activities and any amendments to the SWPPP shall be written and attached to the Plan.

Article 28.4 Construction Activities

The Contractor shall be responsible for providing a list of the Contractors and Subcontractors participating in each construction activity. The list shall be kept current throughout the duration of the project. Each Contractor or Subcontractor shall be required to sign the Signature Page of this SWPPP document prior to the commencement of services.

The Contractor shall list the current activities and the names of the Contractors or Subcontractors who complete each construction activity.

Article 28.5 Maintenance and Inspection

The controls identified in the SWPPP for the project site shall be inspected periodically and maintenance shall begin as soon as a deficiency is observed.

The Contractor shall provide a qualified person to inspect the disturbed areas of the construction site that have not been stabilized, the areas used for storage of materials that are exposed to precipitation, the structural control measures, and the locations where vehicles enter or exit the site.

Disturbed areas and areas used for storage of equipment and materials that are exposed to precipitation shall be inspected for evidence of, or the potential for, pollutants entering the drainage system. Control measures identified in the Contractor's Plan shall be observed to ensure that they are effective in preventing impacts to receiving waters.

An inspection report shall be written summarizing the scope of the inspection, the name(s) and qualifications of personnel making the inspection, the date of the inspection, major observations relating to the implementation of the SWPPP, and the actions and modifications taken to correct insufficiencies identified during the inspection. The report shall identify any incident of non-compliance. If no incidents of non-compliance are observed during the inspection, the report shall contain a certification that the facility is in compliance with the SWPPP and the general NPDES permit. The inspection report shall be signed by the project superintendent or a duly authorized representative. Any person signing a document for the SWPPP shall add the following certification:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system design to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

All inspection reports shall be made and retained as part of the SWPPP. Each inspection report shall be appended by the Contractor to the original SWPPP.

Article 28.6 Basis of Payment

Payment for this Work shall be in accordance with Section 10.00 Standard General Provisions, Section 10.07 Measurement and Payment, and shall include final payment for all Work described in this section.

Payment will be made under the following item:

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Storm Water Pollution Prevention Plan	Lump Sum

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STANDARD CONSTRUCTION SPECIFICATIONS FOR PORTLAND CEMENT CONCRETE

SECTION 30.01 GENERAL

Article 1.1 Scope of Work

The Work covered by these Specifications consists of providing all plant, labor, equipment, supplies, material, transportation, handling, storage and protection for performing all operations in connection with the placement of Portland Cement Concrete in accordance with the Specifications and the Drawings.

Article 1.2 Applicable Standards

The latest revision of the following standards of the American Society for Testing and Materials (ASTM) and American Society of State Highway and Transportation Officials (AASHTO) are hereby made a part of these Specifications.

American Concrete Institute - "Manual of Concrete Practice."

Concrete Reinforcing Steel Institute - "Manual of Standard Practice"

ASTM A-185	AASHTO M-55	Specification for Welded Steel Wire Fabric for Concrete
ASTM A-615	AASHTO M-31	Specification for Billet-Steel bars for Concrete Reinforcement
ASTM C-31	AASHTO T-23	Method of Making and Curing Concrete Compression and Flexure Test Specimens in the Field
ASTM C-33		Specification for Concrete Aggregates
ASTM C-330		Specification for Lightweight Aggregates for Structural Concrete
ASTM C-39	AASHTO T-22	Test for Compressive Strength of Molded Concrete Cylinders.
ASTM C-40	AASHTO T-21	Test for Organic Impurities in Sands for Concrete
ASTM C-42	AASHTO T-24	Method of Securing, Preparing and Testing Specimens from Hardened Concrete for Compression and Flexure Strengths

ASTM C-90		Hollow Load-Bearing Concrete Masonry
ASTM C-94	AASHTO M-157	Specification for Ready-Mix Concrete
ASTM C-150	AASHTO T-119	Specification for Portland Cement
ASTM C-156	AASHTO T-155	Test for Water Retention Efficiency of Liquid Membrane-Forming Compounds and Impermeable Sheet Materials for Curing Concrete.
ASTM C-171	AASHTO M-171	Specification for Waterproof Paper for Curing Concrete
ASTM C-172	AASHTO T-141	Sampling Fresh Concrete
ASTM C-192	AASHTO T-126	Method of Making and Curing Concrete Compression and Flexure Test Specimens in the Laboratory
ASTM C-226	AASHTO M-134	Specification for Air-Entraining Additions for Use in the Manufacture of Air-Entraining Portland Cement
ASTM C-231	AASHTO T-152	Test for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C-260	AASHTO M-154	Specification for Air-Entraining Admixture for Concrete
ASTM C-270		Mortar for Unit Masonry (Including Tentative Revision)
ASTM C-309	AASHTO M-148	Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C-494	AASHTO M-194	Specifications for Chemical Admixtures for Concrete
ASTM D-994	AASHTO M-33	Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)
	AASHTO M-6	Specification for Fine Aggregate for Portland Cement Concrete
	AASHTO M-32	Specification for Cold Drawn Steel Wire for Concrete Reinforcement Cement

Article 1.3 Materials

a. Reinforcing Steel

Concrete reinforcing shall be deformed steel bars conforming to the requirements of ASTM A-615 (AASHTO M-31). It shall be free from loose scales, excessive rust, and coatings of any character which will reduce the bond between steel and concrete.

If reinforcing bars are to be welded, these Specifications shall be supplemented by requirements assuring satisfactory weldability in conformity with AWS D12.1, "Recommended Practices for Welding Reinforcing Steel, Metal Inserts and Connections in Reinforced Concrete Construction."

b. Welded Steel Wire Fabric

The welded steel wire fabric shall be cold-drawn steel wires or galvanized, fabricated into mesh formed by the process of electric welding. The grade of wire shall conform to AASHTO M-32. Welded Steel Wire Fabric shall conform to ASTM Specification A-185 (AASHTO M-55).

c. Cement

The cement shall be of a recognized standard brand of Portland Cement conforming to the specification requirements listed below and of a type listed below:

SPECIFICATION	TYPE PORTLAND CEMENT
ASTM C-150	TYPE I, III*
AASHTO M-85	TYPE I, III*

*Type III cement may be used upon written authorization of the Engineer subject to the following modification:

Minimum design strength shall be achieved in seven (7) days in lieu of the twenty-eight (28) days required for Type I cement.

For architectural concrete only one brand of cement shall be used unless other wise approved by the Engineer. When no type cement is specified, the requirements of Type I shall govern.

Cement reclaimed from cleaning bags or leaking containers shall not be used.

The Engineer may require an additional one-half sack of Portland concrete over the design specification.

d. Water

Water used for the mixing of concrete shall be clean and free of oil or acid, and shall not contain salt, alkali, or organic matter.

e. Aggregates

Aggregates for Portland Cement Concrete shall be well graded, clean, hard gravel, and coarse sand, non-frost susceptible material, and free of deleterious (organic) matter, and coatings of silt or clay. The gradations shall be determined by standard laboratory sieves with square openings. Material retained on a No. 4 screen shall be classified as coarse aggregate, which shall conform to the requirements of AASHTO M-80 and have the following limits of gradation:

COARSE AGGREGATE FOR PCC

Designated Size (AASHTO Gradation)	Percent by weight Passing Laboratory Sieve having square openings in inches.						
	2	1-1/2	1	3/4	1/2	3/8	No.4
No.67 3/4" to No.4	---	---	100	90-100	---	20-55	0-10*
No.4 1-1/2 to 3/4"	100	90-100	20-55	0-15	---	0-5	---

*Not more than 5% shall pass a No.8 sieve.

All material passing a No.4 sieve shall be classified as fine aggregate and shall conform to the requirements of AASHTO M-6 and have the following gradation:

FINE AGGREGATE FOR PCC

SIEVE SIZE	PERCENT PASSING SIEVE
Passing a 3/8 inch sieve -----	100
Passing a No.4 inch sieve -----	95-100
Passing a No.8 inch sieve -----	80-100
Passing a No.16 inch sieve -----	45-80
Passing a No.30 inch sieve -----	25-60
Passing a No.50 inch sieve -----	10-30
Passing a No.100 inch sieve -----	2-10

Aggregates shall consist of washed sand gravel; fine and coarse aggregates shall be regarded as separate ingredients. Aggregates for normal weight concrete shall conform to the requirements of

ASTM C-33 and aggregates for light weight concrete, shall conform to the requirements of ASTM C-330.

The maximum size of coarse aggregates shall not exceed 1-1/2 inches nor 1/5th of the narrowest dimension between the forms nor 3/4ths of the clear spacing between reinforcing bars nor 1/3 of the depth of slabs. The combined aggregates, coarse and fine, shall be of such composition of sizes that when separated on the No. 4 standard sieve, the weight passing shall not be less than 30% nor greater than 50% of the total weight.

The volume removed by sedimentation shall not exceed three (3) percent. Proportioning of the coarse and fine aggregate shall be obtained by weight. The weighing equipment shall be accurate within one (1) percent of the net weight of the batch and shall permit adjustment for variations in the water content in the aggregate. Batching for fractional sacks of cement will not be permitted unless the cement is weighted for each batch. The water added shall be measured by an approved calibrated device capable of metering within one (1) percent of the total amount of water to be used for each batch.

f. Air-Entrainment

Air-entrainment agents shall be used in all concrete. Entrainment shall be achieved by the addition of an approved air-entraining mixture to the concrete mix. Air-entrainment shall conform to ASTM C-231 (AASHTO T-152). Refer to Article 1.6 - Mix Requirements for Classes of Concrete of this Section for air- entrainment percentages for each class of concrete.

g. Curing Materials

Curing materials shall be one the following types as approved by the Engineer.

- 1) Kraft paper conforming to the requirements of ASTM C-171 (AASHTO M-171).
- 2) Mats of commercial quality and of a type used for curing concrete.
- 3) Burlap of commercial quality weighing not less than fourteen (14) ounces per square yard.
- 4) Membrane curing compound conforming to the requirements of ASTM C-309 (AASHTO M-148).
- 5) Concrete International Corporation Ashford Formula.

h. Expansion Joints

Premolded joint filler for use in expansion joints shall conform to the requirements of ASTM D-994 (AASHTO M-33).

Article 1.4 Mix

Portland Cement concrete may be mixed at a central mixing plant or in transit mixers. All mixing equipment and operations shall conform to the requirements of C-94 (AASHTO M-157). All concrete shall be delivered to the work site thoroughly mixed to a uniform color and show uniform distribution of aggregates throughout the mixture.

Concrete shall be delivered to the Project site, discharged from the truck completely and in the forms ready for vibration within 1-1/2 hours after introduction of the cement to the aggregates. At the discretion of the Engineer, the above period may be extended 1 minute for every degree of temperature at which the concrete is delivered below 70 deg. F. to a maximum total time of 2 hours.

In hot weather, or under conditions contributing to quick setting of the concrete, a discharge time less than 1-1/2 hours may be required by the Engineer.

The use of non-agitating equipment for transporting concrete will not be permitted. The mixing drums of transit-mix trucks shall be thoroughly washed after discharging each load to prevent the accumulation of adherent layer of concrete. The discharge of particles of hardened concrete with any batch will be sufficient grounds for the rejection of the entire batch. On curb, gutter and sidewalk work, transit mix trucks shall be operated parallel to the forms while discharging.

The addition of water to the mix at the job site will not be permitted except with the approval of the Engineer.

Article 1.5 Subbase

Prior to placement of forms, the Engineer shall inspect the subbase to insure that it is smooth, compacted and free of soft or yielding spots and that compaction at optimum moisture is at least ninety-five (95) percent of maximum density. Backfilling within the forms will be permitted if the subbase is brought to the above specification and care is taken to maintain the forms to line, shape elevation.

Article 1.6 Mix Requirements for Classes of Concrete

The minimum mix requirement for classes of concrete shall be as set forth below, unless otherwise specified in the Contract Documents.

	CLASS OF CONCRETE						
	C-6	B-3	B-6	A-3	A-6	AA-3	AA-6
Minimum Cement Content in Sacks/Cu YD.	4.5	5.0	5.0	5.5	5.5	6.0	6.0
Maximum Water Content Ratio in Gal./Sack	6.5	6.5	6.5	6.5	6.5	5.75	5.5
Slump Range in Inches	1-5	2-4	1-3.5	2-4	1-3.5	2-4	1-2
Entrained Air Range In Percentage	3-6	4-7	3-6	4-7	3-6	4-7	3-6
Coarse Aggregate (AASHTO Gradation)	No.4 and No.67	No.67	No.4* and No.67	No.67	No.4* and No.67	No.67	No.4* and No.67
Fine Aggregate Shall conform to AASHTO M-6 gradation							
Minimum Design strength (f'c), psi	2000	2500	2500	3000	3000	3500	3500

Minimum design compressive strength specification shall be achieved in twenty-eight (28) days.

*The coarse aggregate for Class B-6, A-6, and AA-6 concrete shall be furnished in 2 separate sizes.

Alternate mix designs will be considered upon submitting to the Engineer the following information:

1. City mix design designation for which the substitution is intended.
2. Design strength.
3. Air content.
4. Slump.
5. Aggregate gradation and maximum size.
6. Maximum water/cement ratio.
7. Minimum cement content.

8. List of admixtures, strength overdesign and other special features.

Water shall not be used to increase slump to beyond five (5) inches. If additional slump is desired, a plasticizing agent may be used subject to the Engineer's approval in writing.=

Article 1.7 Ready-Mixed Concrete

Ready-mixed Concrete shall conform to the requirements of ASTM C-94 (AASHTO M-157). It is the responsibility of the Contractor to furnish to the Engineer for each batch of concrete before unloading at the site a delivery ticket from the manufacturer on which is printed, stamped or written, information concerning said concrete as follows:

1. Name of Ready-mix batch plant.
2. Serial number of ticket.
3. Date and truck number.
4. Name of Contractor.
5. Specific designation of Project (name and location).
6. Specific class of concrete in conformance with that employed in Specifications.
7. Amount of concrete (cubic yards).
8. Time loaded or first mixing of cement and aggregate.
9. Type of cement.
10. Admixtures and amount of same.
11. Slump requested by the Contractor and recorded in inches.
12. Percentage of entrained air requested by the Contractor.

Article 1.8 Sampling and Testing

The Engineer shall take concrete samples for concrete cylinders in accordance with AASHTO T-141. Samples shall not be taken at the beginning or end of discharge. Making and curing the specimens shall be done in accordance with AASHTO T-23. Testing and sampling shall be done by the Engineer.

Slump tests shall be taken in accordance with AASHTO T-119 or ASTM C-150. Slump tests shall be taken by the Engineer.

Should the analysis of any test cylinder not meet the requirements of these specifications, all concrete placed from the batch represented by the cylinder shall be removed and replaced at the Contractor's expense.

Article 1.9 Weather Limitations

Placement of concrete shall be prohibited at an ambient air temperature of less than 40° Fahrenheit or where the foundation material is frozen, except in special situations where authorized by the Engineer.

Exemption from the temperature clause of these Specifications shall be considered under the following conditions:

1. A written proposal shall be submitted by the Contractor to the Engineer outlining a procedure for maintaining the temperature of the concrete placed of at least 50° Fahrenheit for 72 hours where type III cement has been used and 120 hours where type I cement has been used. When the temperature is reduced, the drop in temperature must be gradual and not exceed 30° F in the first 24 hours.
2. Salt, chemicals, or other material shall not be mixed with the concrete to prevent freezing.
3. Placement of concrete shall be prohibited whenever there is standing water in the forms, the subgrade is yielding due to saturation, or rain is threatening.
4. An acceptable admixture is used within the limitations of the approved manufacturer's recommendations.

Article 1.10 Protection of Work

The Contractor shall protect all newly placed concrete from damage of any kind to prevent disfigurement during the curing period. Damaged concrete shall be repaired or replaced to the Engineer's satisfaction at no additional cost.

Article 1.11 Clean-up

When all concrete Work has been completed and cured, the Contractor shall remove the forms, stakes, blocking, and concrete spoil from the site. The area adjoining the concrete that was excavated to permit the construction and placement of forms shall be filled with select material, and the slopes and parking areas, if any, shall be filled, shaped and smoothed to the level as shown on the typical sections.

SECTION 30.02 PORTLAND CEMENT CONCRETE, CURB AND GUTTER AND VALLEY GUTTER

Article 2.1 Description

The Work covered under this Section consists of the construction of curbs, gutters, miscellaneous median shapes and parking stops.

Article 2.2 Materials

Portland Cement Concrete, joint filler, reinforcing steel and curing materials shall conform to Division 30 Standard Construction Specifications for Portland Cement Concrete, Section 30.01 - General, Article 1.3 - Materials. Concrete mix for curbs shall conform to the requirements for Class A-3 unless otherwise specified.

a. Reinforcing Steel and Steel Dowels

Refer to Section 30.01 General, Article 1.3 - Materials, a. - Reinforcing Steel and b. - Welded Steel Wire Fabric of this Division.

b. Preformed Expansion and Dummy Joint Filler

Refer to Section 30.01 - General, Article 1.3 - Materials, h - Expansion of Joints of this Division.

c. Curing Compounds

Refer to Section 30.01 - General, Article 1.3 - Materials, g - Curing of this Division.

d. Forms

Forms may be of wood or metal or any other material at the option of the Contractor, provided that the forms as set will result in a curb, or curb and gutter of the specified thickness, cross section, grade and alignment shown on the Drawings.

Forms may be removed on the day following pour if the concrete is sufficiently set that removal can be accomplished without danger of chipping or spalling. All forms shall be cleaned, oiled and be examined for defects before they are used again.

Curb extrusion machines or pump trucks may be used upon approval of the Engineer. Test samples for such alternate placement methods shall be taken from the discharge side of the machine.

e. Silicone Joint Sealants

Silicone Joint Sealants shall meet FSS TI-5-001543A, CLASS A, SIKA FLEX or approved equal.

Article 2.3 Construction

a. Erecting Forms

All forms shall be set to the lines, grade, and dimensions shown on the Drawings. The forms shall be thoroughly braced and secured to resist deformation or displacement under load, and shall be installed to permit easy removal without hammering or prying against the fresh concrete. The top of the forms shall not deviate more than one-eighth (1/8) inch in ten (10) feet, and the alignment of forms shall be within one-fourth (1/4) inch in ten (10) feet.

Before placement of concrete, steel forms shall be lightly oiled with a good grade of form oil. All oil or other coating fluid which is spilled or applied to the reinforcing wire or iron shall be removed. Wooden forms may be oiled in the same manner as metal forms, or they may be watered immediately in advance of the placement of concrete. Watering of the form shall be done with clean water of the same quality as that specified for mixing water, and only when the atmospheric temperature is not less than forty (40) degrees Fahrenheit. Concrete shall not be placed until all forms have been inspected and approved by the Engineer. Wherever form work is exposed to pedestrian traffic, bridges (not attached to the forms) shall be provided at all regular pedestrian crossings where it is required to maintain safety standards. Barricades and other safety features shall be installed as necessary.

b. Placing Concrete

The subgrade shall be properly compacted and brought to specified grade before placing concrete. The subgrade shall be thoroughly dampened immediately prior to the placement of the concrete. Forms shall not be splashed with concrete in advance of placing.

Concrete shall be handled from transport vehicle to the point of final placement in a continuous manner as rapidly as practicable. The rate of placement shall not exceed the rate at which the various placing and finishing operations can be performed in accordance with these specifications. Concrete shall not be allowed to free-fall more than three (3) feet.

If concrete is to be placed by the extruded method, the Contractor shall demonstrate to the satisfaction of the Engineer that the machine is capable of placing a dense, uniformly compacted concrete to exact section, line and grade. Extruded curb, which does not meet all requirements of formed curbs, shall be replaced at the Contractor's expense.

c. Stripping Forms and Finishing

The face form of the curb shall be stripped at such time in the early curing as will enable inspection and correction of all irregularities that appear thereon.

Forms shall not be removed until the concrete has set sufficiently to retain its true shape. The face of the curb shall be troweled with a tool cut to the exact section of the curb and at the same time maintain the shape, grade, and alignment of the curb. Both front and back edges shall be troweled to a radius of one-half (1/2) inch. Final finish shall be obtained by brooming the surface, including the troweled 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.

It is the intent of this Specification to insure the highest quality of workmanship in the construction and finishing of PCC curb and gutter.

Unightly or poorly finished surfaces will be considered grounds for rejection of the work involved.

All defective areas shall be removed and replaced at the Contractor's expense, unless permission to patch is granted by the Engineer. Such permission shall not be construed as an acceptance of the Work or as a waiver of the Engineer's right to require the complete removal of the Work, if in his opinion the patch does not satisfactorily restore the quality or appearance of the surface.

Should patching be permitted, the area shall be chipped clean to a depth of one (1) inch perpendicular to the surface and saturated with clean water prior to being patched. The patch shall be made with a mortar extracted from fresh concrete by passing it through a 3/8 inch screen. The mortar shall be thoroughly compacted and screeded off slightly higher than the surrounding surface to allow for contracting or setting after the maximum shrinkage has taken place. After one (1) to two (2) hours, the patch shall be troweled to the same finish as the surrounding area and shall be cured as specified herein. The use of special patching material will be permitted if approved by the Engineer.

d. Curing

Curing compounds shall be applied to all exposed surfaces immediately after finishing. Transparent curing compounds shall contain a color dye of sufficient strength to render the film distinctly visible on the concrete for a minimum period of four (4) hours after application.

If, at any time during the curing period any of the forms are removed, a coat of curing compound shall be applied immediately to the exposed surface. The curing compound shall be applied in sufficient quantity to obscure the natural color of the concrete. Additional coats shall be applied if the Engineer determines that the coverage is not adequate. The concrete shall be cured for the minimum period of time set forth below.

Type I Portland Cement Concrete-----	5 days
Type III Portland High-Early-Strength Cement Concrete-----	3 days

When forms are removed before the expiration of the curing period, the edges of the concrete shall be protected with moist earth, or sprayed with curing compound.

Other standard methods of curing the curb and gutter may be used upon approval of the Engineer. Concrete shall not be placed unless curing compounds and necessary equipment for applying such is on the Project site.

e. Expansion and Contraction Joints

- 1) Expansion Joints: Expansion joints shall be placed 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; between curbs and sidewalks (except parallel curb); and at the beginning and end of curb returns. Expansion joint material shall conform to the requirements of ASTM D-994 (AASHTO M-33). 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 (1/4) inch nor more than one-half (1/2) inch below the finished surface of the concrete. The material shall be of one (1) piece in the vertical dimension and shall be securely fastened in a vertical position to the existing concrete face against which fresh concrete is to be placed. After the concrete has cured, the expansion joints shall be filled flush to the finish concrete surface with silicone joint sealant.
- 2) Contraction Joints: Transverse contraction joints, cut to a depth of one (1) inch, prior to the final set of the concrete, shall be tooled in the sidewalks at intervals of five (5) feet, and at ten (10) feet 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.

Article 2.4 Measurement

Curb or integral curb and gutter shall be measured per linear foot along the face of the curb. Mountable (rolled) curb and gutter shall be measured per linear foot along the gutter line. Portland Cement Concrete (P.C.C.) Valley Gutter shall be measured along the straight flow line between expansion joints "A and B" and from expansion joint "C" to the intersection of this flow line (point "D") as shown on the Standard Detail.

Medians with curb noses shall be measured as follows: P.C.C. curb and gutter per linear foot, curb noses as units complete in place.

Parking stops shall be measured as units complete in place.

Article 2.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10.00 Standard General Provisions, Section 10.07 Measurement and Payment of this Specification and shall include full payment for all Work described in this Section.

Payment shall be made under the following units unless otherwise specified:

ITEM	UNIT
P.C.C. Curb and Gutter (type)	Linear Foot
P.C.C. Valley Gutter	Linear Foot
Curb Nose	Each
Parking Stop	Each

Extra payment will not be made for depressed curb or special sections.

SECTION 30.03 PORTLAND CEMENT CONCRETE SIDEWALKS

Article 3.1 Description

The Work covered under this Section consists of all Work necessary for the provision of Portland Cement Concrete sidewalks.

Article 3.2 Materials

The Portland Cement Concrete, joint filler, reinforcing steel, and curing materials shall conform to Division 30.00 - Standard Specifications for Portland Cement Concrete, Section 30.01 - General, Article 1.3 - Materials. Concrete mix for sidewalks shall conform to the requirements for Class A-3.

Article 3.3 Construction

a. Excavation and Embankment

Excavation and embankment for sidewalks shall be as described in Division 20.00 - Standard Construction Specifications for Earth- work. Where directed by the Engineer, unsuitable material in the subgrade shall be removed to a specific depth and then backfilled with classified fill. Payment will not be allowed for excavation below grade and for backfill materials required when such excavation is caused by negligence of the Contractor.

Embankment shall be compacted to 95% maximum density in accordance with Division 20.00 - Standard Specifications for Earthwork, Section 20.01 - General, Article 1.5 - Compaction Standards. In areas that are inaccessible to normal compaction equipment, approved tampers shall be used.

Before the forms are set, the subgrade shall be graded to within one (1) inch of established grade and the area between the sidewalk and the adjacent private property line shall be shaped to line, grade, and section shown on the Drawings.

b. Forms and Fine Grading

Forms shall conform to requirements outlined in Section 30.02 - Portland Cement Concrete, Curb and Gutter, and Valley Gutter of this Division. Wood forms against unexposed concrete surfaces shall be No.2 Common Lumber or better. Those against surfaces to be exposed shall be dressed and matched boards of uniform thickness, and widths not exceeding ten (10) inches. A rigid nonporous and waterproof sheet material may be used provided the end result will be a smooth unmarked concrete surface without waves, fins or other noticeable markings.

Plywood conforming to the requirements for form work, as set forth by the American Plywood Association, may be used against both exposed and unexposed concrete surfaces. This plywood shall be not less than five (5) ply and at least 9/16 inches thick. Low areas in the subgrade shall be backfilled

with classified fill or with suitable native material as directed by the Engineer. The backfill shall then be compacted to 95% maximum density and any dry areas in the subgrade shall be thoroughly dampened prior to the time the concrete is placed. No payment will be made for water and the work of placing and cost thereof shall be considered as incidental to the construction of the concrete sidewalk.

c. Placing and Finishing Portland Cement Concrete Sidewalk

The concrete shall be spread uniformly between the forms and thoroughly compacted with a steel shod strikeboard. After the concrete has been thoroughly compacted and leveled, it shall be floated with wood floats and finished at the proper time with a steel float. Joints shall be edged with a 1/4 inch radius edger and the sidewalk edges shall be tooled with a 1/2 inch radius edger. The surface shall be brushed with a fiber hair brush of an approved type in a transverse direction except that at a driveway and alley crossing it shall be brushed longitudinally.

The sidewalk shall be divided into panels by scoring one (1) inch deep every five (5) feet across the entire width of the concrete sidewalk. Refer to Section 30.02 - Portland Cement Concrete Curb and Gutter, and Valley Gutter, Article 2.3 - Construction and Forms, Paragraph e. - Expansion and Contraction Joints for requirements for contraction and expansion joints. The expansion joints shall be placed at all structures such as catch basins and manholes, at driveways, and at all points of tangency and points of curvature.

For only those surfaces that shall receive the exposed aggregate finish, Contractor shall float and trowel all surfaces to receive the exposed aggregate finish and shall top-seed and thoroughly set the aggregate into the concrete; after which, the aggregate shall be floated.

For all other exposed aggregate concrete sidewalks, Contractor shall float and trowel all surfaces to receive the exposed aggregate finish. Seeding the surface with aggregate shall not be allowed. After the concrete has taken its initial set, the surface aggregate shall be exposed using a water fog spray and brooms to remove the surface matrix. The coarse surface aggregate shall be exposed very lightly, approximately 1/16 inch. After the concrete has taken its final set, a weak acid wash shall be applied to clean and wash the exposed aggregate surfaces. The weak acid wash shall be thoroughly neutralized and flushed from the finished surface. Under no circumstances shall Contractor allow the acid wash to enter the storm drain lines.

Contractor shall protect adjacent construction, plantings, finishings, structures, and the public from damage and harm due to the acid wash. The finished appearance of the exposed aggregate concrete sidewalk shall produce an appearance and texture that matches the adjacent exposed aggregate sidewalk. Any significant difference in texture or appearance between two adjacent concrete panels, as determined by the Engineer, shall result in removal and replacement of concrete panels by Contractor at no additional cost to the Owner.

Contractor shall provide a 2' x 2' exposed aggregate concrete test panel prior to constructing the exposed aggregate concrete sidewalk. Location of the test panel will be on-site as approved by the Engineer. Notification of providing this test panel shall be made to the Engineer no less than 24 hours prior to making the test panels to allow the Engineer and materials analysis personnel to be present. The Engineer may require the Contractor to provide additional panel(s) if the test panel does not produce an appearance that matches the adjacent exposed aggregate sidewalk.

Providing the test panel and any other required test panel shall be considered incidental to the bid item "P.C.C. Sidewalk 6" Thick (Exposed Aggregate)" and no separate payment shall be made.

Additional requirements for placing and finishing concrete in cold weather shall be as outlined in Section 30.01 - General, Article 1.9 - Weather Limitations.

d. Curing and Protection

The curing materials and procedures outlined in Section 30.02 - Portland Cement Concrete Curb and Gutter, and Valley Gutter, Article 2.3. - Construction and Forms, shall prevail. The curing agent shall be applied immediately after brushing and be maintained for a period of seven (7) days.

The Contractor shall have readily available sufficient protective covering, such as waterproof paper or plastic membrane, to cover the pour of an entire day in event of rain or other unsuitable weather.

The sidewalk shall be protected against damage or defacement of any kind until it has been accepted by the Owner. Sidewalk that is not acceptable to the Engineer because of damage or defacement, shall be removed and replaced at the expense of the Contractor.

Additional requirements for curing in cold weather shall be as outlined in Section 30.01- General, Article 1.9 - Weather Limitations.

Article 3.4 Measurement

Sidewalk: Sidewalks shall be measured per square yard, complete in place, for both four (4) and six (6) inch thicknesses.

Article 3.5 Basis of Payment

Payment for this item shall be in accordance with Division 10.00 - Standard General Provisions, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following units:

ITEM	UNIT
P.C.C. Sidewalk 4" thick	Square Yard
P.C.C. Sidewalk 6" thick	Square Yard

SECTION 30.04 STRUCTURES AND RETAINING WALLS

Article 4.1 Description

The Work covered under this Section consists of the construction of Portland Cement Concrete structures and retaining walls.

Article 4.2 Construction

a. Reinforcing Steel

Reinforcing bars shall be bent cold and shall conform accurately to the shape and dimensions shown on the diagram. Bent-up bars, unless otherwise specified, shall be bent up at an angle of forty-five (45) degrees. In no case shall the radius of any bend be less than four (4) times the diameter of the bar.

The reinforcement shall be positioned as indicated on the Drawings or as hereinafter specified. It shall be rigidly blocked and wired in place, using metal supports or concrete blocks and securely tied at each intersection with annealed iron wire of at least twelve (12) gauge.

Splicing bars at points not indicated on the Drawings will not be permitted except as an emergency measure and with the consent of the Engineer. Such splices shall be at the points of minimum tensile stress and the lap shall be not less than thirty-six (36) bar diameters.

Bar lists and Bending schedules shall be furnished by the Contractor for approval of the Engineer. Materials shall not be ordered until such lists and bending diagrams have been approved by the Engineer. The approval of order lists and bending diagrams will in no way relieve the Contractor of responsibility for the correctness of such lists and diagrams. Any expense incident to the revision of material furnished in accordance with such lists and diagrams, to make it comply with the design drawings, shall be borne by the Contractor.

b. Forms

Forms shall conform to the shape and dimensions shown on the plans and shall be accurately set to line and grade. All sheeting in contact with concrete surfaces shall be matched tongue and groove lumber, sized to uniform thickness and free from wane, warp, splits, loose knots or other defects which will prevent obtaining a smooth, tight form. Forms for exposed surfaces shall be lined with plywood conforming to the requirements for form plywood as specified by the American Plywood Association. All plywood lining shall be used in as wide pieces as possible. Areas less than four (4) feet in width shall be lined with a single width of plywood. Joints in lining and backing shall not occur at the same place and the abutting edges of adjacent sheet shall be nailed to the same board.

Joints in the lining shall be filled with cold water putty, patching plaster, plastic wood, or other plastic filler satisfactory to the Engineer. Lining material may be re-used if it is in satisfactory condition, well cleaned, re-oiled, and if specific permission from the Engineer is obtained for each separate operation.

All forms shall be securely tied with bolts or rods in such manner that after stripping, such bolts or rods may be either entirely removed or may be removed for a distance at least one (1) inch below the concrete surface. Such bolts or rods shall be threaded and provided with nuts to prevent slipping and to provide adjustments. No wire ties nor clamping devices shall be permitted.

Forms for walls, etc., shall have large cleanout openings at their lowest points, which shall not be closed until just before placing concrete. All forms shall be thoroughly cleaned and soaked with water immediately before filling.

Weep drains shall be provided by the Contractor and installed as shown on the Drawings.

c. Placing

Concrete shall be placed by means of a bottom dumping bucket, cart, concrete chute, or tremie. At no time shall concrete have a free fall or more than three (3) feet. It shall be brought up in approximately horizontal layers. The concrete shall be placed continuously from one side or end of the section to the other, using precaution to put the full load upon any given area of form as rapidly as possible. The rate of delivery of concrete to the work shall be such as to insure continuity of placement. No partially completed surface shall be allowed to stand more than forty-five (45) minutes before continuing the placing of concrete thereon.

d. Compacting Concrete

All concrete shall be thoroughly spaded, especially along the forms, to prevent the formation of gravel pockets and to permit the escape of trapped air. In addition to spading, the Contractor shall also provide suitable internal vibrating tampers of the type designed to be placed directly in the concrete. Vibration shall be such that the concrete becomes uniformly plastic. Vibrators shall be inserted to a depth sufficient to vibrate the bottom of each layer effectively, but shall not be allowed to penetrate partially hardened concrete which will not become plastic under the vibrator action, nor shall the vibrator be applied directly to steel which extends into partially hardened concrete. Placing of concrete shall not commence until the vibrator is on the job site and the mechanical efficiency of the vibrator is proven in the presence of the Engineer.

e. Finishing Concrete

All irregularities on exposed surfaces such as gravel pockets, bolt holes, etc., shall be neatly painted with mortar of the same proportions as used in the concrete. The surface film of all such patches shall be rubbed off after initial setting has taken place.

All exposed surfaces shall, after irregularities have been corrected, be thoroughly wetted and brushed with a grout composed of one (1) part fine sand and one (1) part cement. It shall then be kept wet for forty-eight (48) hours.

All outside edges are to have three-quarter (3/4) inch chamfered corners, unless noted otherwise. They shall be obtained by putting a triangular strip of wood in the corners of the forms.

f. Joints, Horizontal and Vertical

Joints shall be made in walls or structures as indicated on the Drawings or where directed by the Engineer. If not indicated on the Drawings, the maximum distance between contraction joints shall be 25 feet, and the maximum distance between expansion joints shall be 50 feet. Where expansion joints are required, one-half (1/2) inch precast expansion joint material conforming to the requirements of ASTM D-994 (AASHTO M-148) shall be used. The walls shall be poured one section at a time. The joint material shall be accurately cut to fit the bulkhead between sections, and nailed to the bulkhead with 6d nails. These nails shall be driven into the lumber only enough to hold the material in place, the heads being embedded in the concrete. The bulk- heads between sections shall be removed not sooner than twelve (12) hours after the concrete has been placed and the nail points clinched into the joint material.

At the surface of the wall, unless otherwise shown, the joint shall end in a "V" shaped groove, two (2) inches wide and one (1) inch deep. Unless noted otherwise, all joints will be truly horizontal or truly vertical.

g. Removal of Forms

Unless otherwise directed by the Engineer, forms may be removed from structures and retaining walls, which are not subject to supporting loads, after a period of three (3) days. All other forms shall be removed upon approval of the Engineer.

h. Curing

All exposed surfaces shall be covered by layers of absorptive burlap, mats or other approved material to a thickness weighing not less than fourteen (14) ounces per square yard, immediately after finishing. The cover material shall be kept saturated with clean water for a minimum initial curing period of twenty-four (24) hours.

Following this initial curing, the concrete shall be completely covered with a plastic waterproof membrane, or equal, for an additional six (6) days. Liquid spray type waterproof membrane will not be considered a satisfactory material for curing concrete used for retaining walls or structures.

i. Waterproofing

Unless otherwise specified, the back side of retaining walls and backfilled surfaces of other structures shall be painted with two (2) coats of a cold bituminous waterproof coating which shall be approved by the Engineer prior to application. Application shall be with a stiff masonry type brush, or as recommended by the manufacturer.

j. Earthwork

All earthwork involved in the construction of retaining walls shall be constructed as specified in Section 20 - Earthwork.

Excavation for retaining walls and structures shall be to the limits shown on the drawings. Where limits are not indicated, excavation shall be sufficient to properly construct the work.

Where directed by the Engineer, unsuitable material in the subgrade shall be removed to a specific depth and then backfilled with classified fill.

The subbase under footings shall be compacted to 95% density at optimum moisture content in accordance with Section 30.01 - General, Article 1.5. - Subbase.

Backfilling the lower portion of structures and retaining walls shall not begin until fourteen (14) days after concrete placement. Where High-Early Strength Cement is used, backfilling the lower portion of structures and retaining wall shall not begin until four (4) days after concrete placement. Waterproofing shall not be left exposed for longer than twelve (12) days before backfill. Where drain holes or drain tile are involved, or where the Engineer may direct, a filter fabric shall be used in conjunction with a six (6) inch layer of coarse gravel which shall be spread and compacted around the drains in such a manner that earth will not clog the voids in the gravel. The remainder of the backfill shall be classified fill placed in layers not exceeding one (1) foot in thickness. Each layer shall be thoroughly rammed with a rammer not more than ten (10) inches in diameter and weighing not less than forty (40) pounds, or with an approved mechanical tamper. Unsuitable earth or vegetable matter shall not be used as backfill. Filling with loose earth and puddling will not be allowed except by written permission of the Engineer. Imported material for backfill shall conform to Section 20.05 - Classified Fill and Backfill.

Article 4.3 Measurement

Concrete shall be measured per cubic yard for structures and retaining walls. Measurement will be determined from the neat line dimension. In the case of minor field changes such a changing the length, height, etc., payment shall be based on the same unit price per cubic yard as bid. Measurement shall be determined by the Engineer and Contractor prior to placing concrete. Where sidewalks are constructed in conjunction with retaining walls, the sidewalk shall be measured under the provisions of Section 30.03 - Sidewalks.

Article 4.4 Basis of Payment

Payment for this Work shall be in accordance with Payment - General of this Section including earthwork and Division 10.00 - Standard General Provision, Section 10.07 - Measurement and Payment of this specification and shall include full payment for all Work described in this section. Extra payment will not be made to the Contractor if he places additional concrete over and above the neat line volume to facilitate his operation and save on form work.

No additional payment shall be made for excavation and backfill around retaining walls and structures. Payment for disposal of unusable excavation shall be in accordance with Section 20.04. Payment for classified fill shall be made in accordance with Section 20.05.

Payment shall be made under the following unit:

ITEM	UNIT
Portland Cement Concrete (Class)	Cubic Yard

SECTION 30.06 CONCRETE - BUILDING STRUCTURES

Article 6.1 Description

The work covered by these Specifications consists of providing all operations pertaining to the mixing and placement of Portland Cement Concrete.

Article 6.2 Materials

Portland Cement Concrete, reinforcing steel, curing materials, and miscellaneous concrete Work shall conform to Section 30.01, Article 1.3, Standard Construction Specifications for Portland Cement Concrete - Materials.

a. Reinforcing Steel and Steel Dowels

See Section 30.01, Article 1.3 (a) and (b).

b. Preformed Expansion and Dummy Joint Filler

See Section 30.01, Article 1.3 (h).

c. Curing Compounds

See Section 30.01, Article 1.3 (g).

d. Forms

Forms may be of wood or metal or any other material at the option of the Contractor, provided that the forms as set will result in configurations, dimensions, and proper finish in accordance with the Drawings.

Forms may be removed on the day following pour if the concrete is sufficiently set so that removal can be accomplished without danger of chipping or spalling. All forms shall be cleaned, oiled, and be examined for defects before they are used again.

Article 6.3 Formwork Construction

a. Inspection

Verify lines, levels, and measurements before proceeding with formwork.

b. Preparation

Earthforms - Hand-trim sides and bottoms of earth forms; remove loose dirt prior to placing concrete.

Wood and Prefabricated Forms - Minimize form joints. Symmetrically align joints, make watertight to prevent leakage of mortar for exposed concrete. Arrange and assemble formwork to permit dismantling, and stripping so that concrete is not damaged during its removal. Arrange forms to allow stripping without removal of principal shores, where required to remain in place.

c. Erection

Provide bracing to ensure stability of formwork. Strengthen formwork liable to overstressing by construction loads. Camber slabs and beams to achieve ACI 301 tolerances. Provide temporary ports in formwork to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain. Close ports with tight fitting panels, flush with inside face of forms, neatly fitted so that joints will not be apparent in exposed concrete surfaces. Provide chamfer strips on external exposed corners of beams, joists, and columns. Construct formwork to maintain tolerances in accordance with ACI 301.

d. Application of Form Release Agent

Apply form release agent on formwork in accordance with manufacturer's instructions. Apply prior to placing reinforcing steel, anchoring devices, and embedded items. Do not apply form release agent where concrete surfaces are scheduled to receive special finishes that may be affected by agent. Soak contact surfaces of untreated forms with clean water. Keep surfaces wet prior to placing concrete.

e. Inserts, Embedded Parts, and Openings

Provide formed openings where required for Work embedded in or passing through concrete. Coordinate Work of other sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts. Install accessories in accordance with manufacturer's instructions, level, and plumb. Ensure items are not disturbed during concrete placement.

f. Form Removal

Do not remove forms, shoring, and bracing until concrete has sufficient strength to support its own weight, and construction and design loads which may be imposed upon it. Remove load supporting forms only when concrete has attained 75 percent (75%) of required 28 day compressive strength provided construction is reshored. Reshore structural members due to design requirements or construction conditions to permit successive construction. Remove formwork progressively so no unbalanced loads are imposed on structure. Do not damage concrete surfaces during form removal. Store reusable forms for exposed architectural concrete to prevent damage to contact surfaces. Remove formwork in same sequence as concrete placement to achieve similar concrete surface coloration.

g. Cleaning and Tightening

Thoroughly clean forms and adjacent surfaces to receive concrete as erection proceeds and just before concrete placement. Remove chips, wood, sawdust, dirt, and other debris and ensure that water and debris drain from formwork through cleanout ports.

During cold weather, remove ice and snow from forms. Do not use de-icing salts. Unless within a heated enclosure, do not use water to clean out forms. Use compressed air to remove foreign matter.

Retighten forms immediately after concrete placement as required to eliminate mortar leaks.

Article 6.4 Concrete

a. Placing Concrete

Before placing concrete, ensure reinforcing is clean, free of loose scale, dirt, or other foreign coatings which would reduce bond to concrete. Insure that reinforcing is supported and secured against displacement. Do not deviate from true alignment.

Place concrete in accordance with ACI 304.

Notify the Engineer a minimum of 24 hours prior to commencement of concreting operations.

Ensure anchors, seats, plates, and other items to be cast into concrete are placed, held securely, and will not cause hardship in placing concrete. If problems are found rectify same and proceed with Work.

Maintain records of poured concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints, are not disturbed during concrete placement.

A bonding agent is to be used where pouring against previously placed concrete. Submit manufacturer's product data for the bonding agent to the Engineer for approval. Surface preparation is to be in accordance with the manufacturer's recommendations for the approved product.

Pour concrete continuously between predetermined construction and control joints.

Pour slabs-on-grade in checkerboard pattern or provide control joints to form panels or patterns as shown on the Drawings. If not shown on the drawings, control joints shall be made by sawing or by approved inserts. Saw cut control joints within 24 hours after finishing. Use 3/16 inch thick blade,

cutting 1/4 of slab thickness. Unless otherwise specified or approved, control joint spacing is not to exceed 15 feet.

In locations where new concrete is to be doweled to existing work, lay down dowels as shown on the drawings, drill holes in existing concrete and embed dowels according to the manufacturer's recommendations of the approved bonding agent. Submit manufacturer's product data for the bonding agent to the Engineer for approval.

Excessive honeycomb or embedded debris in concrete is not acceptable. Notify the Engineer upon discovery.

Conform to ACI 306 when concreting during cold weather.

Install vapor barrier under interior slabs on grade. Lap joints minimum 6 inches and seal. Do not disturb or damage vapor barrier while placing concrete reinforcing. If damage does occur, repair areas before placing concrete. Use vapor barrier material, lapped over damaged areas minimum 6 inches and seal.

Screed slabs-on-fill, maintaining surface flatness of maximum 1/8 inch in 10 feet.

c. Patching

Notify the Engineer 24 hours in advance to allow inspection of concrete surfaces immediately upon removal of forms. Patch imperfections as directed.

d. Defective Concrete

Modify or replace concrete not conforming to required lines, details, and elevations.

Repair or replace concrete not properly placed resulting in excessive honeycombing and other defects. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of the Engineer for each individual area.

e. Concrete Finishing

Provide standard form finish to all concrete formed surfaces that are to be concealed in the finish work or by other construction.

f. Floor Finishing

Finish concrete floor surfaces in accordance with ACI 302 and ACI 304.

Uniformly spread, screed, and float concrete. Do not use grate tampers or mesh rollers. Do not spread concrete by vibration.

Maintain surface flatness, with maximum variation of 1/8 inch in 10 feet.

In areas with floor drains, maintain floor levels at walls and pitch surfaces uniformly to drains at 1/8 inch per foot, or as directed by the Engineer.

g. Curing and Protection

Beginning immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

Article 6.5 Measurement

Payment for this Work shall be in accordance with Section 30.04 - Structures and Retaining Walls, Articles 4.3 and 4.4, Measurement and Payment, and shall include full payment for all Work described in Section 30.06.

Article 6.6 Basis of Payment

Unit Cost shall be made on the following basis unless otherwise specified:

ITEM	UNIT
Floor Slabs (on grade)	Cubic Yard
Structural Slabs (on grade)	Cubic Yard
Spread Footings	Cubic Yard
Continuous Footings	Cubic Yard
6" Concrete Walls	Cubic Yard
8" Concrete Walls	Cubic Yard
10" Concrete Walls	Cubic Yard
12" Concrete Walls	Cubic Yard

SECTION 30.07 PORTLAND CEMENT CONCRETE CURB RAMPS

Article 7.1 Description

The Work under this Section shall consist of the performance of all Work required for furnishing and constructing Curb Ramps.

Article 7.2 Materials and Installation

Each Curb Ramp shall be constructed in conformance with the plans and details. Materials and Installation shall meet the requirements of Section 30.03 Portland Cement Concrete Sidewalks and the plans.

Article 7.3 Measurement

The Work to be paid shall be the actual square yardage of Curb Ramp furnished, constructed and accepted in place.

Article 7.4 Basis of Payment

Payment of this Work shall be in accordance with Division 10 - Standard General Provisions, Section 10.07 Measurement and Payment, as amended in these specifications, and shall include full payment for all Work as described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
P.C.C. Curb Ramp	Square Yard

SECTION 30.08 PORTLAND CEMENT CONCRETE CLUSTER MAILBOX BASE

Article 8.1 Description

The Work covered under this Section shall consist of the performance of all Work required for furnishing and constructing a Cluster Mailbox Base.

Article 8.2 Materials and Installation

Each Cluster Mailbox Base shall be constructed in conformance with the plans and details. Materials and Installation shall meet the requirements of Section 30.03 Portland Cement Concrete Sidewalks of the CBSS, and the plans.

Article 8.3 Construction

Contractor shall contact Postmaster, Manager, Address Management, Sitka District, United States Post Office at (907) 747-3381, forty-eight (48) hours prior to beginning construction of the Cluster Mailbox Base to schedule the final placement of the Cluster Mailbox Unit by the United States Post Office.

Article 8.4 Measurement

The Work to be paid for shall be the actual Cluster Mailbox Base furnished, constructed and accepted in place.

Article 8.5 Basis of Payment

Payment of this Work shall be in accordance with Division 10 - Standard General Provisions, Section 10.07 Measurement and Payment, as amended in these specifications, and shall include full payment for all Work as described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
P.C.C. Cluster Mailbox Base	Each

SECTION 30.09 SIDEWALK JOINT SEALANT

Article 9.1 General

The Work covered under this Section consists of all Work necessary to prepare and seal joints in sidewalks.

Article 9.2 Materials

Sealant material shall be long-lasting, and resist deterioration caused by weather, stress, movement, traffic, and water. Sealant materials shall be approved by the Engineer prior to use. The sealant color shall closely match adjacent concrete sidewalk.

Article 9.3 Construction

Joint sealant shall be applied to joints whose dimension is between 1/2" and 1" in width as directed by the Engineer. The sealant shall be applied in conformance with the manufacturer's instructions and to full depth of the joint.

The joints shall be cleaned and all loose material shall be blown out to the full depth of the joint. The interior of the joint shall be completely dried and existing sidewalk surfaces shall be exposed.

The application of joint sealant shall be incidental, and shall require no basis for payment.

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STANDARD CONSTRUCTION SPECIFICATIONS FOR ASPHALT SURFACING

SECTION 40.01 GENERAL

Article 1.1 Scope of Work

The Work covered by these Specifications consists of providing all plant, labor, equipment supplies, material, transportation, handling, and storage, and performing all operations necessary to complete the construction of hot mix asphalt concrete pavement consisting of one or more courses on a previously prepared base, seal coat of asphalt cement and cover aggregate, and bituminous surface treatment in single or multiple courses.

Article 1.2 Applicable Standards

The latest revision of the following standards of the American Society for Testing and Materials (ASTM) and the American Association of State Highway and Transportation Officials (AASHTO) are hereby made a part of these Specifications.

ASTM C-29	Test for Unit Weight of Aggregate
ASTM C-88	Test for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C-117	Test for Materials Finer than No. 200 Sieve in Mineral Aggregates
ASTM C-127	Test for Specific Gravity and Absorption of Coarse Aggregate
ASTM C-128	Test for Specific Gravity and Absorption of Fine Aggregate
ASTM C-131	Test for Resistance to Abrasion of Small Size Coarse Aggregate by Use of Los Angeles Abrasion Machine Test for Sieve or Screen Analysis of Fine and Coarse Aggregate
ASTM C-183	Sampling Hydraulic Cement
ASTM D-75	Sampling Stone, Slag, Gravel, Sand and Stone Block for Use as Highway Materials
ASTM D-140	Sampling Bituminous Materials
ASTM D-242	Specification for Mineral Filler for Bituminous Paving Mixtures
AASHTO M-29	Fine Aggregate for Bituminous Paving Mix
AASHTO M-43	Standard Size of Coarse Aggregate for Highway Construction
AASHTO M-208	Specification for Cationic Emulsified Asphalt
AASHTO T-30	Test for Mechanical Analysis of Extracted Aggregate
AASHTO T-43	Test for Specific Gravity of Bituminous Materials
AASHTO T-180-D	Test for Moisture-Density Relations of Soils
AASHTO T-102	Spot Test of Asphaltic Materials
AASHTO T-164	Test for Quantitative Extraction of Bitumen*
AASHTO M-226-73-1	Viscosity Graded Asphalt Cement - Table Three (3)
AASHTO T-195	Test for Coated Particles for Bituminous Mixtures

*In lieu of the specified methods, the Engineer may permit the use of a nuclear asphalt gauge.

The following standards of The Asphalt Institute are also a part of these Specifications.

Construction Specifications for Asphalt Concrete by The Asphalt Institute.

Mix Design Methods for Asphalt Concrete, Second Edition, by The Asphalt Institute.

The number of blows of the Compaction hammer used in the Marshall Mix Design will be 50 blows per side of biscuit.

Article 1.3 Subsurface Investigation

Information pertaining to subsurface exploration, boring, test pit locations, and other preliminary investigation may appear in the Contract Documents, or be available at selected locations for review by the Bidder. While such data will have been collected with reasonable care, there is not expressed or implied guarantee that conditions so indicated are exact or entirely representative of those actually existing. The Bidder shall put his own interpretation on results of such investigations and satisfy himself as to the conditions to be encountered.

Article 1.4 Materials and Inspection

Representative samples of all materials proposed for use under these Specifications shall be submitted to the Engineer for testing. The Contractor shall submit these materials at his own expense. Material shall not be used until it has been approved by the Engineer.

For verification of weights and measures, character of materials, and determination of temperatures used in the preparation of the paving mixes, the Engineer or his authorized representative shall at all times have access to all portions of the paving plant, aggregate plant, storage yards, and other facilities for producing and processing the material construction.

Article 1.5 Stripping Test for Aggregates

A test sample consisting of the aggregate and bitumen to be used in the paving mixtures shall be mixed at the plant mixing temperature specified herein. The sample shall then be spread in a loose, thin layer and placed on a constant-temperature oven controlled to 140 degrees Fahrenheit for a period of twenty-four (24) hours before testing. A portion of the sample, not to exceed one-half (1/2) the capacity of the jar, shall be placed in a glass jar and completely covered with distilled water. The jar shall be fitted with a tight screw cap and allowed to stand for a period of fifteen (15) minutes and the sample of the mixture shall then be examined for stripping.

Article 1.6 Payment - General

Payment for all Work included in this Division shall be paid for in accordance with Division 10.00 - Standard General Provisions, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described.

SECTION 40.02 ASPHALT CONCRETE PAVEMENT

Article 2.1 Description

The Work under this Section consists of the performance of all Work required for the construction of asphalt concrete pavement on a prepared base.

Article 2.2 Material and Testing

a. Asphalt

The Contractor shall submit a certified analysis of the asphalt from the refinery laboratory to the Engineer for review and approval. A copy of the certified analysis shall accompany each shipment of asphalt to the asphalt mixing plant. The Engineer reserves the right to make check tests of the asphalt received on the Project site, and if the asphalt is not in accordance with the certified analysis he may reject the materials.

The asphalt required by these Specifications shall conform to the requirements of The Asphalt Institute for the type and grade shown below.

Asphalt for Paving Mix shall be A.C.-5.

b. Aggregates

Coarse aggregate is all mineral retained on the No. 4 sieve. The aggregate retained on a No. 4 sieve shall contain at least 65% by weight of crushed pieces having two or more mechanically fractured surfaces.

All coarse aggregate shall be free from coatings of clay, silt, or other objectionable matter and shall not contain clay balls or other aggregation of fine material. Coarse aggregate shall be tested for soundness in accordance with the requirements of ASTM C-88, or will have proven sound through adequate record of service.

When aggregate grading is such that the material will tend to segregate in stockpile or handling, it shall be supplied in 2 or more sizes. Each size of aggregate required to produce the combined gradation specified shall be placed in individual stockpile at the plant site and separated by bulkheads or other means. When it is necessary to blend two or more aggregate sizes, the blending shall be done through separate bins at the cold elevator feeders, and not in the stockpile.

Fine aggregate is composed of all mineral matter passing the No. 4 sieve. It shall consist of natural and/or manufactured material derived by crushing gravel.

The aggregate particles shall be clean, tough, durable, moderately sharp, and free from coating of clay, silt, or other objectionable matter and shall not contain clay balls or other aggregations of fine material. Fine aggregate shall be tested for soundness in accordance with the requirements of ASTM C-88, or shall have a

satisfactory soundness record. When tested for soundness, the number of cycles shall be five (5), the solution shall be sodium sulfate; the maximum loss shall be fifteen (15) percent by weight. Fine aggregates shall be maintained in individual stockpiles, suitably separated to prevent intermingling.

c. Mineral Filler

Mineral Filler shall conform to the requirements of ASTM Specification Designation D-242.

Article 2.3 Composition of Mixes

a. General Requirements

Paving mixtures prepared under these Specifications shall be composed of aggregate and paving asphalt within the limits set forth in the following table:

Percentages by Weight Passing Sieves

Sieve Size	Wearing Course	
	Type II	Type III
3/4 inch	100	----
1/2 inch	----	100
3/8 inch	68-88	75-93
No. 4	45-65	55-80
No. 10	30-50	40-66
No. 40	12-28	14-30
No. 200	3-10	3-10

b. Additive Materials

A "non-stripping" additive shall be added to the asphalt in the amount of one-fourth (1/4) percent by weight of the asphalt. Such additive material shall be of quality and grade acceptable to the Engineer.

c. Job Mix

The Contractor, at his expense, shall submit to the Engineer for approval, a job mix formula within the limits specified above, for each class of mix designated by the Contract. The aggregate gradation of the job-mix formula, when plotted upon an aggregate grading chart, shall closely approximate the shape of average gradations for the limits specified. For that portion of the aggregate passing No. 4 sieve, gradings which range from at or near the maximum of one (1) sieve to at or near the minimum of the next sieve will not be permitted. The Engineer may require increased asphalt content up to 0.5% above that indicated by

Marshall Design Criteria. Upon requiring increased asphalt content, the lower limit of percent voids and the upper limit of percent voids filled shall be waived.

d. Maximum Permissible Variations

Unless specifically changed in writing by the Engineer, the maximum permissible variation from the job-mix formula shall be as follows:

Sieve Size	Permissible Variation Percent by Weight of Total Mix
No. 4 and Larger	5.0
No. 10, 40 and 80	4.0
No. 200	2.0
Asphalt	0.4

These permissible variations from the job-mix formula shall not permit the use of any mix which would be outside the Specification limits through the application of the variation. Maximum temperature variations shall be not more than 25 degrees from mix design.

e. Test Methods

The job-mix shall be determined according to the Marshall Method, as set forth in The Asphalt Institute Manual, Series No. 2, Second Edition.

Upon compaction and testing of the job-mix specimens, the mixture shall conform to the aforementioned specifications within the following limits:

Stability (Marshall) pounds	700 Plus
Flow (Marshall) Maximum	16
Percent Voids	3 to 5
Percent Voids Filled with Asphalt	75 to 85

Article 2.4 Equipment

a. General

All equipment furnished by the Contractor shall be maintained in a sound mechanical condition. Equipment shall be serviced and lubricated away from the paving site; units that drip fuel, oil and/or grease shall be removed from the Project until such leakage is corrected to the satisfaction of the Engineer.

b. Asphalt Mixing Plant

All plants, used by the Contractor, shall be designed, coordinated and operated to produce a mix uniformly within the job- mix tolerances as listed herein. The plant may be either a weightbatch type or a volumetric proportioning, continuous mixing type, provided the equipment has demonstrated that it is suitable for producing finished mixtures complying with the job-mix formula specified herein.

The plant shall be equipped with the necessary equipment for storing, handling, drying, heating and mixing the aggregate and asphalt. Satisfactory means shall be provided for aggregate and asphalt control as to quantity and temperature. Adequate safety measures shall be provided on stairs, gears, pulley, chains, sprockets, and all other dangerous moving parts.

c. Pavers

Unless otherwise provided, the mix shall be placed by a mechanical self-powered paver, capable of placing the mix true to the line, grade, and crown in accordance with the Contract Documents.

To place the mix uniformly, pavers shall be equipped with a receiving hopper and distributing augers. The augers shall uniformly distribute the mix in front of an adjustable vibrating screed. Paver extensions shall include auger, activated screed or strike-off assembly.

They shall be equipped with a quick and efficient steering device, and shall be capable of traveling both forward and in reverse.

Pavers shall be capable of spreading mixes without segregation and/or tearing. Pavers shall be capable of placing courses in thickness of from one-half (1/2) inch to at least three (3) inches and in width be adjustable in increments of six (6) inches and one (1) foot. For trails, pavers shall be capable of placing the required thickness in one lift with a minimum paving width of five feet, truck towed spreader type equipment will be permitted provided the width and depth requirement can be met.

The term "screed" includes any strike-off device operated by cutting, crowding, or other action which is effective on mixes at workable temperatures, without tearing, shoving, or gouging them, and which produces a finished surface of an even and uniform texture. The screed shall be adjustable as to level and section and shall have provisions for vibration and heat.

d. Rollers

Rollers shall be self propelled, and reversible, and equipped to maintain clean and straight contact surfaces. Heat shall be maintained on pneumatic tires by skirting or other approved devices.

The number, weight, and type of rollers furnished shall be sufficient to obtain the required density and surface requirements while the mix is in a workable condition. One pneumatic roller shall be furnished and operated in a workmanlike manner by the Contractor. There shall be at least one operator for each roller.

Pneumatic Tired Rollers:

Pneumatic tired roller shall ride on not less than seven uniformly sized and uniformly inflated smooth tires mounted on wheel rims of 20 inch minimum diameter. The rear group of tires shall align behind and cover the spaces between the forward group of tires. Tires shall be inflated, and the roller ballasted, to provide a uniform (plus or minus 5 pounds per square inch) minimum ground contact weight of 70 pounds per square inch, unless a lower weight is requested in writing by the Engineer.

Steel-Wheel Rollers: Steel-wheel roller may be of three (3) types:

- Three-wheel roller, 10 to 12 tons in weight
- Two-axle tandem rollers, 8 to 12 tons in weight
- Three-axle tandem rollers, 10 to 14 tons in weight

All rollers shall be equipped with power units of not less than four (4) cylinders and under working conditions shall develop a compression in the rear wheels of 250 to 350 pounds per inch of roller width. Rollers shall be in good working condition and be free from backlash, faulty steering mechanism, or worn parts. Rollers shall be equipped with adjustable scrapers to keep the rollers clean and with efficient means of keeping the wheels wet to prevent mixes from sticking to the rollers. Rollers shall be free of flat areas, openings or projections which will mar the surface of the pavement.

e. Haul Trucks

Vehicles used for the transportation of hot-mix asphalt from the plant to the Project shall have tight metal bottoms and shall be free from dust, screenings, petroleum oils, volatiles, and other mineral spirits which may effect the mix being hauled. The truck beds shall be cleaned as often as required, but at least once a day. After this operation the truck bed shall be elevated and thoroughly drained; no excess solution shall be permitted.

When ordered by the Engineer, trucks shall be suitably provided with covers of canvas or other material of sufficient size and weight to protect the load from adverse weather conditions and to maintain the required mix temperatures.

f. Truck Scales

Hot mix asphalt shall be weighed on platform scales furnished by the Contractor or on public scales at the Contractor's expense. The scales shall be satisfactory to the Engineer and shall comply with all State Laws governing the use of scales. The scales shall be tested and sealed by an authorized public official, at the

expense of the Contractor, as often as the Engineer may deem necessary to insure their accuracy. Batch plant proportioning scales may be used in lieu of truck scales only with the written approval of the Engineer.

Weighing will not be required where the basis of payment for Asphaltic concrete work is included in the Basic Bid.

g. Hand Tools

Only lutes or asphalt rakes shall be used during the spreading operation and when finishing by hand.

Tamping irons shall weigh not less than twenty-five (25) pounds and shall have a bearing area not exceeding forty-eight (48) square inches. Mechanical compaction equipment, satisfactory to the Engineer, may be used instead of tamping irons.

h. Straightedges

Straightedges ten (10) and sixteen (16) feet in length, to test the finished surface, shall be provided by the Contractor. The sixteen (16) foot straightedge shall be used on straight away sections and the ten (10) foot straightedge on vertical curves or crown.

Article 2.5 Construction

a. Weather Limitations

The mixing and placing of hot-mix asphalt shall be performed only when weather conditions are suitable. Mix shall not be placed when water is observed on the surface or when the temperature of the surface on which the mix is to be place is less than forty-five (45) degrees Fahrenheit except that, with the written approval of the Engineer, Asphaltic mixes may be placed upon surfaces having temperatures of not less than thirty-five (35) degrees Fahrenheit provided hot-mix asphalt shall be delivered continuously in covered and insulated vehicles.

Air temperature shall be measured in the shade away from heat sources at the paving site. Asphalt pavement shall not be placed unless the ambient air temperature is above 32 degrees Fahrenheit and not falling.

The placement of bituminous paving mixture for wearing course class B, on Projects after September 1 shall be prohibited, unless authorized by the Engineer.

b. Preparation of Area to be Paved

The area to be paved shall be true to line and grade, having a smooth dry, compacted surface prior to the start of paving operations. The area to be paved shall be free from all loose asphalt and foreign material.

Contact surfaces of curbing, gutters, manholes, and other structures shall be painted with a thin, uniform coating of Asphaltic cement or approved equal material prior to the mixture being placed against them. Butt joints on previously placed cooled pavement shall be tack coated prior to continuing the paving operation.

c. Preparation of Paving Asphalt

The asphalt shall be heated at the paving plant to a temperature at which it can be properly handled through the pumping system, but at no time shall the temperature of the asphalts exceed that recommended by the asphalt supplier or manufacturer, or be greater than 325 degrees Fahrenheit or less than 250 degrees Fahrenheit.

d. Preparation and Handling of Aggregates

Aggregates shall be stored at the plant in such a manner that the separate sizes will not become intermixed. Cold aggregate shall be carefully fed to the plant in such proportions that surplus and shortages in the hot bins will not cause breaks in the continuous operations.

Stockpiles and bins shall be sampled for gradation analysis, dust coating, and for other purposes, at the option of the Engineer.

When requested by the Engineer, the Contractor shall provide representative samples from each of the hot bins. Samples shall be used to determine compliance with these Specifications.

1) Drying:

The aggregate shall be thoroughly dried and heated to provide a paving mix within a tolerance specified herein. The moisture content of the heated and dried aggregate shall not exceed five-tenths (0.5) percent.

Dust collected during the drying operation may be fed uniformly back into the hot aggregate prior to screening, provided a position mechanical feed is used which will control the feed back to the quantity specified by the Engineer.

2) Screening:

Aggregates shall be screened into sizes that may be recombined into a gradation meeting the requirements of the job-mix formula. Screens shall have normal capacities slightly in excess of the production capacity of the mixer and rated capacity of the dryer.

3) Hot Aggregate Storage:

Hot screened aggregate shall be stored in such a manner as to minimize segregation and loss of temperature.

e. Mixing Plants and Controls

All plants shall be equipped with a positive means to govern the time of mixing. Mixing time shall not be altered unless so ordered by the Engineer.

Frequent gradation analysis of the hot aggregates of the completed mix shall be made to be certain that the materials being used and produced are within the tolerances of the job-mix formula and the Specifications of the mix being used. If the mix is found to be outside the hot-mix formula tolerances or outside the specification limits, corrections shall be made in quantities measured from the hot bins and suitable changes made at the cold bin feeders. It shall be the responsibility of the Contractor to furnish a finished product in accordance with the Contract Documents. Tests by the Engineer are for checking purposes only and not for calibrating the plant.

Batch Type Plant: When the mix is produced in a batch type plant, the aggregate shall be accurately weighed in the proper proportions to provide the batch weight.

The asphalt shall be heated to provide a material sufficiently fluid to produce a uniform coating on every particle of aggregate within the specified mixing time. The temperature of the aggregates and asphalt immediately prior to mixing shall be approximately that of the completed batch. In no case shall the temperature of the asphalt and aggregate vary more than twenty-five (25) degrees Fahrenheit when placed in the mixing chamber.

A dry mixing period of not less than ten (10) seconds shall precede the addition of the asphalt to the mix. Excess wet mixing shall be avoided. Wet mixing shall continue as long as is necessary to obtain a thoroughly blended mix. The minimum percent of coated particles used to establish the mixing time interval shall be 95% as determined by AASHTO T-195.

Continuous Type Plant: Continuous mix plants shall in general be controlled in the same manner as batch plants.

The determination of mixing time shall be by weight method under the following formula unless otherwise approved:

$$\text{Mixing time in seconds} = \frac{\text{Pugmill Dead Capacity in Pounds}}{\text{Pugmill Output in Pounds Per Second}}$$

The weights used for computing mixing time shall be determined for the job, from tests made by the Contractor and shall conform to the recommendations of the manufacturer. Mixing temperature shall not exceed that recommended by the asphalt cement manufacturer without the written approval of the Engineer.

To aid in determining the proper temperature of the completed batch, current viscosity data shall be available at the plant at all times.

f. Transportation of Mix

The dispatching of the hauling vehicles shall be so scheduled that all material delivered may be placed and rolled in daylight. When variations in size of loads, speed of trucks, length of haul, and conditions of trucks interfere with orderly continuous operations, the Engineer may order suitable corrections to be made.

g. Mechanical Spreading

The asphalt concrete shall be placed on the road surface at a temperature of not less than 260° Fahrenheit or greater than 300° Fahrenheit. Additionally, the maximum temperature to which the asphalt cement is heated shall not exceed supplier's recommendation. The asphalt concrete temperature shall be measured directly behind the paver screed at the time of placement.

The surface course shall be spread and struck off with an approved self-powered and propelled mechanical spreading machine.

Longitudinal joints and edges shall be constructed to true line markings. Lines shall be established parallel to the center line for the paver to follow in placing individual lanes. The paver shall be operated and positioned to closely follow the established line. When backing trucks to the finisher, care shall be taken not to jar the finisher.

The texture of the unrolled surface shall be checked to determine its uniformity. The adjustment of the screed, tamping, feed screws, hopper feed, etc., shall be checked frequently to assure uniform spreading of the mix. Segregation of the material shall not be permitted. If segregation occurs, the spreading operation shall be immediately suspended until the cause is determined and corrected.

Any irregularities left by the paver shall be corrected by trimming directly behind the machine by use of lutes or covered rakes. Immediately after trimming, the edges of the course shall be thoroughly compacted by tamping. Distortion of the pavement during this operation shall be avoided.

Edges against which additional pavement is to be placed shall be vertically formed to true line. A lute or covered rake shall be used immediately behind the finisher, when required to obtain a true line and vertical edge. Any irregularities in the surface of the pavement course shall be corrected directly behind the paver. Excess material forming high spots shall be removed by a shovel or lute. Indented areas shall be filled with hot-mix and smoothed with the back of a shovel pulled over the surface. Fanning of material over such areas shall not be permitted.

On longitudinal joints, the paver shall be positioned so that in spreading, the material overlaps the edge of the lane previously placed by one or two inches and is sufficiently high to allow for compaction. The coarse aggregate in the material overlapping the joint shall all be raked out into the cold lane as soon as possible

behind the paver and broomed up and wasted. In no case shall scattered rocks be rolled into the surface of either lane.

h. Hand Spreading

In small areas where the use of mechanical finishing equipment is not possible, the mix may be spread and finished by hand, if permitted by the Engineer. Placing by hand shall be performed carefully. The material shall be thoroughly loosened and uniformly distributed by lutes and rakes.

i. Compaction

Immediately after the asphalt mixture has been spread, struck off and surface irregularities adjusted, it shall be thoroughly and uniformly compacted by rolling.

The surface shall be rolled when the mixture is in the proper condition and when the rolling does not cause undue displacement, cracking, or shoving.

Initial rolling shall be done with a steel-wheel roller with the drive roll operating toward the paver, and/or a suitable pneumatic tired roller. Initial rolling shall be completed while the bituminous mat temperature is above 225 degrees Fahrenheit.

Following the initial rolling at least three coverages of the pavement shall be completed with a pneumatic tired roller, while the mat temperature is above 175 degrees Fahrenheit.

Final rolling shall be completed with a steel wheeled roller and shall continue until roller marks and further compression are not evident in the pavement.

Unless otherwise directed, rolling shall begin at the sides and proceed longitudinally parallel to the road center line, each trip overlapping one-half the roller width, gradually progressing to the crown of the road. When paving in echelon or abutting a previously placed lane, the longitudinal joint should be rolled first followed by the regular rolling procedure. On superelevated curves the rolling shall begin at the low side and progress to the high side by overlapping of longitudinal trips parallel to the centerline.

Any displacement occurring as result of the reversing of the direction of a roller, or from other causes, shall be corrected at once by the use of rakes and addition of fresh mixture when required. Care shall be exercised in rolling not to displace the line and grade of the edges of the asphalt mixture.

To prevent adhesion of the mixture to the rollers, the wheels shall be kept properly moistened with water or water mixed with very small quantities of detergent or other approved material. Excess liquid will not be permitted.

Along forms, curbs, headers, walls, and other places not accessible to the rollers, the mixture shall be thoroughly compacted with hot hand tampers, smoothing irons, or with mechanical tampers. On depressed areas, a trench roller may be used or cleated compression strips may be used under the roller to transmit compression to the depressed area.

j. Repair and Replacement

Any mixture that becomes loose and broken, mixed with dirt, or is in any way defective, shall be removed and replaced with fresh hot mixture, which shall be compacted to conform with the surrounding area. Any area showing an excess or deficiency of asphalt material shall be removed and replaced.

Parking of rollers or vehicles on pavement that has not cooled sufficiently to prevent indentations by wheels is prohibited.

k. Vehicular Traffic

Contractor shall not allow vehicular traffic on the Asphaltic mat surface until the mat surface has cooled to below 120 degrees Fahrenheit. Any portion of the Asphaltic mixture that becomes loose and broken, rutted or damaged in any way due to vehicular traffic on the Asphaltic mat surface prior to it cooling to below 120 degrees Fahrenheit, shall be removed and replaced with fresh hot asphalt concrete, which shall be compacted to conform with the surrounding area at the specified density.

Article 2.6 Density and Surface Requirements

The complete pavement shall have a density equal to or greater than ninety-five (95) percent except for trail pavement which shall have a density equal to or greater than ninety (90) percent of a laboratory specimen made from the same days mix, and as close to the lay down temperature as practicable.

When requested by the Engineer, the Contractor shall, without charge provide the Engineer with test samples of asphalt concrete cored from the completed pavement. All cores shall be at least four (4) inches in diameter and the core holes will be patched by the Contractor within 72 hours.

The final surface shall be of a uniform texture conforming to true grade, and cross sections in accordance with the Contract Documents. The thickness of the course shall be determined by the Engineer.

Prior to the delivery of the first load of asphalt to the Project, the Contractor shall furnish straightedges to the Inspector for checking surface uniformity. Surface irregularities shall not exceed three sixteenths (3/16) of an inch within ten (10) feet, or five-sixteenths (5/16) of an inch within sixteen (16) feet. Non-conforming surfaces shall be subject to rejection by the Engineer. Irregularities which develop before the completion of rolling shall be remedied by loosening the surface mix, removing or adding material as may be required, and re-rolling.

For trails, a ten (10) foot straightedge, supplied by the Contractor, shall be used to check the paving surface. Surface irregularities shall not exceed one (1) inch in ten (10) feet. Non-conforming surfaces shall be subject to rejection by the Engineer. Irregularities which develop before completion of rolling shall be remedied by loosening the surface mix, removing or adding material as may be required, and re-rolling.

Article 2.7 Measurement

Asphaltic concrete will be paid for by one of the methods as defined in the Paragraph below and as designated in the Bid Schedule.

a. Measurement by the Ton

Measurement of hot-mix Asphaltic paving materials, unless otherwise provided, shall be weighed on truck scales in accordance with Article 2.4 - Equipment, paragraph f., of this Section. Asphalt concrete pavement shall be measured per ton of 2,000 pounds based on the amount of hot mix Asphaltic material actually used in the completed and accepted work modified as follows: the quantity paid for shall not exceed 105% of tonnage determined on the basis of the average core density, the specified neat line thickness, and the completed area of Asphaltic concrete pavement. In addition, the Owner will not pay for that portion of any load in excess of the legal gross weight for the vehicle delivering the load.

b. Measurement by the Square Yard

Measurement of hot-mix Asphaltic paving materials, unless otherwise provided, shall be measured by the completed and accepted work. The area measured will be that which is so shown on the plans plus any additional areas as authorized by the Engineer in writing.

The tolerance for thickness of Asphaltic concrete under square yard measurement shall be plus or minus one-fourth (1/4) of an inch from design mat thickness, as shown on the typical section. This one-fourth (1/4) inch variance shall be the exception only with the average variance for the job being plus or minus one-eighth (1/8) of an inch from the design mat thickness. All Asphaltic concrete placed outside the variables allowed, will be corrected by the Contractor at his expense.

c. Measurement by the Linear Foot

Measurement of hot-mix Asphaltic paving materials for bike trails, unless otherwise provided, shall be per linear foot along the centerline of the constructed trail. The thickness of asphalt shall not be less than the thickness shown in the typical section as noted on the plans.

Article 2.8 Basis of Payment

Payment for this work shall be in accordance with Section 40.01 - General, Article 1.6 - Payment - General, and shall include full payment for all Work described in Section 40.02.

Unit cost payment shall be made on the following basis:

ITEM	UNIT
A.C. Pavement (Type)	Ton
A.C. Pavement (Type, thickness)	Square Yard
A.C. Pavement (Type, thickness)	Linear Foot

SECTION 40.03 SEAL COAT

Article 3.1 Description

This Work under this Section consists of the performance of all Work required for the construction of a seal coat of asphalt cement and cover aggregate on bituminous surfaces.

Article 3.2 Asphalt

The Contractor shall submit a certified analysis of the proposed asphalt from the refinery laboratory to the Engineer for review and approval. A copy of the certified analysis shall accompany each shipment of asphalt to the Project. The Engineer shall reserve the right to make check tests of the asphalt received on the Project site, and if the asphalt is not in accordance with the certified analysis, he may reject the material.

The asphalt required by these Specifications shall conform to the requirements of The Asphalt Institute for the type and grade shown below.

Asphalt for Seal Coating CRS-2.

Article 3.3 Cover Aggregate

a. General

Cover aggregate shall consist of crushed gravel and shall be sound, durable, free of adherent coatings of clay, dirt or any other objectionable matter, and shall have a percentage of wear not to exceed 40 after 500 revolutions, as determined by ASTM G-131. Fractured Face Count shall conform to Section 40.02 - Asphalt Concrete Pavement, Article 2.2 - Material and Testing. The cover aggregate shall have the following gradation:

SIEVE SIZE	PERCENT PASSING SIEVE
½	100%
3/8	90-100
No. 4	10-30
No. 8	0-8
No. 200	0-2

b. Stripping Test for Aggregates

Cover aggregate shall show no detrimental amount of stripping when tested as described in Section 40.01-General, Article 1.5 - Stripping Tests for Aggregates.

Regardless of the test results, a "non-stripping" additive shall be added to the asphalt in the amount of one-half (1/2) percent by weight of the asphalt. Such additive material shall be of quality and grade acceptable to the Engineer.

Article 3.4 Equipment

a. General

All equipment used on this Work shall be of sufficient size and in such mechanical condition as to meet the requirements and to produce the Work to the specified quality.

b. Pressure Distributor

The bitumen distributor shall be pneumatic-tired, self propelled, and shall have a capacity of not less than eight hundred (800) gallons. It shall be equipped with an independently-operated bitumen pump, tachometer, pressure gauges, volume metering devices, a thermometer for reading the tank temperature, and a hose attachment suitable for applying the bituminous material to spots unavoidably missed by the distributor. The independently-operated bitumen pump shall be equipped with a tachometer calibrated in revolutions per minute. The distributor shall also be equipped to agitate and circulate the bituminous material during the heating process. Spray bars shall be the circulating type with extensions, available for distributing width from eight (8) to twenty-one (21) feet by one (1) foot increments.

The nozzle shall give uniform distribution and the shut-off shall be quick and positive so as to prevent dripping. The distributor shall be so designed and equipped as to distribute the bituminous material uniformly at consistent surface speeds, at uniform temperatures with various surface widths, at known and maintained rates of 0.05 to 2.0 gallons per square yard within a tolerance of five (5) percent, and through a pressure ranges from twenty- five (25) to seventy-five (75) pounds per square inch. Air pressure type equipment may be used only upon written approval from the Engineer.

c. Cover Aggregate Spreader

The spreader shall be self-propelled and be capable of spreading the cover material uniformly for widths of eight (8) feet to sixteen (16) feet in one (1) foot increments, and adjustable to spread uniform layers of ten (10) to thirty (30) pounds per square yard. Revolving plate type chip spreaders will not be approved.

d. Rollers

Rollers shall be self-propelled, pneumatic-tired, weighing not less than five (5) tons and not more than eight (8) tons. Rolling shall follow closely on spreading of aggregate.

e. Hauling Equipment

The cover aggregate shall be transported from the plant to the site in trucks having tight, clean and smooth beds.

f. Miscellaneous Equipment

A power broom and all necessary hand tools thermometers, etc. shall be provided by the Contractor.

Article 3.5 Construction

a. Surface Preparation

The existing surface shall be swept clean of all dust, dirt, and other loose material with hand brooms or through the use of approved mechanical sweepers. Where existing dust and dirt cannot be satisfactorily removed by brooming, it may be necessary to flush the asphalt surface with water. If flushing is necessary, the Contractor shall furnish the necessary equipment for flushing.

b. Weather Limitations

Bituminous material shall not be placed during rainy or threatening weather, or when the moisture on the surface to be treated would prevent satisfactory bond, or when the air temperature is less than fifty (50) degrees Fahrenheit, except by approval of the Engineer.

c. Heating and Application of Bituminous Material

The bituminous material shall be heated in such a manner as to insure even heating of the entire mass with an efficient and positive control at all times. It shall be applied at a temperature between 110 and 160 degrees Fahrenheit. Necessary thermometers shall be supplied so that the temperature may be observed at all times.

The bituminous material for the surface coat shall be uniformly applied by the means of a pressure distributor at the ratio of two-tenths (0.20) to three-tenths (0.30) gallons per square yard with 0.25 gallons per square yard desired. The quantity of material as measured by the volume measuring device of the distributor shall not vary from the true quantity, as herein specified, by more than five (5) percent. A strip of building paper or other suitable covering shall be used at the beginning and/or end of the spread to provide a positive cutoff at the desired limits.

Existing improvements such as curb and gutter, steps and buildings shall be protected to prevent contact with bituminous material.

d. Preparation and Application of Cover Aggregate

Cover material shall be sufficiently dried when it comes in contact with bituminous material that a satisfactory bond or coating is obtained. The moisture content shall not exceed two (2) percent by weight.

Immediately following the application of the bituminous material, the aggregate cover material shall be uniformly spread over the surface with an approved mechanical spreader at a rate of eighteen (18) to thirty (30) pounds per square yard. The cover material shall be applied continuously and without delays until the asphalt application is covered.

Whenever possible, successive strips shall be applied before the previous strip has cooled. Cover material shall not be spread on the six (6) inches adjacent to an unprotected edge until the next strip of bituminous material has been applied. Rolling shall immediately follow the application of the cover material. The roller shall be pneumatic-tired and of such a weight that it does not crush the cover material.

Rolling shall continue only long enough to "set" the cover material in the bituminous material. Under no circumstances will the rolling continue until the cover material is crushed or pulverized. If the cover material is distributed or thrown off the surface by traffic, it shall be broomed back into place. Areas with a deficiency or excess of cover material shall be corrected.

e. Maintenance of Surface

After application of the cover material, the surface shall be maintained by the Contractor, from two to five (2-5) days depending on the weather. During this period the Contractor shall, at least once daily, redistribute the cover material that has become displaced by traffic, by means of brooms, a drag or other method satisfactory to the Engineer. When all possible material has been imbedded in the bituminous material, to the satisfaction of the Engineer, the Contractor shall sweep the pavement surface of all excess material and remove it to the storage yard, as designated, unless otherwise directed by the Engineer.

Article 3.6 Measurement

Bituminous material will be measured by weight in tons of 2,000 pounds. Cover aggregate will be measured by weight in tons of 2,000 pounds.

Legible weight tickets shall be submitted to the Engineer for all Bituminous Material and Cover Aggregate delivered to the Project site for use in the Work. All weight tickets shall contain, at a minimum, the following information:

1. Weight ticket serial number;
2. Vehicle identification number;
3. The date and time the load was weighed;
4. The tare weight of the vehicle;
5. The gross weight of the loaded vehicle, as registered on the scale; and
6. The legal gross weight of the vehicle, as permitted by City and Borough of Sitka Municipal Code.

The Owner shall not pay for that portion of any load in excess of the legal gross weight for the vehicle.

Article 3.7 Basis of Payment

Payment for this Work shall be in accordance with Section 40.01 - General, Article 1.6 - Payment - General, and shall include full payment for all Work described in Section 40.03.

Unit cost payment shall be made on the following units:

ITEM	PAY UNIT
Asphalt for Seal Coat	Ton
Cover Aggregate	Ton

SECTION 40.04 BITUMINOUS SURFACE TREATMENT

Article 4.1 Description

The Work under this section consists of the performance of Work required for the construction of a seal coat of asphalt cement and cover aggregate on a street surface.

Article 4.2 Asphalt

The Contractor shall submit a certified analysis from the refinery laboratory to the Engineer for review and approval. A copy of the certified analysis shall accompany each shipment of asphalt to the Project. The Engineer shall reserve the right to make check tests of the asphalt received on the Project site, and if the asphalt is not in accordance with the certified analysis, he may reject the material.

The asphalt required by these Specifications shall conform to the requirements of The Asphalt Institute for the type and grade shown below.

Asphalt for Bituminous Surface Treatment CRS-2

Article 4.3 Aggregates

Aggregate shall consist of crushed gravel and shall be sound, durable, free of adherent coatings of clay, dirt, dust or any other objectionable matter and shall have a percentage of wear not to exceed 40 after 500 revolutions, as determined by the ASTM C-131. Not less than sixty (60) percent by weight of crushed gravel shall consist of crushed pieces having two (2) or more faces having freshly fractured face.

Aggregate material shall have the following gradation:

a. Cover - 1st Course

SIEVE DESIGNATION	% BY WEIGHT PASSING
3/4"	100
1/2"	90-100
3/8"	40-75
No. 4	0-15
No. 8	0-5
No. 200	0-2

b. Cover aggregate - 2nd Course

3/8"	100
No. 4	85-100
No. 8	0-25

Article 4.4 Equipment

a. General

All equipment used on this Work shall be sufficient size and in such mechanical condition as to meet the requirements and to produce the Work to the specified quality.

b. Pressure Distributor

The bitumen distributor shall be pneumatic-tired self-propelled, and shall have a capacity of not less than eight hundred (800) gallons. It shall be equipped with an independently-operated bitumen pump, tachometer, pressure gauges, volume metering devices, a thermometer for reading the tank temperature and a hose attachment suitable for applying the bituminous material to spots unavoidably missed by the distributor. The independently-operated bitumen pump shall be equipped with a tachometer calibrated in revolutions per minute. The distributor shall also be equipped to agitate and circulate the bituminous material during the heating process.

Spray bars shall be the circulating type with extensions, available for distributing width from eight (8) to twenty-one (21) feet by one (1) foot increments. The nozzles shall give uniform distribution and shut-off shall be quick and positive so as to prevent dripping. The distributor shall be so designed and equipped as to distribute the bituminous material uniformly at consistent surface speeds, at uniform temperatures with various surface widths, at known and maintained rates of 0.05 to 2.0 gallons per square yard within a tolerance of five (5) percent, and through a pressure range from twenty-five (25) to seventy-five (75) pounds per square inch. Air pressure type equipment may be used only upon written approval from the Engineer.

c. Cover Aggregate Spreader

The spreader shall be self-propelled and be capable of spreading the cover material uniformly for widths of eight (8) feet to sixteen (16) feet in one (1) foot increments, and adjustable to spread uniform layers of ten (10) to fifty (50) pounds per square yard. Revolving plate type chip spreaders will not be approved.

d. Rollers

Rollers shall be self-propelled, pneumatic-tire, weighing not less than five (5) tons or more than eight (8) tons. Rolling shall follow closely on spreading of aggregate.

e. Hauling Equipment

The cover aggregate shall be transported from the plant to the site in trucks having tight, clean smooth beds.

f. Miscellaneous Equipment

A power broom and all necessary hand tools, thermometers, etc., shall be provided by the Contractor.

Article 4.5 Construction

a. Surface Preparation

The existing road surface shall be graded smooth to the satisfaction of the Engineer. There shall be no visible ruts, holes, or large rocks protruding from the surface to be treated. Existing soft spots in the road base shall be compacted or excavated and backfilled with a suitable base course material. The area to be treated in any one operation shall be as indicated on the Drawings.

b. Weather Limitations

Bituminous material shall not be placed during rainy or threatening weather, or when the moisture on the surface to be treated would prevent satisfactory bond. The surface coats shall not be applied when the air temperature is below fifty (50) degrees Fahrenheit, unless otherwise approved by the Engineer.

c. Heating and Application of Bituminous Material

Bituminous material shall be heated in such a manner as to insure heating of the entire mass with an efficient and positive control at all times. A curing period of forty-eight (48) hours may be required between the application of the prime coat and the next application of bituminous material, during which time the surface shall be kept in repair. The asphalt for the surface treatment shall be applied at a temperature between 110 and 160 degrees Fahrenheit and at a rate of 0.40 to 0.60 gallons per square yard for the first coat and 0.20 to 0.35 gallons per square yard for the second coat. Thermometers shall be provided by the Contractor so that temperatures can be observed at all times.

Bituminous material shall be uniformly applied by means of a pressure distributor in the amount per square yard specified. The quantity of material as measured by the volume measuring device of the distributor shall not vary from the true quantity, as herein specified by more than five (5) percent. Bituminous material shall not be applied until sufficient cover aggregate is on hand to cover the area to be applied at a particular application. If the aggregate spreader is delayed by breakdown or operational difficulties, application of bituminous material shall cease until the Engineer is satisfied that delays will not recur.

d. Preparation and Application of Cover Aggregate

Cover material shall be sufficiently dried when it comes in contact with bituminous material so that a satisfactory bond or coating is obtained.

When the prime coat has sufficiently cured, the asphalt for the surface coat shall be applied to the surface. Immediately following this application of bituminous material, the first coat of cover aggregate shall be uniformly spread over the surface with an approved mechanical spreader at a rate of thirty (30) to forty (40) pounds per square yard. A minimum curing period of twenty-four (24) hours will be required before the second coat of asphalt and cover aggregate is applied. The rate of application of the second coat of cover aggregate shall be eighteen (18) to thirty (30) pounds per square yard. Cover material shall be applied continuously and without delay until the particular application is covered. Whenever possible successive strips shall be applied before the previous strip has cooled. Cover material shall not be spread on the six (6) inches adjacent to an unprotected edge until the next strip of bituminous material has been applied. Rolling shall immediately follow the application of each coat of cover aggregate and shall continue until the surface is accepted as determined by the Engineer.

e. Maintenance of Surface

After application of the second coat of cover material, the surface shall be maintained by the Contractor, at his expense, for a period of three (3) days. During this period the Contractor shall, at least once daily, redistribute the cover material that has become displaced by traffic, by means of brooms, a drag or other method satisfactory to the Engineer.

When all possible aggregate has been imbedded in the bituminous material on each course to the satisfaction of the Engineer, the Contractor shall sweep each course surface of all excess material and remove it to a designated area, unless otherwise directed by the Engineer.

Article 4.6 Measurement

Bituminous material will be measured by weight in tons of 2,000 pounds. Cover aggregate course will be measured by weight in tons of 2,000 pounds.

Legible weight tickets shall be submitted to the Engineer for all Bituminous Material and Cover Aggregate delivered to the Project site for use in the Work. All weight tickets shall contain, at a minimum the following information:

1. Weight ticket serial number;
2. Vehicle identification number;
3. The date and time the load was weighed;
4. The tare weight of the vehicle;
5. The gross weight of the loaded vehicle, as registered on the scale; and
6. The legal gross weight of the vehicle, as permitted by City and Borough of Sitka Municipal Code.

The Owner shall not pay for that portion of any load in excess of the legal gross weight for the vehicle.

Article 4.7 Basis of Payment

Payment for this Work shall be in accordance with Section 40.01 - General, Article 1.6 - Payment - General, and shall include full payment for all Work described in Section 40.04.

Unit cost payment shall be made in the following units:

ITEM	UNIT
Asphalt for Prime Coat (Type & Grade)	Ton
Asphalt (Type & Grade)	Ton
Cover Aggregate (1st Coat)	Ton
Cover Aggregate (2nd Coat)	Ton

SECTION 40.05 PRIME COAT

Article 5.1 Description

This Work under this Section consists of the performance of all Work required for preparing and treating the base course with bituminous material, and blotter material, in conformity with the required lines.

Article 5.2 Materials

The prime coat shall be MC-30 or approved equal. The aggregate for blotter material shall conform to the gradation requirements of AASHTO M43, Size No. 10. The aggregate shall be free from organic or other deleterious material.

Article 5.3 Construction

a) Weather Limitations

Bituminous material shall not be applied on a wet or frozen surface, or when the air temperature is below 45 degrees Fahrenheit, or when weather conditions would prevent the proper construction of the prime coat.

Article 5.4 Application of Bituminous Material

The distributor shall be so designed, equipped, maintained and operated that bituminous material at even heat may be applied uniformly on variable widths of surface up to 15 feet at readily determined and controlled rates from 0.05 to 2.0 gallons per square yard, with uniform pressure and with an allowable variation from any specified rate not to exceed 0.02 gallon per square yard. Distributor equipment shall include a tachometer, pressure gauges, accurate volume measuring devices or a calibrated tank, and a thermometer for measuring temperatures of tank contents. Distributors shall be equipped with a power unit for the pump, and full circulation spray bars adjustable laterally and vertically.

Traveling or stationary mixing plants or other equipment of proven performance may be used by the Contractor in lieu of the specified equipment if approved.

Bituminous material shall be applied to the width of the section to be primed by means of a pressure distributor in a uniform, continuous spread. When traffic is maintained, not more than 1/2 of the width of the section shall be treated in one application. Care shall be taken that the application of bituminous material deficiencies shall be corrected. Building paper shall be placed over the end of the previous applications and the joining application shall start on the building paper. Building paper used shall be removed and satisfactorily disposed of.

When traffic is maintained, one-way traffic shall be permitted on the untreated portion of the roadbed. As soon as the bituminous material has been absorbed by the surface and will not pick up, traffic shall be transferred to the treated portion and the remaining width of the section shall be primed.

The quantities, rate of application, temperatures and areas to be treated shall be approved before application of the prime coat.

Article 5.5 Application of Blotter Material

If, after the application of the prime coat, the bituminous material fails to penetrate within the time specified and the roadway must be used by traffic, blotter material shall be spread in the amounts required to absorb any excess bituminous material. Blotter material will be used only at the direction of the Engineer.

Article 5.6 Measurement

Bituminous material will be measured by the ton and blotter material will be considered incidental to the asphalt used as prime coat.

Article 5.7 Basis of Payment

Payment for this Work shall be in accordance with Section 40.01 - General, Article 1.6 Payment - General, and shall include full payment for all Work described in Section 40.05.

Unit cost payment shall be made on the following unit:

ITEM	UNIT
Asphalt Prime Coat	Ton

SECTION 40.06 TACK COAT

Article 6.1 Description

The Work under this Section shall consist of performing all Work required for the application of bituminous material to an existing asphalt base or bituminous binder to provide bond for a superimposed asphalt wearing surface.

Article 6.2 Material

The Contractor shall submit a certified analysis from the refinery laboratory to the Engineer for review and approval. A copy of the certified analysis shall accompany each shipment of the asphalt received on the Project site, and if the asphalt is not in accordance with the certified analysis, he may reject the material. The asphalt required by these Specifications shall conform to the latest Asphalt Institute Specifications for the type and grade shown below.

Asphalt for Tack Coat

STE-1 or equal

Article 6.3 Equipment

a. General

All equipment used on this Work shall be of sufficient size and in such mechanical condition as to meet the requirements and to produce the Work to the specified quality.

b. Pressure Distributor

The bitumen distributor shall have pneumatic tires of such width and number that the load produced on the binder course shall not exceed 650 pounds per inch of tire width, and shall be so designed, equipped, maintained and operated that bituminous material at even heat may be applied uniformly on variable widths of surface at readily determined and controlled rates per square yards, with a pressure range of from twenty-five (25) to seventy-five (75) lb./sq. inch, and with an allowable variation from the specified rate not to exceed five (5) percent. Distributor equipment shall include a tachometer, pressure gauges, volume measuring devices, and a thermometer for reading temperatures of tank contents.

Contractor shall be required to lay a test strip of not less than 15 feet in length to demonstrate that the equipment is working in accordance with these specifications. Location of the test strip will be on-site, as approved by the Engineer. Street closures required for testing of equipment will be the responsibility of the Contractor prior to testing.

Notification of testing will be made to the Engineer not less than 24 hours prior to making the test strip to allow the inspector and materials analysis personnel to be present. The materials analysis personnel may

recommend to the Engineer adjustments to the distribution rate to meet the required or desired cured thickness.

All equipment shall meet federal and State of Alaska safety standards. Equipment will be inspected jointly by the Engineer and the Contractor. Defective or non-working pumps, gauges, or spray bar parts shall be immediately repaired or replaced.

Test strips that fail due to equipment failure or inexperienced personnel operating the equipment will be re-tested. The Engineer may require additional tests that she/he feels is needed to verify that the equipment meets the requirements of these specifications and the Contractor has qualified personnel and supervision to complete this Work.

Supplying the application of tack coat test strips shall be incidental to the bid item "Tack Coat" and no separate payment shall be made.

c. Miscellaneous Equipment

A power broom equipped with blower and all necessary hand tools, thermometers, etc. shall be provided by the Contractor.

Article 6.4 Construction

a. Surface Preparations

Immediately before applying the tack coat, the full width of surface to be treated shall be swept with a power broom equipped with a blower, supplemented by hand brooms, washed down with water, or otherwise cleaned to remove all loose dirt, clay, or other loose and objectionable material.

After the operation of removing dust has been completed and prior to the application of the tack coat, the Engineer shall make an inspection of the existing pavement to determine its fitness to receive the bituminous material.

b. Weather Limitations

Tack coat shall not be applied during cold weather, after sunset, or to a wet surface. The tack coat shall not be applied when the roadway surface temperature is below forty (40) degrees Fahrenheit.

c. Heating and Application of Bituminous Material

The application of the bituminous tack material shall be made by means of a pressure distributor of approved type, and shall be in the following amounts. Undiluted amounts of bituminous material (STE-1 or equal) shall be diluted 50-50 with water and distributed so that the mixture will cure back to 0.05 to 0.15 gal./sq. yd. The quality of material as measured by the volume measuring device of the distributor shall not

vary from the true quantity, as herein specified, by more than five (5) percent. The bituminous material shall be applied at a temperature between one hundred (100) and one hundred thirty (130) degrees Fahrenheit. Necessary thermometers shall be supplied so that the temperature may be observed at all times.

Existing improvements such as keyboxes, manholes, cleanouts, monuments, curb and gutter, steps, and buildings shall be protected to prevent contact with bituminous material to the satisfaction of the Engineer. The surface shall be allowed to dry until it is a proper condition of tackiness to receive the AC surface course placement as is necessary to obtain this proper condition of tackiness. Until the wearing surface course is placed, the Contractor shall protect the tack coat from damage.

Article 6.5 Measurement

The tonnage to be paid for shall be the number of tons of undiluted bituminous material used as directed in units of 2,000 pounds.

Article 6.6 Basis of Payment

Payment for this Work shall be in accordance with Section 40.01 - General, Article 1.6 - Payment - General, and shall include full payment for all Work described in Section 40.06.

Unit cost payment shall be made on the following unit:

ITEM	UNIT
Asphalt for Tack Coat	Ton

SECTION 40.07 REMOVE AND REPLACE EXISTING ASPHALT SURFACING

Article 7.1 Description

The Work under this Section consists of the performance of all Work required for removing, disposing of, and replacing existing Asphaltic surfacing or cold mix asphalt, including leveling course and existing traffic markings and reflectors, required by the work limits shown on the Drawings.

Article 7.2 Materials

All materials used shall conform to the requirements of the CBS and other agencies (if any) having jurisdiction over the pavement being replaced.

Article 7.3 Construction

All construction practices, tests and other controls shall conform to the Division 20.00 - Standard Construction Specifications for Earthwork, and Division 40.00 - Standard Construction Specifications for Asphalt Surfacing of these Specifications.

Asphaltic concrete paving replacement will be performed by utilizing a mechanical spreader and will be compacted by a mechanical roller weighing not less than ten (10) tons, except that where the area of the asphalt replacement patch is less than three hundred (300) square feet, a mechanical spreader need not be employed.

Small areas inaccessible to roller shall be tamped to produce a compression and surface texture equivalent to that produced by the specified rolling. Hand tampers shall have a maximum tamping face of fifty (50) square inches and a minimum weight of twenty- five (25) pounds.

Article 7.4 Measurement

Removing, disposing of, and replacing existing Asphalt Surfacing and cold mix, including leveling course, will be measured per square yard, complete in place.

Article 7.5 Basis of Payment

Payment for this Work shall be in accordance with Section 40.01 - General, Article 1.6 - Payment - General, and shall include full payment for all Work described in Section 40.07.

Unit cost payment shall be made on the following units.

ITEM	PAY UNIT
Remove and replace existing Asphalt surfacing class	Square Yard
Remove existing asphalt, replace with CBS-supplied cold mix	Square Yard
Remove cold mix, replace with asphalt surfacing, Type II	Square Yard

SECTION 40.08 PAVING GEOTEXTILE

Article 8.1 Description

The Work under this Section shall consist of furnishing and installing Nonwoven Geotextile Paving Fabric in a manner and at locations as shown in the plans or as directed by the Engineer.

Article 8.2 Materials

- a. The geotextile (paving fabric) will be a nonwoven material consisting of at least 85 percent of weight of polyolefins, polyesters or polyamides. The paving fabric shall be resistant to chemical attack, rot and mildew and shall have no tears or defects which will adversely alter its physical properties. The fabric shall be specifically designed for pavement application and be heat bonded on one side only to assist in preventing bleed through of tack coat and sticking of fibers to wheels of laydown equipment. The fabric shall meet the physical requirements of Table 1.
- b. The geotextile fabric supplied shall meet the physical and mechanical properties listed below:

<u>Property</u>	<u>Standard Requirements</u>	<u>Test Method</u>
Tensile Strength, lbs.	80	ASTM D 4632
Elongation, %	50	ASTM D 4632
Asphalt Retention gal/sq. yd.	.2	Texas DOT 3099
Melting Point, degrees F	300	ASTM 276
Surface Texture*	Heat bonded on one side only	Visual Inspection

In addition, the paving fabric must be a material specifically designed for pavement application and shall be heat bonded on one side only.

1. Certification may be required from geotextile manufacturer stating conformance to the above requirements.
2. Minimum - Use value in weaker principal direction. All numerical values represent minimum average roll values (test results from any sampled roll in a lot shall meet or

exceed the minimum values in the table.) Lot sampled according to ASTM D 4354.

- c. The Asphaltic cement sealant shall be AC-5 in accordance with requirements of the Asphalt Institute.

Article 8.3 Construction

a. Surface Preparation

The surface, on which the fabric is to be placed, shall be prepared as follows, unless otherwise stipulated in the Special Provisions or approved by the Engineer.

1. All potholes or depressions in the surface, which vary more than 0.1 feet in 10 feet shall be pre-leveled. The procedure for this work shall include: application of CSS-1 asphalt sealant in accordance with part (b) of this Article, and application of sufficient amounts of a fine aggregate asphalt mix to fill the pothole or depression. This work shall be performed as specified in the Special Provisions, or as approved by the Engineer. This asphalt mix shall be compacted consistent with compaction requirements stipulated for the bituminous surface course overlay.
2. Using air or water pressure jet, clean all cracks. All cracks larger than 1/4 inch in width shall be filled with an asphalt emulsion and sand slurry, in accordance with Special Provisions or as directed by the Engineer. All excess slurry mixture shall be removed.
3. Hand scrape to loosen any and all excess Asphaltic materials and other foreign materials from the surface.
4. Remove all loose aggregate, Asphaltic materials, or other foreign material from the surface by power wire brooming, air or water pressure jet.

b. Application of Sealant

The Asphaltic sealant must be uniformly spray applied at 0.20 to 0.30 gallons per square yard. Temperature of the Asphaltic sealant may vary between 295° F. min. and 325° F. max. Application of the Asphaltic sealant will be by distributor equipment. The distributor must be properly metered and capable of spraying the asphalt at the prescribed uniform application rate. The pressure distributor shall meet all requirements set forth under Section 40.03.

Asphalt material shall not be applied on a wet surface or when the ambient air temperature is below 45° F or when other conditions would prevent the proper application of the sealant.

c. Fabric Laydown Equipment

Mechanical laydown equipment with a proven history of successful fabric laydown will be required for the fabric placement. The mechanical laydown equipment used must be capable of handling full rolls of fabric and shall be capable of laying the fabric smoothly, without wrinkles and/or folds.

d. Fabric Placement

The fabric shall be placed directly on top of the Asphaltic sealant (tack coat) with a minimum of wrinkles prior to the time the sealant has cooled and lost its tackiness. The fabric shall be unrolled and placed in accordance with the manufacturer's recommendations. Wrinkles severe enough to cause folds when flattened shall be slit and laid flat as directed by the Engineer. Fabric overlapping shall be a minimum of 3 inches at all fabric joints. Transverse joints shall be shingled in the direction of paving to prevent fabric pickup by the paver. At all fabric joints, 0.20 gallons per square yard of additional Asphaltic sealant shall be applied beneath the joint.

e. Bituminous Surface Course Overlay

Placement of the bituminous surface course must closely follow the fabric laydown as directed by the Engineer. No fabric is to be left exposed overnight or to inclement weather. In the event that the asphalt sealant bleeds through the fabric before the placement of the overlay, sand or bituminous surface course will be evenly spread over the affected area to prevent fabric pickup by construction equipment. Turning and/or pivoting of the paver or other construction equipment on the fabric before placement of the overlay must be gradual to avoid any movement and/or damage to the fabric.

Article 8.4 Method of Measurement

The amount of geotextile fabric to be paid for shall be the number of square yards of ground surface acceptably covered by geotextile as shown on the plans or as approved by the Engineer. Overlapping of fabric will be considered as incidental.

Article 8.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10.00 Standard General Provisions, Section 10.07 Measurement and Payment of these Specifications and shall be made at the contract unit price per square yard. This price shall be full compensation for furnishing all materials, preparation, delivering, and laying the fabric, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Payment shall be made under the following unit:

ITEM	UNIT
Paving Geotextile	Square Yard

SECTION 40.09 RECYCLED ASPHALT PAVING (RAP)

Article 9.1 General

The work under this Section consists of furnishing all materials and performing all operations necessary to complete placement and construction of a recycled asphalt paving (RAP) surface on an existing prepared subbase.

Article 9.2 Material

The RAP shall consist of crushed gravel, rock, sand, or other approved material. The aggregate shall be derived from recovered AC pavement and be free from lumps, balls of clay, or other objectionable matter, and shall be durable and sound. The portion of the material retained on a No. 4 sieve shall be known as course aggregate.

R.A.P. is to be delivered to the jobsite in an unheated condition. Delivery of heated material to the jobsite will be rejected unless previously approved by the Engineer.

a. Coarse Aggregate

The coarse aggregate material conforming to the requirement specified above shall have a percentage of wear not to exceed 50 after 500 revolutions, as determined by the current requirements of ASTM C-131. It shall consist of angular fragments reasonably uniform in density and quality, and reasonably free from thin elongated pieces, dirt, and other objectionable material. At least fifty (50) percent of the coarse aggregate particles shall have at least two (2) mechanically fractured faces. Asphalt extraction and sieve analysis shall be performed in accordance with ASTM D 2172 - A or B, AASHTO T-164- A or B, and AASHTO T-30.

b. Fine Aggregate

The fine aggregate shall consist of material free of organic or other objectionable matter. The fine aggregate, either naturally combined with the coarse aggregate or separately obtained and mixed therewith, shall be of such character that the composite material will conform to the gradation and other requirement specified.

c. Gradation

The composite mixture of coarse aggregate and fine aggregate, processed as hereinafter specified, shall conform to the following gradation limits:

SIEVE SIZE	PERCENTAGE PASSING BY WEIGHT
1"	100
3/4"	70-100
3/8"	50-85
#4	35-65
#10	20-50
#40	10-30
#80	5-20
#200	2-10

Asphalt Content: 2.7% - 4.7%

Moisture Content: 3.5% Max.

The asphalt content of RAP delivered to the project shall be determined on the individual extraction test results and not an average of extractions conducted.

Article 9.3 Construction

The RAP shall be placed to the lines, grades, and thicknesses shown on the Drawings and shall consist of the materials hereinbefore specified. The RAP shall provide a smooth stabilized paved surface on which vehicular traffic can drive.

a. Preparation of Subbase

Subbase preparation shall be completed by others in accordance with MASS Section 20.21 "Grading Existing Surfaces" with the compaction density modified to 95%.

b. Placing

The approved RAP material shall be deposited and spread uniformly on the prepared subbase in one uniform layer to the required contour and grades and to such loose depth that when compacted to the density required will achieve the specified thickness. Portions of the layer which become segregated in spreading shall be remixed to the required gradation.

c. Compacting

The RAP shall be compacted to at least 95 percent of maximum density as per AASHTO T-180d. In all places not accessible to the rolling equipment, the mixture shall be compacted with tamping equipment capable of attaining the specified density. Blading, rolling and tamping shall continue until the surface is smooth and free from waves and inequalities. If at any time the mixture is determined to be above or below

optimum moisture, it shall be aerated by means of blade graders, harrows or other approved equipment or moisture added until the moisture content is such that the surface can be recompacted and finished as above. In place compaction shall be accomplished with a double-drum vibratory asphalt compactor with a minimum of 15,000 pounds of dynamic force per drum. All requests for equipment substitution shall require a current certification test, identifying the capability of the equipment to meet the required specifications.

d. Smoothness Test

The surface of the RAP, when finished, shall not show any deviation in excess of 3/8 inch when tested with a ten (10) foot straight-edge applied parallel with and at right angles to the centerline of the area to be paved. Any deviation in excess of this amount shall be corrected by loosening, adding, or removing material and reshaping and compacting to satisfy the above requirement.

The Contractor shall furnish a ten (10) foot long straight-edge and shall, in the presence of the Engineer, straight-edge test the entire surface.

Article 9.4 Measurement

The RAP shall be measured in tons of materials delivered and placed in accordance with these Specifications and adjusted for excess moisture as hereinafter provided. Said measurement may include moisture up to a maximum of 3.5% of dry weight of the material.

When tests by the Engineer indicate that moisture contents in excess of 3.5% may be occurring consistently, the frequency of testing will be increased as necessary and the results averaged over a period of one week. When this average is greater than 3.5%, the tonnage as measured over the above period shall be reduced by the difference. No credit will be due the Contractor when moisture content is less than 3.5%. Testing will be done in accordance with AASHTO DESIGNATION: T255-76 (1982).

Article 9.5 Basis of Payment

Payment for this work shall be in accordance with Division 10.00 Standard General Provisions, Section 10.07 Measurement and Payment, of this Specification and shall include full payment for all work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Furnish & Install RAP	Ton

SECTION 40.10 CRACK AND JOINT SEALANT

Article 10.1 General

The Work under this Section shall consist of the performance of all plant, labor and supervision, equipment, and material for performing all operations required for the preparation and application of a hot bituminous emulsion and 3/8-inch chip applied as a crack and joint sealant. The Work under this Section shall be performed after the asphalt pavement has been rotomilled (pavement planed) or as directed by the Engineer.

Article 10.2 Materials

Asphalt materials shall be approved by the Engineer prior to use (a certified analysis by the refinery laboratory with each shipment of asphalt to the project may be acceptable). The Engineer shall reserve the right to make check tests of the asphalt received on the job and if the certified analysis proves to be unsatisfactory individual check tests will be required.

The asphalt required by these specifications shall conform to the requirements of the Asphalt Institute for the type and grade shown below:

Asphalt for Bituminous Emulsion Crack Sealant

STE-1 (Snap-Tack) or approved equal

The aggregate shall consist of crushed gravel (3/8-inch minus and sand) evenly mixed and shall be sound, durable, and free of adherent coatings of clay, dirt, or any other objectionable matter. Not less than 60 percent by weight of crushed gravel shall consist of pieces having two or more faces being freshly fractured.

The aggregate shall have the following gradation:

Sieve Designation	Percentage By Weight Passing
3/8 inch	100
No. 4	85-100
No. 8	0-25
No. 200	0- 2

All aggregate equipment shall meet federal and State of Alaska safety standards and shall be sufficient in size and mechanical condition to meet the requirements and to produce the Work. The equipment will be inspected jointly by CBS and the Contractor and shall be approved by the Engineer before any Work is started. Any units found defective shall be immediately repaired or replaced before starting Work on this project. The Contractor shall notify the Engineer 24 hours in advance for equipment inspection.

The bitumen distributor shall have pneumatic-tires and be self-propelled and shall have a capacity of not less than 400 gallons. It shall be equipped to agitate and circulate the bituminous material during heating, with an independently-operated bitumen pump, tachometer, pressure gauges, volume metering devices, tank thermometer, and a hand held pressurized spray bar with a single nozzle equipped with a quick and positive shut-off to prevent dripping or over-spraying.

Rollers shall be self-propelled, have pneumatic-tires, and weigh not less than five tons or more than eight tons.

A power broom and all necessary hand tools, thermometers, etc., shall be provided by the Contractor at no additional cost to CBS.

Article 10.3 Construction

Crack and joint sealant shall be applied to cracks or joints that have dimensions between 3/8-inch and 3/4-inch in width as directed by the Engineer. The sealant shall be applied in conformance with the manufacturer's instructions and to full depth of the crack. Cracks less than 3/8-inch in width will be filled with sealant (STE-1).

The cracks shall be cleaned and all loose material shall be blown out to the full depth of the crack. The interior of the crack shall be completely dried and existing asphalt surfaces shall be exposed to enable bonding of the sealant.

All cracks shall have a minimum depth of one inch. If the crack does not have a minimum depth of one inch, the crack shall be deepened to a minimum of one inch through the use of a router or similar device approved by the Engineer. The area covered with the emulsion/aggregate treatment shall be a minimum of six inches on either side of the crack.

Crack and joint sealant shall be prepared and applied in conformance with the manufacturer's instructions. All extruded sealant shall be removed and feathered to transition to the existing pavement surface.

Crack sealant shall not be applied during cold weather, after sunset, or when the surface and crack are wet. The crack sealant shall be applied only when the temperature of the atmosphere is above 40° Fahrenheit.

The application of the bituminous material shall be made by means of a pressure distributor of approved type. Undiluted amounts of bituminous material (STE-1) shall be distributed at the rate 0.20 to 0.35 gallons per square yard. The quality of material as measured by the volume-measuring device shall not vary from the true quantity, as herein specified, by more than five percent. The bituminous material shall be applied at a temperature between 125° and 185° Fahrenheit.

The hot bituminous emulsion shall be applied with a hand held spray bar, with a nozzle pressure range from 20 pounds per square inch (psi) to 45 pounds per square inch (psi), to distribute the bituminous material uniformly to the full depth of the crack without filling it.

Aggregate distribution shall follow the emulsion applications closely as possible. It shall be placed prior to the emulsion breaking to ensure the greatest adherence.

The loose aggregate shall be removed and all crack repairs shall be broomed and cleaned before the asphalt overlay is installed.

For wide cracks or other openings in the existing asphalt surface, which in the opinion of the Engineer are too large for crack sealing, the Engineer shall direct the Contractor to remove and replace pavement in accordance with Section 40.07 Remove and Replace Existing Asphalt Surfacing or place an A.C. wedge course in accordance with Section 40.02 Asphalt Concrete Pavement.

The crack and joint sealant must be in place a minimum of 24 hours and approved by the Engineer prior to an application of the tack coat or overlay will be allowed.

Article 10.4 Measurement

The application of crack and joint sealant shall be measured per linear foot of sealant applied as directed. Application of aggregate shall be incidental to bid item “Crack and Joint Sealant” and no separate payment shall be made.

Article 10.5 Basis of Payment

Payment for this Work shall be in accordance with Section 10.07 Measurement and Payment, as amended in these specifications, and shall include full payment for all Work as described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Crack and Joint Sealant	Linear Foot

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DIVISION 50
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STANDARD CONSTRUCTION SPECIFICATIONS FOR SANITARY SEWERS

SECTION 50.01 GENERAL

Article 1.1 Scope of Work

The Work covered by these Specifications consists of providing all plant, labor, equipment, supplies, material, transportation, handling and storage, and performing all operations necessary to complete the construction for pipe laying, jointing, and testing of sanitary sewers.

Requirements for earthwork including trench excavating and backfill is specified in Division 20.00 Standard Construction Specifications For Earthwork.

Article 1.2 Applicable Standards

The latest revision of the following standards of the American Society of Testing and Materials (ASTM), the American Association for State Highway and Transportation Officials (AASHTO), the American Standards Association (ASA), and the American Water Works Association (AWWA) are hereby made a part of these Specifications.

ASTM A48	Specifications for Gray Iron Castings
ASTM 438	Traverse Testing of Gray Cast Iron
ASTM A746	Specification for Ductile Iron Gravity Sewer
ASTM C14 or ASTM C14M [Metric]	Specification for Concrete Sewer, Storm Drain and Culvert Pipe
ASTM C76 or ASTM C76M [Metric]	Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe
ASTM C150	Specification for Portland Cement
ASTM C206	Specification for Finishing Hydrated Lime
ASTM C443 or ASTM C443M [Metric]	Specification for Joints for Circular Concrete Sewer & Culvert Pipe, Using Rubber Gaskets

ASTM C478 or ASTM 478M [Metric]	Specification for Precast Reinforced Concrete Manhole Sections
ASTM D256	Test methods for D-C Resistance of Plastics and Electrical Insulating Materials
ASTM D2321	Recommended Practice for Underground Installation of Thermoplastic Sewer Pipe
ASTM D3034	Specification for Type of PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D3035	Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter
ASTM D3350	Specification for Polyethylene Plastic Pipe and Fittings Materials
AASHTO M45	Sand for Cement Mortar
AWWA C104/ ANSI A21.4	Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
AWWA C105/	Polyethylene Encasement for Ductile Iron Piping for ANSI A21.5 Water and Other Liquids
AWWA C110/ ANSI A21.10	Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In., for Water and Other Liquids
AWWA C111/ ANSI A21.11	Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
AWWA C151/ ANSI A21.51	Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids
AWWA C901	Standard for Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. Through 3 In., for Water Service

Article 1.3 Required Clearance from Water Mains

During construction of a sewer line, a water main may be encountered and field changes may be necessary to meet the required minimum vertical separation distance of eighteen inches (18") or a

horizontal distance of ten feet (10'). In such cases, refer to Division 70, Section 70.16 "Sewer Encasement", and 70.17 "Relocate Water Main."

Article 1.4 Surveys

The Contractor will lay out (in the field) the alignment and grade of work to be done under the Contract prior to starting installation. When once laid out, the Contractor shall be responsible for the preservation of all line stakes, grade stakes, and hubs. In the event of their loss or destruction, the Contractor shall pay all costs for their proper replacement. The Contractor shall be responsible for, and pay all costs for the transfer of, the control points from the reference hubs to such hubs or batter boards as required or needed for the prosecution of the work. A ground line profile will be made by the Contractor. The ground line profile refers to the elevation of the ground directly above the centerline of pipe and the grade line refers to the elevation of the invert of pipe, except where otherwise noted.

The CBS will furnish the Contractor with a list of all pertinent benchmarks, necessary for control points, and other information for control of the Work. Prior to utilizing information such as benchmarks, etc., it shall be the Contractor's responsibility to verify benchmark elevations by checking between at least two (2) benchmarks. The Contractor shall protect the benchmarks and control points provided by the Engineer and properly reference them off. The contractor shall be responsible for any necessary replacement.

As-built measurements and documentation will be done by the Contractor, and prior to final acceptance. The Contractor will furnish the CBS with AutoCAD electronic files (current version) and two (2) signed record drawings. Location, rim and invert elevations shall be recorded for the following: Manholes, mainline cleanouts and service lateral connections. Locations shall be established with three (3) swing-tie distances to permanent structures, and when possible, tied to property corners. Record drawings and submittals shall conform to ADEC and CBS requirements. A Professional Engineer licensed in the State of Alaska shall stamp the record drawings.

Article 1.5 Concrete and Mortar

a. Miscellaneous Concrete

All concrete used in the construction of sanitary sewer systems with the exception of precast manholes, manhole risers, cones, and reinforced concrete pipe shall be Class A-3. Concrete Work shall conform to Division 30.00 Portland Cement Concrete - Buildings of these Specifications.

b. Mortar

Cement for mortar used in the construction of sanitary sewer systems shall conform with the requirements of ASTM C-150, Type II. Sand shall conform with the requirements of AASHTO M-45. The mortar shall be composed of one (1) part cement and three (3) parts sand. The addition of lime is not permitted.

Article 1.6 Payment - General

Payment for all Work included in this Division shall be paid for in accordance with Division 10.00 Standard General Provisions, Section 10.07 Measurement and Payment and shall include full payment for all Work described.

SECTION 50.02 FURNISH AND INSTALL PIPE

Article 2.1 Description

The Work under this Section consists of the performance of all operations pertaining to furnishing and installing pipe for sanitary sewer systems.

In the case of Owner-furnished pipe, the Owner will allot to the Project, Pipe to accomplish the project in amounts, exactly matching the Contractor's pay quantities for pipe. Any surplus pipe left over from this allotment at the end of the project shall be returned from the Contractor's job sites to the Owner's designated pipe yard. If the Contractor withdraws from the Owner's pipe yard more than the amount required to match the payment quantities, the Contractor shall pay the Owner on the basis of the Owner's invoice price for pipe (including freight), plus a 10% overhead to reimburse the Owner's invoice price for pipe (including freight), plus a 10% overhead to reimburse the Owner for handling, warehouse, inspection, and administration.

Article 2.2 Material

a. General

All piping shall be in accordance with the Contract Documents conforming to the size and class shown and specified. Changes in class shall be made within one-half of a pipe length of the station indicated on the Drawings. The use of pipe containing asbestos materials shall be prohibited.

b. Ductile Iron Pipe

Ductile iron pipe shall conform to requirements of ASTM A-746 (AWWA C-151) and Cement Mortar shall conform to the requirements of AWWA C-104, Class 50 pipe shall be used, unless otherwise required by the Contract Documents. Fittings shall be cast iron and all bell conforming to AWWA C-104 except that so called "short body" fittings, otherwise meeting AWWA Specifications may be used. Rubber gasket joints for ductile iron pipe fittings shall conform to the requirements of AWWA C-111.

c. Joints

Joints shall conform to the requirements of ASTM C-14 and ASTM C-443. Joints shall be of the "O" Ring type and shall be subject to the approval of the Engineer as to configuration. All repair clamps shall be Romac SS1 Repair Band, 8" min. length, or approved equivalent.

d. High Density Polyethylene Pipe (HDPE)

The pipe and fitting material shall have a cell classification of 345434C in accordance with ASTM D3350. In addition, the material must exceed 1000 hours when tested in accordance with the Ring Environmental Stress Crack Resistance Test (Radar Ring Test) with fewer than 20 percent failures.

Also, the extruded pipe shall have impact strength greater than 3 Ft#/in. when tested in accordance with the ASTM D256 (Charpy Impact Test).

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.

Butt fusion and side fusion of the pipe and fittings shall be performed in accordance with the pipe manufacturer's recommendations as to equipment and technique. The fusion operation shall be performed by an individual who has demonstrated the ability to fuse polyethylene pipe in the manner recommended by the pipe supplier. The pipe supplier shall supply a representative to instruct the Contractor's crew on butt fusion, side fusion and installation and witness the first twenty joints. **The individual performing the fusing procedure must hold a current certification for fusing HDPE as stated in Title 49.1 DOT Certification.**

All HDPE mainline shall be installed with No. 10 bare copper locate trace wire.

e. Poly Vinyl Chloride (PVC) Pipe

All plastic sewer pipe and fittings shall meet the requirements of ASTM D3034. The standard dimension ratio (SDR) of all pipe and fittings shall not exceed 35 unless otherwise specified. All pipe shall be suitable for use as gravity sewer pipe. Sizes and dimensions shall be as designated in ASTM D3034. Standard laying lengths shall be 13 feet or 20 feet \pm 1 inch.

All joints shall be of the bell and spigot type and conform to ASTM D3212. Gaskets shall be in accordance with ASTM F477. All bells shall be formed integrally with the pipe and shall contain a factory installed elastomeric gasket, which is positively retained. No solvent cement joints will be permitted in the field construction except as specifically authorized by the engineer.

All fittings shall have a push-on joint, which is compatible with the pipe and conforms to ASTM D3034.

Physical and chemical tests shall be performed in accordance with the referenced ASTM specifications and shall be conducted at $73^0 \pm 3^0$ Minimum pipe stiffness (F/Iy) at 5% deflection shall be 46 psi for all sizes when tested in accordance with ASTM D2412. Impact tests shall be conducted in accordance with ASTM D2444 and shall comply with the requirements given in ASTM D3034. Pipe deflection shall be measured by pulling a mandrel or other device through the pipe.

Article 2.3 Construction

a. Excavation and Backfill

Excavation and backfill for furnishing and installation of sanitary sewer pipe shall be in accordance with Division 20.00 Standard Specifications For Earthwork, Section 20.07 Trench Excavation And Backfill, of these Specifications.

b. Pipe Grade and Alignment

Variance of individual pipe sections from established line and grade shall not be greater than those listed in the table below, providing that such variance does not result in a level or reverse sloping invert.

The allowance tolerance is per twenty linear feet

Diameter Inches	Allowance Tolerance Feet	Diameter Inches	Allowance Tolerance Feet
8	0.03	14	0.04
10	0.03	16	0.04
12	0.03	18*	0.05

*Note: For all pipe sizes over eighteen inches (18") in diameter, variance shall not exceed 0.05 feet.

During the progress of the Work, the Contractor shall provide instruments such as transits, levels, laser de- vices, and other facilities for transferring grades from offset hubs or for setting of batter boards or other construction guides from the control points and bench marks provided by the Contractor. The Contractor shall provide a surveyor to use such instruments and who shall have the duty and responsibility for placing and maintaining such construction guides. Copies of the surveyors field notes shall be provided to the CBS Wastewater Department daily. All field data shall be compiled on the record drawings by a licensed surveyor.

If the method of transferring grades from the offset hubs to the pipe require batter boards, they shall be at least 1" X 6" supported on 2" X 4" stakes or approved metal rods and shall be placed every 25 feet.

At least three boards must be in place at any given time to facilitate checking of line and grade. Both line and grade shall be checked for each piece of pipe laid, except at tunnels where methods acceptable to the Engineer shall be used to carry forward line and grade.

The practice of pushing in uncompacted backfill over a section of pipe to provide a platform for transit and level alignment and grade observations shall be subject to the approval of the Engineer. If intermittent backfilling is allowed, backfilling shall be accomplished in accordance with Division 20.00 Standard Construction Specifications for Earthwork, Section 20.07, Trench Excavation and Backfill, of these Specifications. All trench excavation and compaction shall be considered incidental to pipe laying.

Imported trench backfill which is requested by the Engineer or called out on the plans will be paid under the appropriate pay item or by letter of agreement.

c. Pipe Laying

All pipe shall be laid with Bedding unless otherwise required by the Contract Documents or directed by the Engineer.

Pipe laying shall not progress ahead of back-filling of ditches more than two hundred feet (200'). This length may be reduced as required to meet site specific demands. Pipe laying shall in all cases proceed upgrade with the spigot ends of the pipe pointing in the direction of the flow. Each pipe shall be laid true to line and grade and in such a manner as to form a close concentric joint with the adjoining pipe. The alignment of the installed pipe shall appear straight to visual observation and shall be such that a full circle of light can be seen between manholes, etc., when sighting along all points of the pipe circumference unless otherwise required by the Contract documents or directed by Engineer. Each section of pipe shall be handled carefully and placed accurately; the spigot end shall be fully inserted. Care shall be exercised to avoid over-insertion. Each section of pipe shall be properly supported to insure true alignment and an invert which is smooth and free from roughness or irregularity.

At all times, when Work is not in progress, open ends of pipe and fittings shall be securely and satisfactorily closed so that no undesirable substance will enter the pipe or fittings.

Where a project outfalls into an existing sanitary sewer, construction of physical connection to the existing line shall be delayed until all upstream underground construction, including exfiltration testing, is complete and accepted unless special permission is granted by the CBS. Care shall be exercised during construction, flushing, and testing operations of the connecting link to assure that water is not diverted into any portion of a sanitary sewer line in service or a sanitary sewer line which is not a portion of the construction project for which the Contractor is responsible.

d. Laying Instructions

All pipe shall be laid in accordance with the manufacturer's recommendations. Pipe shall not be laid when the bottom of the ditch, or the sides to one foot (1') above the pipe, is frozen. Backfill material shall not contain frozen material. The trench shall not be left open during freezing weather in order to prevent the temperature of the material near the pipe from freezing.

Article 2.4 Testing:

a. General

The Contractor shall clean and flush all sanitary sewer pipe and manholes installed prior to testing and final inspection.

All sanitary sewer pipe and manholes installed shall be subject to either an infiltration test or an exfiltration test. Pipe and manholes shall be tested separately. In those areas where, in the opinion of the Engineer, the water table is high enough to subject the pipe and manhole to a satisfactory infiltration

test, it is not anticipated that an exfiltration test shall be required. In checking leakage, there will be no allowance made for external hydrostatic head.

Where in the opinion of the Engineer, the water table is not high enough to provide a satisfactory infiltration test, an exfiltration test shall be required.

The type of test (either infiltration or exfiltration) shall be determined by the Engineer. The Contractor shall have the option of choosing only one method (air or water) of testing for each section tested.

All wyes, tees or ends of side sewer stubs and service connections shall be plugged or capped and the plug or cap shall be securely fastened to withstand the internal test pressures. Such plugs or caps shall be readily removable and their removal shall provide a socket suitable for extending the lateral connection.

All testing shall be considered a subsidiary obligation under Furnish and Install Pipe and extra payment will not be allowed for this portion of Work.

The lengths of service connections shall be included in the computations to determine the allowable leakage for the test section.

b. Exfiltration Test for Manholes (Using Water)

The manhole exfiltration 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.

c. Exfiltration Test for Mains and Services (Using Air)

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.

The Contractor may desire to make an air test prior to backfilling for his own purpose. However, the acceptance air test shall be made after backfilling has been completed, and compacted.

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 4.0 pounds per square inch greater than the average back pressure of any ground water that may submerge the pipe. At least two (2) minutes shall be allowed for temperature stabilization before proceeding further.

The pipeline shall be considered acceptable when tested at an average pressure of 4.0 pounds per square inch greater than the average back pressure of any ground water that may submerge the pipe, if:

The total rate of air loss from any section tested in its entirety between manholes or between manholes and cleanout structures does not exceed 2.0 cubic feet per minute, or the following table may be utilized as a guideline for a satisfactory test by air for pipe sizes shown:

Minimum Allowable Time for Air Pressure Decrease of One Pound

Pipe Diameter	L=200 feet	L=300 feet	L=400 feet	L=500 feet
8 inch	2:20 minutes	3:30 minutes	3:47 minutes	3:47 minutes
10 inch	3:40	4:43	4:43	4:43
12 inch	4:24	5:40	5:40	5:40

The formula is the lesser of the two following formulas:

$$tQ = \frac{0.022 (d_1^2 L_1 + d_2^2 L_2 + d_n^2 L_n)}{Q} \quad \text{Or} \quad tq = \frac{0.085 (d_1^2 L_1 + d_2^2 L_2 + d_n^2 L_n)}{q (d_1 L_1 + d_2 L_2 + d_n L_n)}$$

Where: tQ and tq = allowable time (in seconds) for air pressure decrease of one pound.

Q = 2.0 cubic feet of air loss

q = 0.003 cubic feet per minute air loss per square foot of internal pipe surface

d = diameter in inches of sewer pipe being tested

L = length of sewer pipe being tested

Pressure gauges shall be incremented in not more than 1/2 pound increments for accurate tests.

If the pipe installation fails to meet test requirements, the Contractor shall determine at his own expense the source or sources of leakage, and he shall repair (if the extent and type of repairs proposed by the Contractor are acceptable to the Engineer), or replace all defective materials or Workmanship. The completed pipe installation shall meet the requirements of this test or the alternative water exfiltration test before being considered acceptable.

Safety 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, workmen shall not be allowed in the manholes in which plugs have been placed while tests are being conducted. The Contractor's testing equipment shall be arranged in such a manner that a pressure relief device will prohibit the pressure in the pipeline from exceeding 10 PSI.

d. Infiltration Test

Infiltration testing may be allowed at the Engineer's option when the natural ground water table is six feet (6') above the crown of the higher end of the test section. The maximum allowable limit for infiltration shall not exceed the rate of 50 gallon per inch diameter per mile per 24 hours.

The Contractor shall furnish all tools, equipment, and labor necessary to complete the tests and shall verify from his own observations, or preliminary tests, that each line conforms with this Specification before requesting the Engineer to observe and record the actual leakage.

The infiltration test on manholes may be performed using vacuum with all connecting pipes plugged. A vacuum tester head assembly, designed specifically for this test, shall be set atop the manhole, preferable on the frame.

Attach vacuum pump to the head assembly and start vacuum pump engine. Open the pump outlet valve and evacuate the manhole to 10" Hg (about 5 psig back pressure). Close outlet valve and monitor vacuum for specified time period. If vacuum does not drop in excess of 1" Hg over a two-minute period, the manhole is considered acceptable.

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.

e. Check of Line and Grade

After backfilling and cleaning, but before final acceptance, all sections of installed line may be checked for line and grade. Excluding service connections, all size sanitary sewer mains thirty inches (30") and smaller in diameter may be checked for line and grade by closed circuit television. A full circle of light must be seen and no pipe misplaced in line or grade.

After placement and compaction of trench backfill and prior to restoration of the surface, all new sewer lines constructed with flexible pipe shall be tested with a mandrel to measure for pipe deflection and joint misalignment. The mandrel testing device is a rigid cylindrical plug tapered on each end with a diameter equal to 95 % of the inside diameter of the pipe to be tested. The plug has pulling rings at both ends to which pulling and tag lines are attached. The lines are marked so that the distance the mandrel has been pulled into a sewer can be determined.

Any excess deviation in line and grade shall be corrected by the Contractor prior to Final Acceptance of the Project.

f. Closed Circuit Television Inspection

A closed circuit television inspection (CCTV) consisting of a special television camera passing through the sewer pipe with the signal being observed on a monitor shall be performed. The contractor shall furnish all tools, equipment, and labor necessary to complete the inspection. The intent of the inspection is to provide a visual inspection of the interior of the sewer and to document the location of sewer service wyes or saddles. Any problems such as pipe separations, leaks, obstructions, debris, misalignment, drops or bellies shall be corrected by the contractor prior to acceptance of the project. A

copy of the video inspection, in VCR tape or DVD format, shall be provided to the CBS at the end of the project. CBS shall view and approve video inspection prior to acceptance.

Article 2.5 Measurement

Measurement for all sizes of pipe shall be based on the horizontal distances and will be from center to center of manholes or from center of manholes to center of cleanout wye.

Article 2.6 Basis of Payment

Payment for this Work shall be in accordance with Section 50.01 General, Article 1.6 Payment - General, of this Division and shall include full payment for all Work described in Section 50.02.

Fittings and appurtenances as shown on the Drawings or not specifically identified for payment under a separate pay item but required for normal completion of sewer main installation will be considered incidental and shall be included in the linear foot cost of the sanitary sewer main. Trench excavation, bedding, backfill and compaction shall be incidental to the Bid Item provided in this item of work unless specified otherwise. Imported backfill shall be paid under the appropriate pay item or by letter of agreement.

The unit price per linear foot shall be full payment for all Work, including labor, equipment and materials. The unit price shall include, but not be limited to, delivery of non-serviceable portions of removed pipe and fittings at a Contractor-furnished disposal site; delivery of serviceable portions of removed pipe and fittings to the Owner when directed by the Engineer; installation of all pipe, caps, plugs, adapters and other fittings; adjustment to finish grade; cleaning and flushing; provisions coordinating the supply of water as required for flushing and testing; protection/restoration of all existing utilities; maintenance of existing sanitary sewer system flows; shoring/protection of existing light poles; maintenance and restoration of existing drainage patterns; restoration of existing driveways; signage, mail boxes, newspaper boxes, trees and shrubs located on private property, landscaping, utility markers, survey monumentation, removal and replacement of miscellaneous public or private improvements; preparation of off roadway areas for top soiling and re-seeding; cleanup, and miscellaneous items required to complete the Work as shown on the plans. All construction shall be in accordance with Division 20 and Division 50 of these standards.

Unit cost payment shall be made on the following basis:

ITEM	UNIT
Furnish and Install (include size, shape, type material, class and/or gauge) Pipe	Linear Foot

SECTION 50.03 MANHOLES

Article 3.1 General

The Work under this Section consists of the performance of all operations pertaining to the construction and installation of sanitary sewer manholes complete with frames and covers.

Article 3.2 Material

Materials used in the construction of manholes shall conform to the requirements of ASTM C-478-69. Cones shall be eccentric unless otherwise approved.

Cement for grout used in the construction of manholes shall conform to the requirements of ASTM C-150, Type II. Sand shall conform with AASHTO Specification M-45. The grout shall be composed of one (1) part cement and three (3) parts sand. The joints shall be constructed so as to produce a smooth, regular watertight surface. Only enough water shall be added to provide plasticity in placing the grout.

The tensile strength of the gray cast iron for manhole frames and covers shall be 30,000 PSI minimum, conforming with the requirements of ASTM A-48. The requirement for transverse breaking load shall be 2,000 pounds, conforming with the requirements of ASTM A-438. Contact surfaces between frames and covers shall conform to the Standard Details of these Specifications. Where lockable manhole covers are specified, the Contractor shall submit Shop Drawings of the locking device for approval of the Engineer.

Pre-molded gaskets for manhole construction shall be as manufactured by K. T. Snyder Company, Inc., Ram-Nek Gasket Division, 2100 Travis Street, Houston, Texas or equal.

Refer to Section 30.01 General, Article 1.6 Mix Requirements for Classes of Concrete, for Specifications pertaining to Class A-3 concrete as required in forming manhole inverts.

Manhole exterior joint waterproofing shall be an Esky-Wrap system as manufactured by Caddiloc External Pipe Joint, Inc. or a Miradri system as manufactured by Mirafi, Inc. including Miradri P-804 primer, Miradri 860 membrane and Miradri M-800 mastic, or approved equal that includes a membrane and adhesive system for positive water exclusion. Joint waterproofing shall extend a minimum of 6" above and 6" below the joint.

Article 3.3 Construction

a. General

Excavation and backfill for furnishing and installing sanitary sewer manholes shall be in accordance with Division 20.00 Standard Construction Specifications For Earthwork, Section 20.07 Trench Excavation And Backfill, of these Specifications.

Precast manhole bases shall be set on a firm foundation of compacted gravel materials or rock. Continuous support under sewer pipes shall be required. Placement of manhole barrel sections and cones must be made in vertical alignment with watertight joints. Placement of cast iron frames and covers at proper elevations is required. Installation of pre-molded gasket materials for manhole construction shall be in accordance with manufacturer's instructions.

The manhole frames and covers shall be brought to the grades shown on the Drawings. Manhole adjusting rings shall be set in and made secure with high strength grout on both interior and exterior surfaces, troweled smooth.

Use of, and installation of pre-molded plastic gaskets for man-hole construction shall be strictly in accordance with the manufacturer's printed instructions. Gaskets shall be trimmed on the inside of the manhole to prevent the excess gasket material from entering the sanitary sewer lines.

All portions of precast manholes must be approved by the Engineer prior to installation in the sanitary sewer systems. The contractor shall provide timely notice (at least two working days in advance) to allow time for the Engineer to arrange for necessary inspections. Installation, of manhole sections will not be allowed prior to the Engineers written approval. This approval does not relieve the Contractor of the responsibility for protection of manholes against damage during handling and installation.

Manholes shall be installed at the locations shown on the Drawings such that primary leads enter radially at the invert elevations specified. The base section shall be set plumb on a prepared surface.

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 mechanical plug, cap or other adequate method to prevent water, earth or other substances from entering the pipe. Manholes shall have nine foot (9') stub-outs, minimum.

b. Sanitary Sewer Manhole Invert Construction

All penetrations through the wall of manholes for pipes shall be constructed with resilient EPDM rubber boots which are integral with the manhole wall; invert flow channels shall be full depth, smooth and semicircular in shape, and conform to the inside of the sewer section. Changes in directions of flow shall be made by forming a smooth radius sized to allow adequate access of a T.V. camera and/or maintenance equipment into the served sewer pipe. Changes in size and grades of the channels shall be made gradually and evenly. The full-depth invert channels shall be pre-formed directly in the concrete of the manhole base for new construction, or may be formed and poured in place in existing manholes. The floor of the manhole outside the channels shall be smooth and shall slope towards the channels at a grade of one inch (1") per foot.

c. Component Part Replacements

The Contractor shall take due care not to destroy or damage existing component parts of manholes that are to remain or be reset in place.

The Contractor shall furnish and install barrel sections and grade rings to adjust the top of sanitary sewer manholes to grade in accordance with CBS Division 70, Sections 70.02 and 70.03, as shown in Standard Detail 50-4. All materials used in the adjustment of sanitary sewer manhole cones including mortar, steps barrel sections, block, etc., shall conform to the requirements for sanitary sewer manholes as outlined in Section 50.03, Article 3.2.

The Contractor is hereby informed that base sections may not be notched or “keyed” to the first barrel section as shown in the standard detail. Installation of new sections shall be constructed to produce a smooth, regular, watertight surface.

d. Removal of Existing Manhole Component Parts

Upon removal of manhole component parts, the Contractor shall clean and prepare existing component parts prior to installation of replacement parts. This will include, but not be limited to, removing existing grout and Ramnek-type sealant from remaining and connecting component parts.

Materials that can be reused (manhole covers, frames, etc.) shall be salvaged and removed in a workmanlike manner. The Contractor shall provide a disposal site for non-salvageable materials.

Article 3.4 Measurement

Manholes shall be measured as units complete in place. Depth of manholes will be based upon a measurement to the nearest foot, for payment purposes, from top of casting to the top of the base slab.

Article 3.5 Basis of Payment

Payment for this Work shall be in accordance with Section 50.01 General, Article 1.6 Payment - General, of this Division and shall include full payment for all Work described in Section 50.03.

Separate payment will not be allowed for frames and covers, but shall be included in the unit price for manholes.

Payment shall be made on the following basis:

ITEM	UNIT
Construct Manhole (Including Type & Standard Depth)	Each
Additional Depth to Manhole (Include Type)	Linear Foot

SECTION 50.04 WATERTIGHT MANHOLE FRAMES AND COVER

Article 4.1 General

The work under this Section consists of the performance of all operations pertaining to the furnishing and installation of watertight manhole frames, covers, and watertight inserts.

Article 4.2 Material

Watertight frames and covers for manholes and similar appurtenances shall be bolt-down cast iron and conform to the dimension shown in the applicable Standard Details. The requirement for tensile strength of the gray cast iron shall be 30,000 PSI minimum in accordance with the requirements of ASTM A-48 and the requirement for transverse breaking load shall be 2,000 pounds in accordance with the requirements of ASTM A-438. Contact surfaces between frames and covers shall be machined to provide a uniform contact surface. Manhole covers shall have identification letters as shown on the Standard Details.

Inflow protection inserts are required where surface work only is performed and manhole is not removed. Inflow protection inserts shall be provided in accordance with the standard details of these specifications.

Article 4.3 Construction

Installation shall be performed in accordance with the manufacturer's written instructions and Standard Details of these Specifications.

Article 4.4 Measurement

Watertight manhole frames, covers, and inflow protection inserts shall not be measured separately, but shall be considered incidental to Item 50.03, Manholes.

Article 4.5 Basis of Payment

None

SECTION 50.05 CONNECTIONS TO EXISTING MANHOLES

Article 5.1 General

The Work under this Section consists of providing all operations pertaining to the Work required for connections to existing manholes.

Article 5.2 Construction

Excavation and backfill for connections to existing manholes shall be in accordance with Division 20.00 Standard Specifications For Earthwork, Section 20.07 Trench Excavation And Backfill, of these Specifications.

Connection to existing manholes shall be made in a workmanlike manner, shall be water tight and have smooth flow surfaces and curves. The invert shall be brought into the existing manhole at the elevation shown on the drawings. Pipe penetrations into existing manholes shall be performed using a Link-Seal, Kor-n-Seal, Sand Collar, or an approved equivalent method installed per the pipe penetration manufacturer's recommendations. The exterior of the Sand Collar pipe penetration shall be waterproofed, after the grout has cured, with Esky-Wrap or Miradri waterproofing system in accordance with these specifications and the system manufacturer's recommendations. An expanding type grout shall be used in all cases where grout is required. The downstream pipe in manholes shall be screened to prevent mortar or other debris from entering the system.

Where a connection is made to an existing sanitary sewer manhole, the base shall be broken out, if necessary, to form a smooth channel in accordance with the construction requirements of a new manhole. Connections to existing sanitary sewer manholes will be allowed only after all portions of the Contractor's work tributary to the connection point has been cleaned and flushed, inspected, and tested. Under certain conditions, connections prior to the completion of the system may be permitted subject to the Engineer's prior written approval and the provision of adequate debris and sand traps, and sumps, upstream from the connection.

Article 5.3 Measurement

Connection to existing manholes shall be measured as complete units in place.

Article 5.4 Basis of Payment

Payment for this Work shall be in accordance with Section 50.01 General, Article 1.6 Payment - General, and shall be full payment for all Work described in Section 50.05. Where the connect is made to a pipe stubbed out of the existing manhole, payment will not be allowed for the connect.

Payment shall be made on the following unit:

ITEM	UNIT
Connect to Existing Sanitary Manhole	Each

SECTION 50.06 CONSTRUCT DROP CONNECTION

Article 6.1 General

The Work under this Section consists of providing all operations pertaining to furnishing and installing drop sewer connections to manholes.

Article 6.2 Materials

Pipe and fittings used in the construction of drop connections for sanitary sewers shall conform to the requirements of AWWA C-151 for Class 50 pipe and AWWA C-110 for Class D fittings and the standard details.

Article 6.3 Construction

Excavation and Backfill for furnishing and installing drop sewer connections shall be in accordance with Division 20.00 Standard Specifications For Earthwork, Section 20.07 Trench Excavation and Backfill, of these Specifications.

Over-excavation under drop connection shall require compaction of not less than ninety-five (95) percent of the maximum density prior to installation of the pipe and fittings, or the concrete cradle.

Refer to Division 30.00 Standard Construction Specifications for Portland Cement Concrete, Section 30.01 General, of these Specifications for requirements pertaining to Class A-3 concrete.

Article 6.4 Measurement

Drop sewer connections shall be measured as units, complete in place.

Article 6.5 Basis of Payment

Payment for this Work shall be in accordance with Section 50.01 General, Article 1.6 Payment - General, of this Division and shall include full payment for all Work described in Section 50.06.

Payment shall be made on the following basis:

ITEM	UNIT
Construct Sanitary Sewer Drop Connection	Each

SECTION 50.07 CONSTRUCT BEAVER SLIDE

Article 7.1 General

The Work under this Section consists of providing all operations pertaining to the construction and installation of beaver slides in a manhole. Beaver slides shall only be allowed with the specific approval of the City and Borough of Sitka.

Article 7.2 Material

Refer to Division 30.00 Standard Construction Specifications for Portland Cement Concrete Section 30.01 General, of these Specifications, for requirements pertaining to Class A-3 concrete as required in forming beaver slide inverts.

Article 7.3 Construction

Beaver slides shall be constructed to provide a smooth and continuous channel directed into and with the flow of the receiving sewer and in accordance with the Standard Details of these Specifications. Beaver slides shall be constructed only when the discharge invert is positioned between 90° and 180° from the receiving invert.

Beaver slides are required where the invert of the connecting sewer is above the crown of the receiving sewer and the drop in the manhole does not exceed the maximum height shown on the Standard Details of this Specification.

Beaver slides shall be pre-formed directly in the concrete of the precast manhole base for new construction, or may be formed and poured in place in existing manholes.

Article 7.4 Measurement

Beaver slides shall be measured as units complete in place.

Article 7.5 Basis of Payment

Payment for this Work shall be in accordance with Section 50.01 General, Article 1.6 Payment - General, of this Division and shall include full payment for all Work described in Section 50.07.

Payment shall be made on the following basis:

ITEM	UNIT
Construct Beaver Slide	Each

SECTION 50.08 LATERAL CONNECTION TO EXISTING PIPE

Article 8.1 General

The Work under this Section consists of providing all operations pertaining to lateral connections to trunk and interceptor mains.

Article 8.2 Construction

Lateral connections to existing sanitary sewer pipe shall be water tight and have smooth flow surfaces. The lateral shall be brought into the existing pipe in accordance with the Contract Documents, unless otherwise approved by the Engineer. The connection shall be made in a top quadrant of the pipe, and the lateral shall not intrude past the inside wall of the existing pipe.

Taps to reinforced concrete sanitary sewer pipe shall be made by use of an approved mechanical hole cutter. Breaking into the pipes by use of a chipping gun, jack hammer, or other similar method will not be allowed.

Article 8.3 Measurement

Lateral connections will be paid for as a complete unit in place which includes all pipe and fittings from the manhole to the existing main.

Article 8.4 Basis of Payment

Payment for this Work shall be in accordance with Section 50.01 General, Article 1.6 Payment - General, of this Division and shall include full payment for all Work described in Section 50.08.

Payment shall be made on the following basis:

ITEM	UNIT
Lateral Connection	Each

SECTION 50.09 DEEP SANITARY SEWER SERVICE RISERS

Article 9.1 General

The Work under this Section consists of providing all materials and operations pertaining to deep sanitary sewer service risers.

Article 9.2 Material

All deep sanitary sewer service riser connections shall be constructed with the following materials:

- a. Ductile iron with "Tyton" joints, or approved equivalent.
- b. PVC with "Twinseal" joints, or approved equivalent.

Article 9.3 Construction

Excavation and backfill for furnishing and installing deep sanitary sewer service risers shall be in accordance with Division 20.00 Standard Construction Specifications for Earthwork - Section 20.07 Trench Excavation and Backfill, of these Specifications.

Where ductile iron bolt-on or banded service connections are used, the pipe shall be cut with a mechanical hole cutter and the connection bolted on in accordance with the Contract Documents.

Article 9.4 Measurement

Service risers for deep sanitary sewer connections shall be measured as complete units in place.

Article 9.5 Basis of Payment

Payment for this Work shall be in accordance with Section 50.01 General, Article 1.6, Payment - General, of this Division and shall include full payment for all Work described in Section 50.09.

Payment shall be made on the following basis:

ITEM	UNIT
Deep Sanitary Sewer Service Riser (size)	Each

SECTION 50.10 SANITARY SEWER SERVICE CONNECTIONS

Article 10.1 General

The Work under this Section consists of providing all materials and operations pertaining to the construction required for sanitary sewer service connections.

Article 10.2 Material

All sanitary sewer service connects shall be constructed with the following materials:

- a. Ductile iron with "Tyton" joints, or approved equivalent.
- b. PVC with "Twinseal" joints, or approved equivalent.

All services with less than four feet (4') of cover shall be insulated with 4" of rigid board insulation in conformance with Section 70.18 Insulation.

Connections to main shall be made with wye fittings for new construction and Romac CB Sewer Saddles, or approved equivalent, on existing mains.

Article 10.3 Construction

Excavation and backfill for furnishing and installing sanitary sewer service connections shall be in accordance with Division 20.00 Standard Specifications for Earthwork, Section 20.07 Trench Excavation And Backfill, of these Specifications.

The service connections shall be bedded with D-1 Bedding. Bedding shall be placed the full extent of ditch and up to a height not less than six (6) inches above the crown of the pipe. Piping may be bedded with native soils if approved in advance by the Engineer.

Construction shall be in accordance with the Standard Details of this Specification. Multiple connections shall not be made any closer together than three feet (3'). The terminus of the house connection shall be sealed with a water-tight mechanical plug or cap capable of withstanding acceptance pressure test. Taps, where allowed for installation of saddles on to sewer pipes, shall be made with a mechanical hole cutter as manufactured by the Pilot Manufacturing Company or equal. Tee and Wye saddles will be allowed on mains twelve inches (12") and larger, Romac CB Sewer Saddles, or approved equivalent, will be the only saddles allowed on existing mains smaller than twelve inches (12"). All service connections to sanitary sewer mains shall be approved ductile iron or PVC pipe.

Saddles shall be placed over a circular hole sawed one-eighth inch (1/8) larger than the inside diameter of the saddle. The strap(s) shall be tightened in accordance with the manufacturer's instructions and centered over the hole sawed in the pipe being tapped. The hole shall be made above the spring line of the main being tapped.

Sanitary sewer service connections shall be installed to the edge of right-of-way or edge of permanent easement of the lot being served and shall be permanently marked by means of a four-by-four extending two feet (2') above grade, painted green, or with a 2-foot piece of rebar attached if it is not feasible for the marker to extend above ground.

As-built measurements shall be the station of the service connection at the main plus a minimum of three (3) ties to permanent prominent features and, when possible, ties to property corners. Measurements will also include depth of bury to the top of pipe.

Minimum slopes shall be as follows:

<u>Pipe Diameter</u>	<u>Slope</u>	
4"	2.08%	.0208 feet per foot (1/4" per foot)
6"	2.00%	.0200 feet per foot
8"	0.50%	.0050 feet per foot
10"	0.28%	.0028 feet per foot
12"	0.22%	.0022 feet per foot
*All Sizes	>1.50%	Muskeg Areas

*Where pipe trench is predominantly in muskeg material, the minimum pipe slope shall be 1.5% or 0.015 feet per foot.

Upon exposing a stub-out the Contractor is required to insure that the line is free and clear of obstructions prior to connection with the service extension.

If the service line is found to be either plugged or to have reverse grade, the Contractor is required to notify the Engineer immediately or be liable for correcting the misalignment or unplugging the line at his expense. At the point of tie-in if DIP or PVC pipe is exposed, a Romac SS1 Repair Clamp, or equal, shall be used to connect to the on-property service line. If a "Ty-seal" hub is utilized, the use of a Romac SS1 Repair Clamp, or equal, is not required. When using a bend at the point of tie-in (2) two Romac SS1 Repair Clamps shall be used.

An Inspector for the Engineer shall be present when initial connection, or service line extension is made to the Utility line, without exception.

Engineer will not approve any installation which is not in accordance with the Uniform Plumbing Code and these Specifications. The Contractor shall not start the excavation for main line tap or on site service until a permit is obtained or notification is given. All permits must be posted on the job at the time of the inspection.

Article 10.4 Measurement

Sanitary sewer service connections shall be measured as completed units in place. This item will include all materials, excavation, installation, compaction, backfill, and bedding.

Article 10.5 Basis of Payment

Payment for this Work shall be in accordance with Division 50.01 General, Article 1.6 Payment - General, of this Division and shall include full payment for all Work described in Section 50.10.

Payment shall be made on the following basis:

ITEM	UNIT
Sanitary Sewer Service Connect (Size)	Each

SECTION 50.11 REMOVE AND DISPOSE OF EXISTING CESSPOOLS OR SEPTIC TANKS AND CONNECT EXISTING SERVICE

Article 11.1 General

The Work under this Section consists of providing all operations pertaining to removal and disposing of existing cesspools or septic tanks and connection of existing service. If cesspools or septic tanks are encountered during construction, the Contractor shall either defer construction of the main trunk through the cesspools until such time as all downstream construction has been completed, tested and accepted or the Contractor may proceed with construction provided that the waste from the house service connection is accommodated continuously until satisfactory connection to the sewer main can be made.

Such accommodations shall be in a manner approved by the City and Borough of Sitka (CBS) and the Alaska Department of Environmental Conservation (ADEC).

Article 11.2 Construction

Where the Contractor must remove cesspools or septic tanks from the trench area the following procedures shall apply:

1. The liquid and sludge from the existing structure shall be pumped into a watertight container, and transported to and disposed of at a sanitary sewer manhole to be designated by the Engineer or at one of the manholes to be constructed under this Contract, subject to approval of the Engineer. Care shall be exercised in transporting cesspool liquid and sludge so that no spillage occurs during transport and disposal.
2. The Contractor shall then remove the remaining sludge, septic tank, cesspool or privy pit, logs or cribbing, and any saturated gravel remaining in the trench area, and shall dispose of this material at a Contractor provided disposal area.
3. The Contractor shall then fill the void created by removal of the cesspool with Type III material in accordance with Division 20.00 Standard Construction Specifications for Earthwork, Section 20.07, Trench Excavation and Backfill, of these Specifications.
4. As soon as the downstream portion of the new sewer has been tested and accepted the Contractor shall replace the existing service to the property line and connect the existing house service to the main. Connection shall be made in a workmanlike manner and at a uniform grade to accommodate the existing service.

Article 11.3 Measurement

Removal of existing cesspool or septic tank, replacing the existing service to the property line and connecting existing house service to the new sewer is to be measured as two pay items as indicated in Article 11.4. Disposal of logs, cribbing, tanks and saturated gravel shall be measured as unsuitable

material. Gravel necessary to fill the void after removal of structure shall be measured as Type III material.

Article 11.4 Basis for Payment

Payment for this Work shall be in accordance with Section 50.01 General, Article 1.6 Payment - General, and shall be full payment for Work described in this Section 50.11.

Payment shall be made on the following basis:

ITEM	UNIT
Remove Cesspool and Connect	Each
Sanitary Service Connect	Each

SECTION 50.12 CONSTRUCT SANITARY SEWER CLEANOUT

Article 12.1 General

The Work under this Section consists of providing all materials and operations pertaining to construction and installation of cleanouts. Unless specifically approved by the Engineer, sanitary sewer cleanout assemblies are not approved for installation. In lieu of a cleanout on dead end, or the terminus of a sewer main, a Type A sewer manhole shall be installed.

Article 12.2 Material

When approved, material used in the construction of sanitary sewer cleanouts shall conform to the requirements of AWWA C-151, for Class 50 ductile iron pipe and AWWA C104/ANSI A21.4 fittings and as shown on the Standard Detail of this Specification.

Article 12.3 Construction

Excavation and backfill for the construction of sewer cleanouts shall be in accordance with Division 20.00 Standard Construction Specifications for Earthwork, Section 20.07 Trench Excavation and Backfill, of these Specifications.

Over-excavation under cleanouts shall require thorough compaction prior to installation of the pipe and fittings.

Article 12.4 Measurement

Cleanouts will be measured as units, complete in place.

Article 12.5 Basis of Payment

Payment for this Work shall be in accordance with Section 50.01 General, Article 1.6 Payment - General, and shall include full payment for all Work described in Section 50.12.

Payment shall be made on the following basis:

ITEM	UNIT
Construct Sewer Cleanout	Each

SECTION 50.13 POLYETHYLENE ENCASEMENT

Article 13.1 General

The Work under this Section consists of providing all operations pertaining to the furnishing and installation of one layer of polyethylene encasement on all ductile iron pipe and fittings if required in the plans and specifications.

Article 13.2 Material

The polyethylene encasement material for pipe shall conform to the most current edition of AWWA C105/ANSI A21.5.

Article 13.3 Construction

The polyethylene encasement shall be installed in strict conformance to the methods described in the most current editions of AWWA C105/ANSI A21.5 and the Ductile Iron Pipe Research Association's "A Guide for the Installation of Ductile Iron Pipe."

Article 13.4 Measurement

Measurement on all sizes of polyethylene encasement for pipe shall be the same as the measurement of the pipe installed.

Article 13.5 Basis of Payment

Payment for this Work shall be in accordance with Section 50.01 General, Article 1.6 Payment - General, and shall be full payment for all Work described in Section 50.13.

Payment shall be made on the following units:

ITEM	UNIT
Polyethylene Encasement	Linear Foot

SECTION 50.14 ADJUST MANHOLE CONE

Article 14.1 General

This item consists of furnishing all labor, equipment, and materials necessary to adjust existing manhole cones to finish grade as shown on the plans and in accordance with the applicable standard details of these specifications.

Article 14.2 Material

All materials used in the adjustment of manhole cones shall conform to the requirements for manholes as outlined in the standard construction specifications for sanitary sewer systems and storm drain systems, unless otherwise approved by the Engineer.

Article 14.3 Construction

The Contractor shall adjust the manhole cones in accordance with the applicable standard detail or as called out on the plans. Any damage to manholes resulting from construction under this item shall be repaired or the damaged portion replaced at the Contractor's expense.

Article 14.4 Measurement

Manhole cone adjustments will be measured per unit, complete in place.

Article 14.5 Basis of Payment

Payment for this Work shall be in accordance with Section 50.01 General, Article 1.6 Payment - General, and shall be full payment for all Work described in Section 50.14 and all work outlined on the applicable standard detail, unless otherwise noted.

Payment for cone adjustment shall include full compensation for changes in height. In no case will payment for both ring and cone adjustments be made for the same manhole.

Payment will be made under:

ITEM	UNIT
Adjust Manhole Cone	Each

SECTION 50.15 ADJUST MANHOLE RING

Article 15.1 General

This item consists of furnishing all labor, equipment and materials necessary to adjust existing manhole rings to finish grade as shown on the plans and in accordance with the applicable standard details of these specifications.

Article 15.2 Material

All materials used in the adjustment of manhole rings shall conform to the requirements for manholes as outlined in the standard construction specifications for sanitary sewer systems and storm drain systems, unless otherwise approved by the Engineer.

Article 15.3 Construction

The Contractor shall adjust the manhole rings in accordance with the applicable standard detail in these specifications. Any damage to manholes resulting from construction under this item shall be repaired or the damaged portion replaced at the Contractor's expense.

If the distance from the finish rim elevation to the first manhole step exceeds 18-inches, a manhole cone or barrel section adjustment shall be required.

Article 15.4 Measurement

Manhole ring adjustments will be measured per unit, complete in place.

Article 15.5 Basis of Payment

Payment for this Work shall be in accordance with Section 50.01 General, Article 1.6 Payment - General, and shall be full payment for all Work described in Section 50.15 and all work outlined on the applicable standard detail, unless otherwise noted.

Payment for ring adjustment shall include full compensation for changes in height. In no case will payment for both ring and cone adjustments be made for the same manhole.

Payment will be made under:

ITEM	UNIT
Adjust Manhole Ring	Each

SECTION 50.16 ADJUST CLEANOUT

Article 16.1 General

This item consists of furnishing all labor, equipment, and materials necessary to adjust existing sanitary sewer cleanouts to finished grade as shown on the plans.

Article 16.2 Construction

All cleanout adjustments shall be accomplished as directed by the Engineer. Any damage to the cleanout or sewer main resulting from work under this item shall be repaired or replaced at the Contractor's expense.

Article 16.3 Measurement

Cleanout adjustments shall be measured per unit, complete in place.

Article 16.4 Basis of Payment

Payment for this Work shall be in accordance with Section 50.01 General, Article 1.6 Payment - General, and shall be full payment for all Work described in Section 50.16. The contract unit prices per each for cleanout adjustments shall be full compensation for furnishing all equipment and labor necessary to complete the work as specified. Materials required to adjust cleanouts shall be incidental to this item.

Payment will be under:

ITEM	UNIT
Adjust Cleanout	Each

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DIVISION 55
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STANDARD CONSTRUCTION SPECIFICATIONS FOR STORM DRAIN SYSTEMS

SECTION 55.01 GENERAL

Article 1.1 Scope of Work

The Work covered by these Specifications consists of providing all plant, labor, equipment, supplies, transportation, handling, storage and performance of all operations necessary to complete the construction for the pipe laying, jointing, and testing of storm drain systems and culverts.

Requirements for earthwork including trench excavation and backfill are specified in Division 20.00 Standard Construction Specifications for Earthwork - Buildings.

Article 1.2 Applicable Standards

The latest revision of the following standards of the American Society for Testing and Materials (ASTM), the American Association for State Highway and Transportation Officials (AASHTO), and the American Water Works Association (AWWA) are hereby made part of this Specification.

ASTM A-48 and ASTM A-438	Strength Requirements for Manhole Frames and Covers
ASTM C-76	Specification for Reinforced Concrete
ASTM C-150	Specification for Portland Cement
ASTM C-478 (AASHTO-199)	Specification for Precast Reinforced Concrete
ASTM-746 (AWWA C-151)	Ductile Iron Pipe
AASHTO M-36	Corrugated Steel Pipe & Fittings
AASHTO M-45	Sand for Cement Mortar
AASHTO M-190	Bituminous Coating of CMP
AASHTO M-196	Corrugated Aluminum Pipe & Fittings
AASHTO M-245-82	Precoated Galvanized Steel Culverts and Underdrains
AASHTO M-246-80	Precoated Galvanized Steel Sheets for Culverts and Underdrains
AASHTO M-274	Corrugated Aluminized Pipe and Fittings
AASHTO M-252	Corrugated Polyethylene Tubing 3"-10" diameter
AASHTO M-294	Corrugated Polyethylene Pipe, 12" diameter and larger
ASTM D 1248-81	Polyethylene Plastics Molding and Extrusion Materials, Type III, High Density
ASTM D 2774	Underground Installation of Thermoplastic Pressure Piping
ASTM D 3035-83	Polyethylene Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter
ASTM D 3261-82	Butt Heat Fusion Polyethylene Plastic Fittings for Polyethylene Plastic Pipe and Tubing
ASTM D 3350-82	Polyethylene Plastics and Fittings Materials

Article 1.3 Surveys

The Contractor will lay out (in the field) the alignment and grade of work to be done under the Contract prior to starting installation. When once laid out, the Contractor shall be responsible for the preservation of all line stakes, grade stakes, and hubs. In the event of their loss or destruction, the Contractor shall pay all costs for their proper replacement. The Contractor shall be responsible for, and pay all costs for the transfer of, the control points from the reference hubs to such hubs or batter boards as required or needed for the prosecution of the work. A ground line profile will be made by the Contractor. The ground line profile refers to the elevation of the ground directly above the centerline of pipe and the grade line refers to the elevation of the invert of pipe, except where otherwise noted.

The CBS will furnish the Contractor with a list of all pertinent benchmarks, necessary for control points, and other information for control of the Work. Prior to utilizing information such as benchmarks, etc., it shall be the Contractor's responsibility to verify benchmark elevations by checking between at least two (2) benchmarks. The Contractor shall protect the benchmarks and control points provided by the Engineer and properly reference them off. The contractor shall be responsible for any necessary replacement.

As-built measurements and documentation will be done by the Contractor, and prior to final acceptance. The Contractor will furnish the CBS with AutoCAD electronic files (current version) and two (2) signed record drawings. Location, rim and invert elevations shall be recorded for the following: Manholes, catch basins, mainline cleanouts and service lateral connections. Locations shall be established with three (3) swing-tie distances to permanent structures, and when possible, tied to property corners. Record drawings and submittals shall conform to ADEC and CBS requirements. A Professional Engineer licensed in the State of Alaska shall stamp the record drawings.

Article 1.4 Concrete and Mortar

a. Miscellaneous Concrete

All concrete used in the construction of storm drains with the exception of precast manholes, manhole risers, cones, and catch basin barrels shall be Class A-3. Concrete Work shall conform to Division 30.00 Portland Cement Concrete of these Specifications.

b. Mortar

Cement for mortar used in the construction of storm drain shall conform with the requirements of ASTM C-150, Type II. Sand shall conform with the requirements of AASHTO M-45. The mortar shall be composed of one (1) part cement and three (3) parts sand. The addition of lime is not permitted.

Article 1.5 Payment - General

Payment for all Work included in this Division shall be paid for in accordance with Division 10.00 Standard General Provisions, Section 10.07 Measurement and Payment and shall include full payment for all Work described.

SECTION 55.02 FURNISH AND INSTALL PIPE

Article 2.1 General

The Work under this Section consists of the performance of all operations pertaining to furnishing and installing pipe for storm drain systems.

In the case of Owner-furnished pipe, the Owner shall allot to the Project, pipe to accomplish the Work in amounts, exactly matching the Contractor's pay quantities for pipe. Any surplus pipe left over from this allotment at the end of the Project shall be returned from the Contractor's job sites to the Owner's designated pipe yard. If the Contractor withdraws from the Owner's pipe yard more than the amount required to match the payment quantities, the Contractor shall pay the Owner on the basis of the Owner's invoice price for pipe (including freight), plus 10% overhead to reimburse the Owner for handling, warehousing, inspection, and administration.

Article 2.2 Material

a. General

All piping shall be in accordance with the Contract Documents conforming to the size and class shown and specified. Changes in class shall be made within one-half of a pipe length of the station indicated on the Drawings. Unless otherwise shown on Drawings, all pipe shall be Corrugated Polyethylene Pipe with Smooth Inner Liner (CPP-S).

b. Corrugated Metal Pipe (CMP)

Corrugated metal pipe is intended to refer to both steel and aluminum. The pipe shall conform to the following specifications:

1. **Steel:** Corrugated steel pipe shall meet the requirements of AASHTO M-36.
2. **Aluminum:** Corrugated aluminum pipe shall conform to the requirements of the AASHTO M-196.
3. **Aluminum Coated (Aluminized):** Corrugated aluminized pipe shall conform to the requirements of AASHTO M-36 and AASHTO M-274.

All CMP fittings shall be fabricated in a workmanship-like manner, develop the full strength of the material being joined, and finished to conform to the appropriate requirements of AASHTO M-36, AASHTO M-196 and AASHTO M-274.

Jointing for corrugated steel and aluminum pipe shall be made through the use of coupling bands applied as recommended by the manufacturer and approved by the Engineer.

Dissimilar metals may only be used in extending in place metal CMP and reattachment of dissimilar metal end sections provided an electrical insulating material, at least 1/16 inch in thickness, is used to separate the dissimilar materials.

All angles, bolts, and nuts shall be as recommended by the manufacturer for the type of pipe used and as approved by the Engineer.

The metal gage for pipe to be used shall be in accordance with the Contract Documents.

If bituminous coating of CMP is required, the bituminous coating shall conform to the requirements of AASHTO M-190.

All welding performed by the Contractor on aluminum pipe shall incorporate the use of 4043 or 5356 alloy for welding wire. The welding shall be accomplished by either the "TIG" (tungsten, inert gas shielded) or "MIG" (metal arc welding, inert gas shielded) process.

End Section for Corrugated Metal Pipe - Galvanized steel and aluminum end sections shall be flared, beveled, shop-assembled units to serve as structural, hydraulic and esthetic treatment to corrugated metal pipe culverts. They may be attached to culverts by threaded bolts, by riveting or bolting in accordance with the manufacturer's standard procedure. End sections shall have a turned-down lip or toe plate at the wide end to act as a cutoff. Materials for steel end sections shall be galvanized steel conforming to the requirements of AASHTO M-36. The gage shall be as follows:

- 16 Ga. - Through 24" in diameter or 29" X 18" pipe-arch
- 14 Ga. - 30" in diameter and 36" X 22" Pipe-arch
36" in diameter and 43" X 27" Pipe-arch
- 12 Ga. - Over 36" in diameter and 43" X 27" Pipe-arch
(except that the center panels of 60" in diameter and larger and 72" X 44" pipe-arch and larger, shall be 10 Ga.)

Galvanized stiffener angles shall supplement the usual reinforced side edges for 60" in diameter and larger, 79" X 49" pipe-arch and larger.

If the end section is shop attached to a stub of pipe, the pipe stub shall not be lighter in gage than the end section.

Materials for aluminum end sections shall comply with the provisions of AASHTO M-196 and fabrication shall comply with the requirements above.

- c. Precoated Corrugated Metal Pipe (PMCP).

All precoated corrugated metal pipe and connecting bands shall be coated to meet the ASSHTO DESIGNATION: M-245 and M-246 and the coating shall be 10 mils minimum thickness each side. All exposed edges including any perforated hole edges shall be coated with a liquid coating supplied by the supplier of the precoated corrugated pipe. All metal utilized for the precoated metal pipe shall conform to Section 55.02 Furnish and Install Pipe, Article 2.2 Material, subsection b. Corrugated Metal Pipe. All metal pipe utilized shall have a nominal wall thickness of 16 gauge for pipes 21" and larger and 18 gauge for pipes 18" and smaller, unless otherwise noted.

d. Corrugated Polyethylene Pipe (CPP)

Corrugated Polyethylene pipe shall conform to the following specifications:

1. 3" through 10" diameters:
the requirements of AASHTO M-252.
2. 12" and larger diameters:
the requirements of AASHTO M-294.

The corrugated Polyethylene Pipe covered by these specifications is classified as follows:

- Type C - This pipe shall have a full circular cross-section with a corrugated surface both inside and outside. Corrugations may be either annular or helical.
- Type S - This pipe shall have a full circular cross-section, with an outer corrugated pipe wall and a smooth inner liner. Corrugations may be either annular or helical.
- Type CP - This pipe shall be Type C with perforations.
- Type SP - This pipe shall be Type S with perforations.

All CPP fittings shall be rotational or blow molded and shall conform to the fitting requirements of AASHTO M-252 or M-294.

Jointing for 3" - 10" CPP shall be with couplings corrugated to match the pipe corrugations or with push-on couplings with locking devices.

Jointing for 12" and larger CPP shall be made through the use of couplings, corrugated to match the index in the pipe corrugations and in a width not less than 3/4 of the nominal pipe diameter. All couplings shall be manufactured to lap equally to a distance on each jointed pipe, to no less than the diameter of the pipe and shall provide a positive means of closure.

CPP may be connected to CMP or may be used between or connected to dissimilar metals.

All flared end sections and saddles shall be constructed of the same material as the pipe and shall be factory assembled units to serve as structural, hydraulic, and/or aesthetic end treatment to CPP culverts.

Connections to the CPP shall be as recommended by the manufacturer. The cost of the end section and saddles shall be incidental to the pipe.

e. High Density Polyethylene Pipe (HDPEP)

High density polyethylene pipe shall conform the following specifications:

The polyethylene resin shall be classified by ASTM D 1248 as Type III, Class C, Category 5. Grade P34, and have a minimum ASTM D 3350 cell classification of 335434C and a designation of PE 3408 by the Plastic Pipe Institute.

The polyethylene compound shall be suitably protected against degradation by ultra-violet light by means of a 2 percent concentration of carbon black, well dispersed by pre-compounding in with the resin (by the resin manufacturer).

The pipe shall contain no recycled compound except that generated in the manufacturer's own plant from resin of the same specification from the same raw material supplier. The pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, or other deleterious defects, and shall be identical in color, density, melt index, and other physical properties.

The pipe shall be designed according to the ISO modified formula in ASTM D 3035. The design pressure rating shall be expressed in terms of the static working pressure in psi for water at 73.4° F according to ASTM D 2837. The minimum allowable pressure rating for storm drain pipe shall be 52 psi.

Jointing of the pipe lengths to one another shall be by means of thermal butt fusion. Butt fusion of pipes shall be performed in accordance with the pipe manufacturer's recommendations for equipment and technique, using the correct size equipment and technique. Butt fusion will be performed only by personnel certified as competent by the polyethylene material supplier.

The Contractor shall provide butt fusion equipment compatible with the piping system being used as necessary to complete all joints on the project. All costs in connection with this equipment shall be included in the price bid for pipe installation.

Provide wall pipes or wall fitting as recommended by the pipe manufacturer to connect storm drain and catch basin drain pipes to manholes and catch basins.

Installation of all components shall be accomplished using the manufacturer's own recommendations. Unless the Contractor's personnel are certified in the installation of polyethylene pipe, the pipe suppliers

shall provide pipe personnel to instruct the Contractor in the handling, installation, and testing of their products. The Contractor shall provide for the on-site services of one supplier's representative at the start of construction. Additional technical representative services, if necessary, will also be at the Contractor's expense.

Random tests of field joints will be made by the Engineer, as necessary, as a quality control measure. The Contractor shall be responsible for removal or repair of unsatisfactory butt fusion joints.

Article 2.3 Construction

a. Excavation and Backfill

Excavation and backfill for furnishing and installing pipe shall be in accordance with Division 20.00 Standard Construction Specifications for Earthwork, Section 20.07 - Trench Excavation and Backfill of these Specifications.

b. Pipe Grade and Alignment

Variance of individual pipe sections from established line and grade shall not be greater than those listed in the table below, providing that such variance does not result in a level or reverse sloping invert.

Diameter Inches	Allowance Tolerance Feet	Diameter Inches	Allowance Tolerance Feet
8	0.03	14	0.04
10	0.03	16	0.04
12	0.03	18*	0.05

*Note: For all pipe sizes over eighteen inches (18") in diameter, tolerance not to exceed 0.05 feet.

During the progress of the Work, the Contractor shall provide instruments such as transits, levels, laser devices, and other facilities for transferring grades from offset hubs or for setting of batter boards or other construction guides from the control points and bench marks provided by the Contractor. The Contractor shall provide qualified personnel to use such instruments and who shall have the duty and responsibility for placing and maintaining such construction guides. The Contractor shall notify the Engineer 48 hours prior to taking measurements on newly installed section of line and/or appurtenances for Record Documents.

If the method of transferring grades from the offset hubs to the pipe require batter-boards, they shall be at least 1" X 6" supported on 2" X 4" stakes or approved metal rods and shall be placed every 25 feet. At least three boards must be in place at any given time to facilitate checking of line and grade. Both

line and grade shall be checked for each piece of pipe laid, except at tunnels where methods acceptable to the Engineer shall be used to carry forward line and grade.

The practice of pushing in un-compacted backfill over a section of pipe to provide a platform for transit and level alignment and grade observations shall be subject to the approval of the Engineer. If intermittent backfilling is allowed backfilling shall be accomplished in accordance with Division 20.00 Standard Construction Specifications for Earthwork, Section 20.07 Trench Excavation and Backfill, of these Specifications.

Due to the flexibility of the CPP, the Contractor shall exert due care while placing bedding and/or filter material and compacting adjacent to and over the pipe. All placement bedding and/or filter material and compaction shall be as per the manufacturer's recommendations or as approved by the Engineer.

The Contractor shall exert due care in handling the pre-coated corrugated metal pipe or while placing bedding and/or filter material around the pipe so as not to damage the coating. The Contractor shall obtain a liquid coating supplied by the pre-coated corrugated metal supplier which will be painted over scratched or cut sections of the pipe.

c. Pipe Laying

All pipe shall be laid with C-1 Bedding unless otherwise required by the Contract Documents or directed by the Engineer.

Pipe laying shall in all cases proceed upgrade. Each pipe shall be laid true to line and grade and in such a manner as to form a close concentric joint with the adjoining pipe. The alignment of the installed pipe shall appear straight to visual observations and shall be such that a full circle of light can be seen between manholes, etc., when sighting along all points of the pipe circumference. Each section of pipe shall be handled carefully and placed accurately. Each section of pipe shall be properly supported to insure true alignment and an invert which is smooth and free from roughness or irregularity. On helical pipe, the laps shall not impede the flow and all seams shall be aligned uniformly for the length of the run.

At all times, when Work is not in progress, open ends of pipe and fittings shall be securely and satisfactorily closed so that no undesirable substances shall enter the pipe or fittings. All pipe shall be laid in accordance with the respective manufacturer's recommendations. Pipe shall not be laid when the bottom of the ditch or the sides to one foot above the pipe are frozen. Backfill containing frozen material shall not be placed, nor shall the trench be left open during freezing weather so that temperature of the material near the pipe goes below freezing.

Article 2.4 Measurement

Measurement for all sizes of pipe shall be based on the horizontal distances and shall be from center to center of manholes, from the center of manholes to center of catch basins, from the center of catch basins to center of catch basins, from center of manholes to center of cleanout wye, and from center of manhole to end of pipe including flared end sections.

Article 2.5 Basis of Payment

Payment for this Work shall be in accordance with Section 55.01 General, Article 1.5 Payment - General, of this Division and shall include full payment for all Work described in Section 55.02.

Fittings and appurtenances as shown on the Drawings or not specifically identified for payment under a separate pay item but required for normal completion of storm drain system installation will be considered incidental and shall be included in the linear foot cost of the storm drain pipe. Trench excavation, bedding, backfill and compaction shall be incidental to the Bid Item provided in this item of work unless specified otherwise. Imported backfill shall be paid under the appropriate pay item or by letter of agreement.

The unit price per linear foot shall be full payment for all Work, including labor, equipment and materials. The unit price shall include, but not be limited to, delivery of non-serviceable portions of removed pipe and fittings at a Contractor-furnished disposal site; delivery of serviceable portions of removed pipe and fittings to the Owner when directed by the Engineer; installation of all pipe, caps, plugs, adapters and other fittings; adjustment to finish grade; cleaning and flushing; provisions coordinating the supply of water as required for flushing and testing; protection/restoration of all existing utilities; maintenance of existing sanitary sewer system flows; shoring/protection of existing light poles; maintenance and restoration of existing drainage patterns; restoration of existing driveways; signage, mail boxes, newspaper boxes, trees and shrubs located on private property, landscaping, utility markers, survey monumentation, removal and replacement of miscellaneous public or private improvements; preparation of off roadway areas for top soiling and re-seeding; cleanup, and miscellaneous items required to complete the Work as shown on the plans. All construction shall be in accordance with Division 20 and Division 55 of these standards.

Payment shall be made under the following units:

ITEM	UNIT
Furnish and Install (include size, shape, type material, class and/or gauge) Pipe	Linear Foot
Furnish and install end cap	Each

SECTION 55.03 SUBDRAINS

Article 3.1 General

The Work under this Section consists of the performance of all operations pertaining to furnishing and installing subdrains.

Article 3.2 Material

- a. All piping shall be in accordance with the Contract Documents and shall be the sizes shown and specified.
- b. The Contractor shall use perforated steel, perforated aluminum or perforated aluminized coated corrugated metal pipe as noted. Corrugated metal pipe shall conform to the provisions of Section 55.02 Furnish and Install Pipe of this Division. Geotextile fabric shall conform to the provisions of the Contract Documents and Section 70.22 Geotextiles, Division 70.00 Miscellaneous. Perforations shall be located and sized in accordance with the requirements of AASHTO M-36. The top row of holes shall not be less than 22-1/2 degrees below the horizontal axis.
- c. Corrugated Polyethylene Pipe (CPP) shall conform to the provisions of Section 55.02 Furnish and Install Pipe of this Division. Perforations shall be sized and located in accordance with the requirements of AASHTO M-252. Perforations shall be cleanly cut so as not to restrict the inflow of water, and uniformly spaced along the length and circumference of the pipe. The top row of holes shall not be less than 22-1/2 degrees below the horizontal axis. Perforations shall be centered in the corrugation valleys. The water inlet area shall be a minimum of one square inch per lineal foot of pipe. Perforations may be slots or holes. Slots shall be a maximum of one-tenth (1/10) of an inch wide. Holes shall not exceed 3/16" diameter.

Article 3.3 Construction

Refer to the Standard Details number 55-2 for construction of subdrains. Each phase of construction shall be accomplished in accordance with the applicable sections of these Specifications. Excavation and backfill for furnishing and installing of subdrains shall be in accordance with Division 20.00 Standard Construction Specifications for Earthwork, Section 20.07 Trench Excavation and Backfill, of these Specifications. Furnishing and installing subdrains shall be in accordance with Section 55.02 - Furnishing and Installing Pipe. Furnishing filter material shall be in accordance with Section 20.12 - Furnish Filter Material.

Article 3.4 Measurement

Measurement for all sizes of pipe shall be based on the horizontal distances and shall be from center to center of manholes, from the center of manholes to center of catch basins, from center of manholes to center of cleanout wye, and from center of manhole to end of pipe including flared end sections. Measurement includes: Furnishing and Installing Pipe, Furnishing Filter Material and, if applicable per Contract Documents, Furnishing and Installing Geotextile Fabric.

Article 3.5 Basis of Payment

Payment for this Work shall be in accordance with Section 55.01 General, Article 1.5 Payment - General and shall include full payment for all Work described in Section 55.03 including furnishing and installing pipe, furnishing and placing filter material and when required by the Contract Documents, the furnishing and installing Geotextile Fabric.

Payment shall be made under the following units:

ITEM	UNIT
Subdrain (Include size, material, and gauge of pipe, and type of filter material)	Linear Foot
Subdrain with geotextile (Include size, material, and gauge of pipe, and type of filter material and type of geotextile fabric)	Linear Foot

SECTION 55.04 MANHOLES AND CATCH BASINS

Article 4.1 General

The Work under this Section consists of the performance of all Work required for the construction of storm drain manholes and catch basins complete with frames and covers.

Article 4.2 Material

a. Frames and Covers

The requirement for tensile strength of the gray cast iron shall be 30,000 PSI minimum in accordance with the requirements of ASTM A-48 and the requirement for transverse breaking load shall be 2,000 pounds in accordance with the requirements of ASTM A-438. Contact surfaces between frames and covers shall conform to the Standard Details of these Specifications. Catch basin castings shall be in accordance with the Standard Details of these Specifications.

b. Reinforced Concrete Manholes

Material used in the construction of reinforced concrete storm drain catch basins and manholes shall conform to the requirements of ASTM c-478 and the standard details of these specifications. Unless otherwise approved, catch basins shall be of the Arctic Type, and shall measure 48 inches wide by 36 inches across and 36 inches deep, pipe penetration knock-out areas shall be provided with the bottom of the knock out area not less than eighteen inches above the bottom of the basin unit. Riser sections shall be reinforced and sized to match the profile of the catchment box. Where cylindrical manholes are approved, cones shall be Type (b), eccentric. When approved, forty eight inch (48") reinforced concrete pipe may be used for storm drain manhole riser sections. This pipe shall conform to the requirements of ASTM C-76, with a minimum thickness of five inches (5").

Each precast concrete barrel section shall be set and sealed by use of a pre-molded plastic gasket pipe joint sealer which meets AASHTO M-198, ASTM C990 or Federal Specification SS-S-210.

Cement for mortar used in the construction of manholes shall conform with the requirements of ASTM C-150, Type II. Sand shall conform with the requirements of AASHTO M-45. The mortar shall be composed of one (1) part cement and three (3) parts sand. The joints shall be constructed so as to produce a smooth, regular, watertight surface. Water shall be added in minimum amounts to provide plasticity in placing the mortar.

Refer to Division 30.00 Standard Construction Specifications for Portland Cement Concrete, Section 30.01 General, Article 1.6 Mix Requirements for Classes of Concrete, for Specifications pertaining to Class A-3 concrete as required in forming manhole inverts.

Article 4.3 Construction

a. General

Excavation and backfill for the construction of storm drain manholes and catch basins shall be in accordance with Division 20.00 Standard Construction Specifications for Earthwork, Section 20.07 Trench Excavation and Backfill, of these Specifications.

All portions of the manholes must be approved by the Engineer prior to installation in the storm drain system. The Contractor shall provide timely notice (at least two Working days in advance of casting) to allow time for the Engineer to arrange for necessary inspections. Installation of manhole sections without the Engineer's written approval shall not be allowed. This approval does not relieve the Contractor of the responsibility for protection of manholes against damage during handling and installation.

The manhole frames and covers shall be brought to grades shown on the Drawings unless otherwise approved by the Engineer. Manhole rings shall be set in a full bed of mortar and made secure.

Manholes shall be installed at the location shown on the Drawings and primary leads shall enter radially at the invert elevations specified. The base section shall be set plumb on a prepared surface.

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 the pipe. Manholes up to 12 feet in depth shall have 9-foot stub-outs, over 12 feet in depth shall have 18-foot stub-outs.

In the 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. Precast concrete barrel sections shall be set and sealed with pre-molded plastic gasket. Pre-molded plastic gaskets for sealing pre-cast concrete barrel sections for manholes shall meet AASHTO M-198, ASTM C990, or Federal Specification SS-S-210 and shall be installed in accordance with the manufacturer's recommendations. Gaskets shall be trimmed on the inside of the manhole to prevent the excess gasket material from entering the storm sewer lines.

b. Storm Drain Manholes and Catch Basins

Storm drain manholes shall be constructed in accordance with the Drawings, Details and Standard Details. There shall be a catch of eighteen inch (18") minimum constructed in the invert of the manholes unless otherwise specified. With reinforced concrete Manholes, after the mortar has firmly set, the pipe is to be cut off evenly so that not more than two inch (2") of the pipe protrudes into the manhole.

Article 4.4 Measurement

Manholes and catch basins shall be measured as units complete in place. Depth of manholes and catch basin shall be based upon a measurement to the nearest foot from top of casting to the top of the base slab. All depths over the specified standard depth shall be paid for under "Additional Depth for Manholes".

a. Additional Depth for Manholes

This item consists of the construction of additional depth to manholes over and above the twelve foot (12') depth specified below.

Additional depth to manholes and catch basin manholes shall be complete in place.

Standard depths for manholes and catch basins shall be constructed in accordance with the Standard Details of these Specifications and designated as to type.

TYPE	STANDARD DEPTH
Types I & II	12 feet

Article 4.5 Basis of Payment

Payment for this Work shall be in accordance with Section 55.01 General, Article 1.5 Payment - General and shall include full payment for all Work described in Section 55.04.

Payment shall be made on the following basis:

ITEM	UNIT
Construct (Type) Storm Drain Manhole	Each
Construct (Type) Catch Basin	Each
Additional Depth to (Type) Storm Drain Manhole	Linear Foot

SECTION 55.05 WATERTIGHT MANHOLE FRAMES AND COVER

Article 5.1 General

The Work under this Section consists of the performance of all Work required for the construction of watertight manhole frames and covers.

Article 5.2 Material

Watertight frames and covers for manholes and similar appurtenances shall be of cast iron and conform to the dimension shown in the Standard Details of these specifications. The requirement for tensile strength of the gray iron shall be 30,000 PSI minimum in accordance with the requirements of ASTM A-48 and the requirement for transverse breaking load shall be 2,000 pounds in accordance with the requirements of ASTM A-438. Contact surfaces between frames and covers shall be machined to provide a uniform contact surface. Manhole covers shall have identification letters as shown on the Standard Details.

Article 5.3 Construction

Provide watertight Manhole Frames and Covers as indicated on the Drawings and in accordance with the Standard Details of these Specifications.

Article 5.4 Measurement

Watertight manhole frames and covers shall be measured as complete units in place.

Article 5.5 Basis of Payment

Payment for this Work shall be in accordance with Section 55.01 General, Article 1.5 Payment - General and shall include full payment for all Work described in Section 55.05. Payment is to be made only for the additional cost of furnishing and installing the watertight frame and cover which exceeds the cost of the standard frame and cover included in the completed manhole unit price.

Payment shall be made under the following unit:

ITEM	UNIT
Additional cost of Watertight Manhole Frame and Cover	Each

SECTION 55.06 CONSTRUCT CATCH BASIN

Article 6.1 General

The Work under this Section consists of the performance of all operations pertaining to the construction and installation of catch basins.

Article 6.2 Material

Materials used in the construction of catch basins shall conform to the requirements of ASTM M-478 and the Standard Details of these Specifications.

Cement for mortar used in the construction of catch basins shall conform with the requirements of ASTM C-150, Type II. Sand shall conform with the requirements of AASHTO M-45.

Article 6.3 Construction

Excavation and backfill for furnishing and installing of catch basin shall be in accordance with Division 20.00 Standard Construction Specifications for Earthwork, Section 20.07 Trench Excavation and Backfill, of these Specifications.

After the mortar has set firmly, the pipe is to be cut off evenly so that not more than one inch (1") of the pipe protrudes into the catch basin.

The catch basin rings and covers shall be brought to the grades shown on the Drawings. Grade stakes defining the elevation of the casting, and hub stakes with tacks to define the line for the curb face shall be set by the Contractor. The Contractor may accomplish final setting of the casting by wedging it up with masonry material as approved by the Engineer. The casting shall then be set in a full bed of mortar and made secure.

Mortar used in the construction of catch basins shall be composed of one (1) part cement and three (3) parts sand. All joints and connections are to be mortared. The joints shall be made so as to produce a smooth, regular, watertight surface. Water shall be added in minimum amounts to provide plasticity in placing the mortar.

Refer to Division 30.00 Standard Construction Specifications for Portland Cement Concrete, Section 30.01 General, Article 1.6 Mix Requirements For Classes of Concrete for Specification pertaining to Class A-3 concrete, which shall be used in the formation of catch basin base slabs.

Article 6.4 Measurement

Catch Basins shall be measured as units complete in place.

Article 6.5 Basis of Payment

Payment for this Work shall be in accordance with Section 55.01 General, Article 1.5 Payment - General, and shall include full payment for all Work described in Section 55.06.

Payment shall be made on the following basis:

ITEM	UNIT
Construct Catch Basin	Each

SECTION 55.07 CONNECTIONS TO EXISTING MANHOLES

Article 7.1 General

The Work under this Section consists of the performance of all operations pertaining to the construction required for connections to existing manholes.

Article 7.2 Construction

Excavation and backfill for connections to existing manholes shall be in accordance with Division 20.00 Standard Construction Specifications for Earthwork, Section 20.07 Trench Excavation and Backfill of the specification.

Connections to existing manholes shall be made in a workmanlike manner. The invert shall be brought into the existing manhole at the elevation shown on the Drawings. The downstream pipe in manholes shall be screened to prevent entry of mortar or other debris from entering the system.

After connection is made to a storm drain manhole and the mortar holding the pipe in place has set, the pipe is to be cut off evenly so that no more than one inch (1") of pipe protrudes into the manhole.

Article 7.3 Measurement

Connection to existing manholes shall be measured as complete units in place.

Article 7.4 Basis of Payment

Payment for this Work shall be in accordance with Section 55.01 General, Article 1.5 Payment - General, and shall include full payment for all Work described in Section 55.07.

Payment shall be made on the following basis:

ITEM	UNIT
Connect to Existing Storm Drain Manhole	Each

SECTION 55.08 CONSTRUCT DROP CONNECTION

Article 8.1 General

The Work under this Section consists of the performance of all Work required for the construction and installation of drop storm sewer connection to manholes.

Article 8.2 Material

Pipe and fittings used in the construction of drop connections for storm sewer shall conform to the requirements of Division 55.00 Standard Construction Specifications for Storm Drain System, Section 55.02 - Furnish and Install Pipe and the Standard Details.

Article 8.3 Construction

Excavation and backfill for the construction of drop sewer connection to manhole shall be in accordance with Division 20.00 Standard Construction Specifications for Earthwork, Section 20.07 Trench Excavation and Backfill, of these Specifications.

Over-excavation under drop connection shall require compaction of not less than ninety-five (95) percent of the maximum density prior to installation of the pipe and fittings, or the concrete cradle.

Refer to Division 30.00 Standard Construction Specifications for Portland Cement Concrete, Section 30.01 General, Article 1.5 Mix Requirements For Classes of Concrete for specifications pertaining to Class A-3 concrete.

Article 8.4 Measurement

Drop sewer connections shall be measured as units, complete in place.

Article 8.5 Basis of Payment

Payment for this Work shall be in accordance with Section 55.01 General, Article 1.5 Payment - General, and shall include full payment for all Work described in Section 55.08.

Payment shall be made on the following basis:

ITEM	UNIT
Construct drop storm drain connection	Each

SECTION 55.09 CONSTRUCT CLEANOUT

Article 9.1 General

The Work under this Section consists of the performance of all Work required for the construction and installation of cleanouts.

Article 9.2 Material

Materials used in the construction of storm drain cleanouts shall conform to the Standard Details of these Specifications.

Article 9.3 Measurement

Cleanouts shall be measured as units, complete in place.

Article 9.4 Basis of Payment

Payment for this Work shall be in accordance with Section 55.01 General, Article 1.5 Payment - General and shall include full payment for all Work described in Section 55.09.

Payment shall be made on the following basis:

ITEM	UNIT
Construct Storm Drain Cleanout	Each

SECTION 55.10 CONSTRUCT CONCRETE HEADWALL

Article 10.1 General

The Work under this Section consists of the performance of all operations required for the construction of concrete headwalls.

Article 10.2 Material

Refer to Division 30.00 Standard Construction Specifications for Portland Cement Concrete, Section 30.01 General, Article 1.6 Mix Requirements for Classes of Concrete for Specifications pertaining to Class A-3 Concrete as required for constructing Headwalls.

Article 10.3 Construction

The Contractor shall excavate, place and compact to not less than ninety-five (95) percent of maximum density backfill bedding in accordance with Division 20.00 Standard Construction Specifications for Earthwork. Forms shall be set to provide finished concrete conforming to the lines, shape and dimensions shown on the applicable detail. The forms shall be made sufficiently tight to prevent leakage of cement or roughness of the finished surfaces.

The Contractor shall backfill behind the headwall and place the necessary sewer insulating berm. He shall also grade open ditches as shown on the Drawings and as required to conduct the storm water from the headwall to a point of disposal.

Article 10.4 Measurement

Headwalls shall be measured as units complete in place.

Article 10.5 Basis of Payment

Payment for this Work shall be in accordance with Section 55.01 General, Article 1.5 Payment - General and shall include full payment for all Work described in Section 55.10.

Payment shall be made on the following basis:

ITEM	UNIT
Construct Concrete Headwall	Each

SECTION 55.11 CONSTRUCT OPEN DITCH

Article 11.1 General

The Work under this Section consists of the performance of all Work required for the excavation, embankment and spreading of material necessary to construct an open ditch.

Article 11.2 Construction

a. Excavation

Excavation shall be to the grade and ditch cross section shown on the Drawings. The final ditch shall have no projections of roots, stumps, rock or similar matter. Material hauled from the job site for disposal shall be paid for under Section 20.13 of these Specifications.

b. Embankment

Embankment shall be to the shape and at the location shown on the Drawing. The type of material utilized to construct ditch banks and dikes shall be as noted on the Drawing, or as approved by the Engineer. If additional material is required for embankment, it will be paid for under Division 20 of these Specifications.

c. Cleanup

The Contractor shall maintain the ditch and keep it open and free from all debris, as directed by the Engineer until Final Acceptance.

Article 11.3 Measurement

Measurement for open ditch construction shall be per linear foot along the slope of the ditch.

Article 11.4 Basis of Payment

Payment for this Work shall be in accordance with Section 55.01 General, and Article 1.5 Payment - General, and shall include full payment for all Work described in Section 55.11.

Payment shall be made on the following basis:

ITEM	UNIT
Construct Open Ditch	Linear Foot

SECTION 55.12 FURNISH AND INSTALL CULVERT

Article 12.1 General

The Work under this Section consists of the performance of all materials and operations required to furnish and install culverts.

Article 12.2 Construction

Excavation and backfill for furnishing and installing of culverts shall be in accordance with Division 20.00 Standard Construction Specifications for Earthwork, Section 20.07 Trench Excavation and Backfill, of these Specifications.

The Contractor shall furnish and install culverts as shown on the Drawings. The pipe shall be installed to the alignment and grades as required by the Drawings. Pipe materials shall meet the Specifications included in Section 55.01, General and Section 55.02, Furnish and Install Pipe, of this Division. The pipe shall be installed so that there is a minimum of 12" of cover over the pipe before the placement of surfacing materials. Excavation, backfilling, compaction, and grading or ditching necessary to direct water into or out of the culvert, are incidental items and no separate payment shall be made.

Where additional backfill material is required it shall be classified fill or backfill in accordance with Section 20.05 of these specification and as directed by the Engineer. Disposal of unusable material shall be paid under "Unusable Excavation" or "Disposal of Unsuitable or Surplus Material" as designated in the Bid Proposal.

Article 12.3 Measurement

Measurement of culverts shall be per linear foot along the slope of the pipe from end to end.

Article 12.4 Basis of Payment

Payment for this Work shall be in accordance with Section 55.01 General, Article 1.5 Payment - General, and shall include full payment for all Work described in Section 55.12.

Payment shall be made on the following basis:

ITEM	UNIT
Culvert (Pipe size, type, gage and shape)	Linear Foot

SECTION 55.13 CONSTRUCT DRYWELL

Article 13.1 General

The Work under this Section consists of the performance of all operations pertaining to the construction and installation of dry wells.

Article 13.2 Material

Materials used in the construction of drywells shall conform to the requirements of Division 30.00 Standard Construction Specifications for Portland Cement Concrete, Division 55.00, Standard Construction Specifications for Storm Drain System, Division 20.00 Standard Construction Specifications for Earthwork and the Standard details of these Specifications. Frames and intake castings shall be in accordance with the Standard Details of these Specifications.

Article 13.3 Construction

Excavating and backfill for the construction of drywells shall conform with Division 20.00 Standard Specifications for Earthwork, Section 20.07 Trench Excavation and Backfill, of these Specifications. Compaction shall conform with Section 20.14 Mechanical Compaction of this Specification. All materials and portions of the drywells must be approved by the Engineer Prior to installation.

The drywell shall be installed at the location and elevation shown on the Drawings.

Article 13.4 Measurement

Drywells shall be measured as units complete in place. Disposal of Unusable Excavation and A.C. Pavement (if required) shall be paid under the designated item in the Bid Proposal.

Article 13.5 Basis of Payment

Payment of this Work shall be in accordance with Division 10.00 Standard General Provisions, Section 10.07 Measurement and Payment of these Specifications and shall include payment for all Work described in Section 55.13.

Payment shall be made on the following basis:

ITEM	UNIT
Construction Drywell	Each

SECTION 55.14 ABANDON EXISTING CATCH BASIN LEAD

Article 14.1 General

The Work under this Section consists of providing all operations pertaining to the abandonment of existing catch basin leads. Otherwise, catch basin leads to be abandoned may be crushed in place, filled with a sand slurry, or removed, at Contractor's option.

Article 14.2 Materials

a. Sand Slurry

Sand slurry shall consist of a mixture of water and sand with an approximate ratio of seven gallons of water per cubic foot of sand. Native materials that contain no lumps, frozen material, organic matter, or other deleterious material are acceptable for use in the slurry mixture.

Article 14.3 Construction

Contractor shall abandon all existing catch basin leads as shown on the plans. The opening in the storm drain manhole where the catch basin lead enters shall be plugged with concrete grout and the lead filled with a sand slurry.

Where existing catch basin leads lie within trench excavation as called for in the Drawings and Specifications, the leads shall be removed.

Article 14.4 Measurement

Abandonment of each existing catch basin lead shall be measured as a complete unit. This item will include materials, excavations, placement of materials, disposal of unusable materials, backfill, and incidental operations.

Article 14.5 Basis of Payment

Payment of this Work shall be in accordance with Division 10.00 Standard General Provisions, Section 10.07 Measurement and Payment of these Specifications and shall include payment for all Work described in Section 55.14.

ITEM	UNIT
Abandon Existing Catch Basin Lead	Each

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STANDARD CONSTRUCTION SPECIFICATION FOR WATER SYSTEMS

SECTION 60.01 GENERAL

Article 1.1 Scope of Work

The Work covered by these Specifications consists of providing all plant, labor, equipment, supplies, material, transportation, handling and storage, and performing all operations necessary to complete the construction of all water facilities that will be distributing water by the City and Borough of Sitka Water and Wastewater Utility. Requirements for earthwork including trench excavation and backfill are specified in Division 20.00 - Standard Construction Specifications for Earthwork.

Article 1.2 Applicable Standards

The most recent revision of the following standards of the American Society for Testing and Materials (ASTM) and the American Water Works Association (AWWA) are hereby made a part of these Specifications:

ASTM A126	Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings
ASTM B88 or B88M [Metric]	Specification for Seamless Copper Water Tubing
ASTM D256	Test Methods for D-C Resistance of Plastics and Electrical Insulating Materials
ASTM D3035	Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter
ASTM D3261	Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
ASTM D3350	Specification for Polyethylene Plastic Pipe and Fittings Materials
AASHTO M45	Sand for Cement Mortar
AWWA C104/ ANSI A21.4	Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
AWWA C105/	Polyethylene Encasement for Ductile Iron Piping for ANSI A21.5 Water and Other Liquids

AWWA C110/ ANSI A21.10	Ductile-Iron and Gray-Iron Fittings, 3 in. through 48 in., for Water and Other Liquids
AWWA C111/ ANSI A21.11	Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
AWWA C115/ ANSI A21.15	Flanged Ductile-Iron Pipe with Threaded Flanges
AWWA C151/ ANSI A21.51	Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids
AWWA C303	Reinforced Concrete Pressure Pipe, Steel Cylinder Type, Pre-Tensioned, for Water and Other Liquids
AWWA C500	Gate Valves for Water and Sewerage Systems
ANSI/ AWWA C502	Dry-Barrel Fire Hydrants
ANSI/ AWWA C504	Rubber-Seated Butterfly Valves
ANSI/ AWWA C600	Installation of Ductile-Iron Water Mains and Their Appurtenances
AWWA C651	Disinfecting Water Mains
ANSI/ AWWA C800	Underground Service Line Valves and Fittings
AWWA C901	Standard for Polyethylene (PE) Pressure Pipe and Tubing, 1/2 in. through 3 in., for Water Service

Uniform Fire Code (UBC) latest edition and local amendments, National Fire Codes, Volume I and Volume II, 1982 Codes and Standards, National Fire Protection Association.

Article 1.3 Survey

The Contractor will layout (in the field) the alignment and grade of work to be done under the Contract prior to starting installation. When once laid out, the Contractor shall be responsible for the preservation of all line stakes, grade stakes, and hubs. In the event of their loss or destruction, the

Contractor shall pay all costs for their proper replacement. The Contractor shall be responsible for, and pay all costs for the transfer of, the control points from the reference hubs to such hubs or batter boards as required or needed for the prosecution of the work. A ground line profile will be made by the Contractor. The ground line profile refers to the elevation of the ground directly above the centerline of pipe and the grade line refers to the elevation of the invert of pipe, except where otherwise noted.

The CBS will furnish the Contractor with a list of all pertinent benchmarks, necessary control points, and other information for control of the Work. Prior to utilizing information such as benchmarks, etc., it shall be the Contractor's responsibility to verify benchmark elevations by checking between at least two (2) benchmarks. The Contractor shall protect the benchmarks and control points provided by the CBS and properly reference them off. The contractor shall be responsible for any necessary replacement.

As-built measurements (both horizontal and vertical) and documentation will be done by the Contractor prior to final acceptance. As-built measurements shall be recorded for the following: All fittings, including corporation and curb stops, curb and valve boxes, bends, valves, abandoned fittings, etc., grade breaks and utility crossings. Locations shall be established with three (3) swing-tie distances to permanent structures and, when possible, tied to property corners. Record drawings and submittals shall conform to ADEC and CBS requirements. A Professional Engineer licensed in the State of Alaska shall stamp the record drawings. The Contractor will furnish the CBS with AutoCAD electronic files (current version), two (2) signed record drawings and survey field notes.

Article 1.4 Payment - General

Payment for all Work included in this Division shall be paid for in accordance with Division 10.00 - Standard General Provisions - Section 10.07 - Measurement and Payment, and shall include full payment for all Work described.

SECTION 60.02 FURNISH AND INSTALL PIPE

Article 2.1 General

The Work under this Section consists of the performance of all Work required for furnishing and installing water pipe, fittings and mechanical restraints. The Contractor shall install them in accordance with these Specifications and in conformity with the lines and grades as shown on the Drawings, unless otherwise approved. The use of pipe containing asbestos materials shall be prohibited.

Contractor shall provide forty-eight (48) hours written notice to the Engineer, The City Fire Department, and affected property owners prior to anticipated main line flow interruptions. It shall be Contractor's responsibility to coordinate "turn-off" and "turn-on" with the CBS Environmental Superintendent.

Article 2.2 Material

a. Ductile Iron Pipe

Ductile Iron Pipe shall conform to the requirement of AWWA C-151, with cement mortar lining conforming to the requirements of AWWA C-104. Class 52 Pipe shall be used for all pipe.

Fittings shall be of a minimum three hundred fifty (350) pounds pressure rating, mechanical joint or all bell, lined or unlined ductile iron, unless otherwise required by the contract documents. Pipe shall be US Pipe or equal. All fittings shall conform to the requirements of AWWA C-110. Rubber gasket joints for ductile iron pipe and fittings shall conform to the requirements of AWWA C-111.

b. Copper Service Pipe

Pipe used under this Specification shall be soft-drawn, seamless, annealed copper pipe suitable for use as underground service water connections for general plumbing purposes and shall comply with the requirements of ASTM B88 for Type K soft copper as manufactured by the American Brass Company, or equal.

c. Joint Tie Rods

Tie back rods and/or tie back rod and shackle assemblies will not be acceptable as restrained joints or restraining system for fittings, valves, piping deflection points.

Unless otherwise detailed on the plans, pipe joints shall be push-on rubber gasket type conforming to AWWA C111. Where specified on the plans, restrained joint pipe shall be EBAA Iron MEGALUG, Romac Industries GripRing, U.S. Pipe Field LOK Gasket System, or approved equal. All restrained joint installation areas shall include joints, fittings, and piping deflection points.

Flange adapter shall be used to connect to ductile iron pipe. 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 backup ring drilled to match the standard ANSI bolt.

Contractor shall provide pipe manufacturer submittals which include thrust restraint calculations prior to construction.

d. High Density Polyethylene Pipe

HDPE shall only be allowed with the specific approval of the City and Borough of Sitka. 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 160 pounds per square inch and a Standard Dimension Ratio (SDR) of 11.0. All HDPE water pipe shall have a standard iron pipe size (IPS) outside diameter.

The pipe and fitting material shall have a cell classification of 355434C in accordance with ASTM D3350. In addition, the material must exceed 1000 hours when tested in accordance with the Ring Environmental Stress Crack Resistance Test (Radar Ring Test) with fewer than 20 percent failures. Also, the extruded pipe shall have impact strengths greater than 15 Ft#/#in. at 32 degrees Fahrenheit when tested in accordance with the ASTM D 256 Charpy Impact Test. The material shall be listed by the N.S.F. for potable water service. In plant blending shall not be allowed.

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. The pipe shall be marked at five (5) 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 manufacture can be determined.

Butt fusion of the pipe and fittings shall be performed in accordance with the pipe manufacturer's recommendations as to equipment and technique. The fusion operation shall be performed by an individual who has demonstrated the ability to fuse polyethylene pipe in the manner recommended by the pipe supplier. The individual performing the fusing procedure must hold a current certification for fusing HDPE as stated in Title 49.1 DOT Certification. Prior to laying HDPE pipe, the Contractor shall provide a pipe manufacturer representative on-site to give a seminar on pipe fusions, laying, etc. at Contractor's expense.

All HDPE mainline shall be installed with No. 10 bare copper locate trace wire.

e. Material Limitations

HDPE, copper and ductile iron pipe are the only pipe materials allowed on water service connections. Galvanized pipe, asbestos-cement pipe and the use of lead-tipped gaskets shall be prohibited.

Article 2.3 Construction

a. Excavation and Backfill

The Contractor shall provide all excavation, bedding, backfill and compaction necessary to install pipe in accordance with Division 20.00 - Standard Construction Specifications for Earthwork, Section 20.07 - Trench Excavation and Backfill, of these Specifications.

b. Materials Delivery

Pipe and appurtenances shall be handled in such a manner as to insure delivery to the trench in a sound, undamaged condition. Particular care shall be taken not to injure the pipe, pipe coating, or lining. Before installation, the pipe and appurtenances shall be examined by the Engineer for defects.

The pipe shall not be strung out along the shoulders of the road for long distances if it causes inconvenience to the public. The amount of pipe strung at the job site shall be at the discretion of the Engineer.

Rubber gaskets shall be stored in a cool, dark place to prevent damage from the direct rays of the sun. Gasket lubricant shall be NSF approved for domestic water contact.

c. Installation

Installation shall be in accordance with the requirements of ANSI/AWWA C600. The interior of the pipe and accessories shall be thoroughly cleaned of foreign matter before being lowered into the trench. The pipe shall be kept clean and plugged during laying operation to prevent trench water from entering the pipe.

Pipe and appurtenances shall be carefully lowered into the trench by means of derrick, ropes, belt slings, or other suitable equipment. Under no circumstances shall any of the pipe or appurtenances be dropped or dumped into the trench. Care shall be taken to avoid abrasion of the pipe coating. Poles used as levers or skids shall be of wood and shall have broad, flat faces to prevent damage to the pipe and coating. Damage to pipe coating must be repaired per manufacturer recommendation before installation, or pipe will be rejected.

The trench bottom shall be graded to provide uniform support for the pipe barrel. Water shall be kept out of the trench by pumping, if necessary, until the jointing and backfilling is completed. When Work is not in progress, open ends of the pipe, fittings, and valves shall be securely plugged so that no trench water, earth or other substances will enter the pipes or fittings. Where any part of the coating or lining is damaged, the pipe will be rejected. At a sufficient distance, prior to encountering a known obstacle or tie into an existing pipe, the Contractor shall expose and verify the exact location of the obstacle or pipe so that proper alignment and/or grade may be determined before the pipe sections are laid in the trench

and backfilled. The connections shall be made by using fittings to suit actual conditions. All connections made under pressure shall be witnessed by CBS Water Utility personnel.

Pipe ends left for future connections shall be plugged, or capped, and anchored as shown on the Drawings or as directed by the Engineer. The end of the pipe shall be marked by means of a two by four (2x4) extending from the face of the pipe to two feet (2') above finish grade. The 2x4 marker shall be painted blue and stenciled with the word "Water" in white two-inch (2") high letters. A 2-foot piece of rebar shall be driven into the ground next to the 2x4.

Cutting of pipe shall be done in a neat and workmanlike manner without damage to the pipe.

Concrete thrust blocks and mechanical restraint of the types shown in the standard details shall be installed where the pipeline terminates or changes alignment, utilizing a tee, cross, bend, or similar fitting. Either poured-in-place or pre-cast thrust blocks are acceptable if the minimum base area is sufficient as shown in the Standard Details. Concrete for the thrust blocks shall be Class C-6 as described in Division 30.00 - Standard Construction Specifications for Portland Cement Concrete, Section 30.01 - General, Article 1.6 - Mix Requirements for Classes of Concrete of these Specifications.

If the Contractor elects to use poured-in-place thrust blocks, all pipe and fittings exposed to concrete shall be double wrapped with 4-mil polyethylene film prior to placement of the concrete. All fitting joints and bolts shall remain accessible for future repairs.

d. Alignment and Grade

The pipe shall be so laid in the trench that after the line is completed, the bottom of the pipe conforms accurately to the grades and alignment given by the Engineer. A maximum two-tenths (2/10) foot deviation from design elevation and alignment will be allowed. The pipe shall be generally straight to visual observation as determined by the Engineer.

Both line and grade shall be checked and recorded in a field book for each piece of pipe and appurtenances laid. The Contractor shall have instruments such as a transit and level for transferring alignment and grades from offset hubs. He also shall have in his employ a licensed surveyor who is qualified to use such instruments and who shall have the responsibility of placing and maintaining such construction guides. The Contractor will furnish to the Engineer a copy of the surveyor's notes daily for the newly installed pipe and appurtenances. The practice of placing backfill over a section of pipe to provide a platform for instruments shall be subject to the approval of the Engineer and shall be accomplished in accordance with Division 20.00 - Standard Construction Specifications for Earthwork, Section 20.07, - Trench Excavation and Backfill, Article 7.3 - Construction of these Specifications. The Contractor shall provide true, correct, and certified record drawings of the survey notes, to the Engineer.

All adjustments to line and grade shall be done by scraping away or filling the earth under the body of the pipe and not by blocking or wedging up. Deflections from a straight line or grade, as required by vertical curves, horizontal curves, or off-sets shall not exceed the manufacturer's recommendations.

If the alignment requires deflection in excess of the above limitations, the Contractor shall furnish special bends to provide angular deflections within the limits allowable. Short-radius curves and closures shall be formed by shorter lengths of pipe, bevels, or fabricated specials.

e. Jointing of Metal Pipe

The Contractor has the option of using either mechanical or push-on joints. All joints shall conform to the requirements of ANSI/AWWA C600.

The Contractor will be required to use mechanical joints on all hydrant leads. The Engineer has the option of checking any or all mechanical joints to assure proper torque as specified by the manufacturer.

Whenever flange connections are shown on the Drawings, called for in the Specifications, or required in the Work, the flange and fittings shall conform to the requirements of AWWA C110/ANSI A21.10 for 350 pound pressure ratings.

Contractor must field demonstrate to the Engineer the installation and/or construction of each **new** restrained joint or restraining system. Contractor shall contact the Water Department a minimum of forty-eight (48) hours prior, excluding non-working days, to coordinate the review of the field demonstration. The Engineer shall certify that the restrained joint system is installed in accordance with the manufacturer's instructions. If Contractor fails to install the restrained joint system in accordance with manufacturer's instructions, in the opinion of the Engineer, Contractor shall remove the disapproved system and replace with a **new** restrained joint system.

Contractor shall be responsible for access to the field demonstration location and all trench excavation, de-watering and backfill operations prior to, during, and after the restrained joint system is reviewed by the Engineer. The cost for coordinating and providing access for review of Contractor's installation and/or construction of the restrained joint system shall be incidental to the bid item under construction.

Article 2.4 Flushing and Testing

Prior to any tests performed, all newly installed water facilities, including fire lines and services, shall be tested by the Contractor in the following sequence:

1. Open-bore flushing
2. Hydrostatic testing
3. Disinfection

Disinfection will not be allowed until all open bore flush pipes are removed and the water system is sealed.

The CBS Water Utility must be present for all testing and flushing.

A request to supply water for flushing, testing, and disinfecting shall be scheduled in writing with the Engineer at least twenty-four (24) hours prior to obtaining CBS supplied water. The request for flushing, testing, and disinfecting will be subject to water availability. In the event of high water demand or low water availability within the CBS Water Department water system, meeting Contractor's schedule may not be possible.

Contractor shall submit, in writing, for the Engineer to review and approve a schedule and procedure for the flushing, pressure testing, chlorination and bacteriological testing of all newly installed pipe. When, in the opinion of the Engineer, the testing and flushing schedule and procedure is deficient, inadequate, improper, or conditions are such that the impact to existing water service areas are adversely affected by service interruptions, Contractor will be notified in writing by the Engineer. Such notification shall be accompanied by a statement of the corrective action to be taken. Contractor shall adhere to the testing and flushing schedule and comply with such instruction as directed by the Engineer.

a. Flushing

All newly installed water facilities shall be "Open-Bore" flushed to remove any foreign matter. "Open-Bore" flushing shall be accomplished prior to hydrostatic testing and disinfection at each extremity of the main, including all fire lines, services, stub-outs and deadends. The Contractor shall furnish, install and remove all fittings and pipes necessary to perform the flushing, at no additional cost to the City. Under no circumstances will open-bore flushing through hydrants or reduced outlets be permitted. All flushing water shall be controlled as to not damage neighboring property.

It will be the Contractor's responsibility to notify the Engineer and the CBS Water Department forty-eight (48) hours in advance of any flushing operations. Flushing of newly-constructed mains may be required between the hours of 1:00 a.m. and 6:00 a.m. depending upon the availability of water, as authorized by the CBS. The City will not be responsible for any cost incurred by the Contractor for flushing.

b. Hydrostatic Testing

All mains shall be flushed, pressure tested, and chlorinated by the Contractor after service connections are made. Pressure testing shall include service lines between the main and the curb stop. Fire lines shall be pressure tested per Section 60.05 – Fire Lines.

A hydrostatic test will be conducted on all newly constructed water mains, fire hydrant leads, services and stub-outs. This will occur after "Open-Bore" flushing, and will be in the presence of either the CBS

or the Engineer in accordance with the requirements of ANSI/AWWA C600 unless hereinafter modified.

The Contractor shall furnish all necessary assistance, equipment, labor, materials, and supplies (except the test pressure gauge) necessary to complete the test to the satisfaction of the Engineer. The Contractor shall suitably valve-off or plug the outlet to the existing or previously-tested water main at his expense, prior to making the required hydrostatic test. Prior to testing, all air shall be expelled from the pipe. If permanent air vents are not located at all high points, the Contractor shall, at his expense, install corporation cocks at such points so the air can be expelled as the line is slowly filled with water.

All main valves, fire hydrant auxiliary valves, fire hydrant main valves, and plugs shall be tested. All intermediate valves within the section being tested will be closed and reopened as directed by the Engineer during the actual test. Only static pressure will be allowed on the opposite side of the end valves of the section being tested.

All hydrostatic testing will be performed through test copper. Use of fire hydrant and service connections for testing will not be allowed.

The hydrostatic pressure shall be one hundred pounds per square inch (100 psi) greater than static line pressure but not less than one hundred fifty pounds per square inch (150 psi) any place within the system being tested. The duration of each hydrostatic pressure test shall be two (2) hours. After the required test pressure has been reached, the pumping will be terminated. If the pressure does not drop more than 5 pounds per square inch, that section of line will not be subject to any future hydrostatic test.

Cracked or defective pipe, gaskets, mechanical joints, fittings, valves, or hydrants discovered as a consequence of the hydrostatic tests shall be removed and replaced with sound material at the Contractor's expense. The test shall then be repeated until the results are satisfactory.

For HDPE pipe the initial pressure test shall be at 150 psi. The initial pressure shall be applied and allowed to stand without makeup water for 3 hours to allow the HDPE pipe to stretch. Return test pressure to 150 psi with makeup water after initial 3-hour period. Allow pipe to stand for 2 additional hours during the test period and then measure the amount of water required to return pressure to 150 psi. Allowable makeup water for pipe expansion is as follows:

3" diameter pipe and smaller = 0.15 gallons/100 feet of pipe

4" diameter pipe = 0.25 gallons/100 feet of pipe

6" diameter pipe = 0.60 gallons/100 feet of pipe

8" diameter pipe = 1.0 gallons/100 feet of pipe

10" diameter pipe = 1.3 gallons/100 feet of pipe

Check for leaks or significant pressure drops. Correct all leaks and significant pressure drops that require more makeup water than allowable and retest pipe.

The Contractor shall notify the Engineer forty-eight (48) hours, (two (2) working days) prior to any test and shall notify the Engineer two (2) hours in advance of the scheduled time if the test is to be cancelled.

In the event the Engineer has not been notified of cancellation and the Contractor is not prepared for the test as scheduled, the Contractor shall reimburse the Engineer for all expenses incurred. These will include, but not be limited to, salaries, transportation and administrative costs.

c. Disinfection

Disinfection shall be in accordance with ANSI/AWWA C657, latest edition. Chlorine shall be used for disinfection. Chlorine shall be applied with a calcium hypochlorite and water mixture.

Calcium hypochlorite shall be comparable to commercial products known as HTH, Perchlora or Machochlor.

The chlorinating agent shall be applied at the beginning of the section adjacent to the feeder connection, insuring treatment of the entire line including hydrants and services. Water shall be fed slowly into the new line with chlorine applied in amounts to produce a dosage of forty (40) ppm to fifty (50) ppm. Application of the chlorine solution shall continue until the required dosage is evident at all extremities of the newly laid line.

Calcium hypochlorite shall be injected or pumped into the water main. During the chlorination process, all intermediate valves, service lines, fire hydrants, fire lines and accessories shall be operated. Valves shall be manipulated so that the 40-50 ppm chlorine solution in the line being treated will not flow back into the line supplying the water. The superchlorinated solution shall remain in the system for 24-hours, minimum. Hydrostatic testing of a water line containing the chlorine mixture will not be allowed.

A residual of not less than twenty-five (25) ppm chlorine shall remain in all parts of the water main at the end of the twenty-four (24) hour period, after which this residual shall be flushed from the line and neutralized at its extremities until the replacement water tests are equal chemically to those of the permanent source of supply. After another twenty-four (24) hours, bacteriological samples shall be taken per the CBS Standards. In no instance shall a water main be chlorinated before "Open-Bore" flushing.

<u>CHLORINATION</u>	
Pipe Diameter	Dosage (oz.) 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.

The above table is to be used as a guide for chlorinating mains by the calcium hypochlorite and water mixture method. The given dosage per 100 feet results in a chlorine solution of forty (40) to fifty (50) ppm.

This dosage takes into account that Contractors most frequently used granular HTH, which is sixty-five percent (65%) pure. If another chlorinating agent is used, the dosage must be adjusted.

After the applicable retention period, heavily chlorinated water should not remain in prolonged contact with pipe. In order to prevent damage to the pipe lining or corrosion damage to the pipe itself, the heavily chlorinated water shall be flushed from the main until chlorine measurements show that the concentration in the water leaving the main is no higher than that generally prevailing in the distribution system or is acceptable for domestic use.

d. Test and Air Vent Copper Pipe Removal

After completion of testing, all test and air vent copper pipe and corporation stops shall be removed at the main and repaired with a Romac SS1 or SS2 repair band, or equal, in the presence of the Engineer.

Article 2.5 Measurement

Measurement for furnishing and installing water main shall be per linear foot of horizontal distance of the various sizes as set forth in the Bid Schedule. Measurement will be from station to station as staked in the field and as shown on the Drawings, except where the grade exceeds twenty-five (25) percent, in which case measurement will be by actual pipe length.

Article 2.6 Basis of Payment

Payment for this Work shall be in accordance with Section 60.01 - General, Article 1.4 - Payment - General, of this Division and shall include full payment for all Work described in Section 60.02.

Fittings and appurtenances as shown on the Drawings or not specifically identified for payment under a separate pay item but required for normal completion of water main installation, will be considered incidental and shall be included in the linear foot cost of the water main. Trench excavation, and compaction shall be incidental to the Bid Item provided in this item of work. Imported backfill shall be paid under the appropriate pay item or by letter of agreement.

The unit price per linear foot shall be full payment for all Work, including labor, equipment and materials. The unit price shall include, but not be limited to, delivery of non-serviceable portions of removed pipe, valves and fittings at a Contractor-furnished disposal site; delivery of serviceable portions of removed pipe, valves, and fittings to the Owner when directed by the Engineer; installation of all pipe, tees, crosses, bends, caps, plugs, adapters, reducers, restrained joint systems, and other fittings; thrust blocks; adjustment to finish grade; cleaning and flushing; hydrostatic testing; bacteriological testing;

provisions coordinating the supply of water as required for flushing and hydrostatic testing; disinfecting; protection/restoration of all existing utilities; maintenance of existing water distribution system flows; shoring/protection of existing light poles; maintenance and restoration of existing drainage patterns; restoration of existing driveways; signage, mail boxes, newspaper boxes, trees and shrubs located on private property, landscaping, utility markers, survey monumentation, removal and replacement of miscellaneous public or private improvements; preparation of off roadway areas for top soiling and re-seeding; cleanup, and miscellaneous items required to complete the Work as shown on the plans. All construction shall be in accordance with Division 20 and Division 60 of this Specification.

Payment shall be made on the following unit:

ITEM	UNIT
Furnish and Install (Size) (Type) Water Main	Linear Foot

SECTION 60.03 FURNISH AND INSTALL VALVES

Article 3.1 General

The Work under this Section consists of the performance of all Work required for furnishing and installing valves, including valve boxes and marker posts.

Article 3.2 Material

a. Gate Valves

Resilient seat valves as manufactured in accordance with the requirements of AWWA C-509, Gate Valves for Ordinary Water Works Service. All valves shall be non-rising stem type with an O-ring seal and a two inch (2'') square operating nut, and shall open counter clockwise. Valves shall have mechanical joint ends or, if approved by the Engineer, flanged ends. Gate Valves shall be M & H Style 4067 or equal.

b. Butterfly Valves

Butterfly valves shall be of the rubber-seated tight-closing type. They shall meet or exceed the performance requirements of AWWA C504 for operational pressures of 150 psi working pressure and 300 psi hydrostatic pressure.

Mechanical joint valve ends shall be per AWWA C110/ANSI 21.10 and AWWA C111/ANSI 21.11 of the latest revision, and "Short-Body" in accordance with the requirements of Table 2 of ANSI/AWWA C504. Accessories (bolts, glands, and gaskets) shall be supplied by the valve manufacturer.

Valves must use full ANSI/AWWA C504 Class 150 B valve shaft diameter and full Class 150 B underground service operator torque rating throughout entire travel to provide capability for operation in emergency service.

Valve body shall be high strength cast iron ASTM A126 Class B. For valves with the rubber seat mounted on the disc, the mating surface in the body shall be 304 or 316 steel. For valves containing the rubber seat in the body, the method of seat retention shall be in accordance with the requirements of ANSI/AWWA C504-80, except that no retaining fasteners or other hardware shall be permitted in the flow stream.

Valve operators, unless otherwise required by the Contract Documents, shall be of the traveling nut type, sealed, gasketed, and lubricated for underground service and capable of withstanding on overload input torque of 450 ft/lbs. at full open or closed position without damage to the valve or valve operator. The number of turns to operate the valve shall be a minimum of two (2) turns per inch of valve diameter

for ninety (90) degrees of closure travel at a maximum pull of eighty (80) pounds. All valves shall open counterclockwise and be equipped with two-inch square AWWA operating nut.

Butterfly valves twenty inches (20") and less: The valve shaft shall be one piece extending full size through valve bearings, disc and shaft seal. In the event that the shaft is turned down to fit connections to the operator, the limits of ANSI/AWWA C504, Sec. 3.3.2 shall be strictly observed. Carbon steel shafts, if used, shall have 304 or 316 stainless steel journals with static seals to isolate the interior of the disc and the shaft from the water.

Butterfly valves over twenty inches (20"): The valve shaft shall be of two-piece stub shaft type, made of 18-8 Type 304 stainless steel. Valve bearings and shaft seals for valves of all sizes shall meet the requirements of ANSI/AWWA C504 Sec. 3.6 and 3.7 respectively, with the following additional requirements:

- Sleeve bearings shall have a maximum coefficient of friction of 0.1.
- For underground service, packing shall be pressure-energized chevron or "O" ring type, not requiring adjustment and suitable for permanent duty.

c. Pressure Reducing Valves

Pressure reducing valves shall be supplied as directed in the Contract Documents.

d. Valve Boxes

Valve boxes shall be cast iron of sliding, adjustable height type with round or oval bottom hood sections to fit over the top of the valve. The top section shall be recessed to receive a close fitting "eared" lid with the word "water" cast into it. Internal diameter of the smallest section shall not be less than five (5) inches. Minimum thickness of the metal shall not be less than five-sixteenths (5/16) inch. Castings shall be smooth and the workmanship shall be acceptable to the Engineer.

Valve boxes shall be of sufficient length for the pipe cover depth on the profile drawings and in accordance with the Standard Detail, of these Specifications. Valve boxes shall be installed perpendicular to the main and centered over the operating nut.

Valve boxes shall be supplied with valve operator extension rods such that the maximum depth from the ground surface to the operator nut does not exceed four (4) feet.

e. Swing Ties

The Contractor's licensed surveyor shall provide a minimum of three swing ties from prominent nearby physical features to each valve box. This information shall be made part of the record drawings.

f. Live tap connections

Contractor shall provide all trench excavation, backfill, and compaction necessary to assist the CBS Water Utility with live tap connections. Excavation for live tap connections shall be unclassified and Contractor shall excavate all materials encountered to the depth required for the live tap connections. Variations in depth from the depth indicated in the plans will not be grounds for additional compensation. It shall be Contractor's responsibility to familiarize himself with the depth of water mains for the project. Contractor shall excavate for live tap connections in such a manner that the excavation is 90 degrees to the main water line, whenever possible. The trench shall be long enough and be of sufficient width at the bottom to allow installation of Romac SST Tapping Sleeve, or equal, and Flanged x Mechanical Joint valve per AWWA C-509 for the live tap connection and provide safety for CBS Water Utility personnel per OSHA requirements.

Contractor shall be responsible for, and shall bear the expenses incurred, in the event that a water main should be damaged during excavation or backfilling. Contractor shall bear the cost of all material, labor, and other expenses thereof.

Contractor shall provide assistance equipment, labor, materials, and supplies including the water main line valve and tapping sleeve necessary to complete the live tap connection. Contractor shall notify the Engineer and the CBS Water Utility forty-eight (48) hours in advance (two working days) prior to installation of the live tap connection. In addition, Contractor shall obtain all necessary permits for the live tap connection and pay all associated fees.

Tie back rods and/or tie back rod and shackle assemblies **will not** be acceptable as restrained joints or restraining system for valves and valve/pipe joint interface.

Unless otherwise detailed on the plans, valve and valve/pipe interface shall be mechanical joint or flanged type conforming to AWWA C111. Where specified on the plans, restrained joint pipe shall be EBAA Iron MEGALUG, Romac Industries GripRing, or approved equivalent.

Contractor shall provide pipe manufacturer submittals which include thrust restraint calculations prior to construction.

Article 3.3 Construction

The Contractor shall provide all trench excavation, backfill, and compaction necessary to install valves in accordance with Division 20.00 - Standard Construction Specifications for Earthwork, Section 20.07 - Trench Excavation and Backfill of these Specifications.

Valves or valve boxes shall be installed where shown on the Drawings. The valve operator shall be placed on the side of the water main away from the center line of the street or easement. On fire line installations a valve shall be placed outside the building so that all fire hydrants will remain in service in the event water service to the building must be shut off for any reason.

Valves shall have the interiors cleaned of all foreign matter before installation. If the valve is at the end of the line, it shall be plugged prior to backfilling. The valve shall be inspected by the Engineer in the open and closed positions to insure that all parts are in working condition.

Provisions shall be made to restrict the soils from entering the bottom section of the valve box. Wrap burlap inside bottom section and wrap three (3) layers of non-woven geotextile fabric around the outside of the valve and base section of the valve box and secure the fabric at the top and bottom with wire or tape.

In areas where running sand is encountered, provisions shall be made to restrict the sand from entering the bottom section of the valve box.

The Contractor shall expose all valve boxes for pre-final and final inspection.

Article 3.4 Measurement

The quantity to be paid shall be the actual number of valves of each class and size (including valve boxes) furnished, installed and accepted.

Article 3.5 Basis of Payment

Payment for this Work shall be in accordance with Section 60.01 - General, Article 1.4 - Payment - General of this Division and shall include full payment for all Work described in Section 60.03.

Payment shall be made on the following unit:

ITEM	PAY UNIT
Furnish and Install (Size) Gate Valve and Valve Box	Each
Furnish and Install (Size) Butterfly Valve and Valve Box	Each
Furnish and Install (Size) Gate Valve, Tapping Sleeve and Valve Box (Live Tap Connection)	Each
Furnish and Install (Size) Butterfly Valve, Tapping Sleeve and	

Valve Box

Each

SECTION 60.04 FURNISH AND INSTALL FIRE HYDRANTS

Article 4.1 General

The Work under this Section consists of the performance of all Work required for the furnishing and installation of "L-Base" Fire Hydrant Assemblies, including the fire hydrant leg pipe, auxiliary gate valve, valve box, hydrant access pad, restrained joint, guard posts and fire hydrants.

Article 4.2 Materials

a. Fire Hydrants

Fire hydrants shall conform to the requirements of ANSI/AWWA C502 for Dry Barrel Fire Hydrants. Fire hydrants shall be MH 929 or approved equal.

1. All fire hydrants shall be supplied with a five and one-fourth (5-1/4) inch main valve opening.
2. All single pumper hydrants shall be furnished with a six (6) inch ANSI Class 125 standard mechanical-joint end.
3. All connections shall be restrained mechanical-joint unless otherwise indicated in the Contract Documents.
4. Single pumper hydrants shall be furnished with two (2) two and one-half (2-1/2) inch hose connections and one (1) four and one-half (4-1/2) inch pumper connection.
5. Unless otherwise required by the Contract Documents, all hydrants shall be furnished with a barrel length that will allow a minimum of five (5) feet of cover over hydrant leg.
6. The hydrant main 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.
7. All fire hydrants shall be furnished with a breakaway ground flange and stem coupling which allows both barrel and stem to break clean above ground upon impact from any angle. Traffic flange design must be such that repair and replacement can be accomplished above ground.
8. Painting and coating shall be in accordance with AWWA Specifications. After installation, the hydrant section from the traffic flange to the top of the operating nut shall be pressure-washed, primed and painted "Caterpillar Yellow".

9. Operating and nozzle nuts shall be pentagon shaped with one and one-half (1-1/2) inch point to flat measurements.
 10. Hose nozzle threading shall be in conformance with NFPA #194 for National (America) Standard Fire Hose Coupling Screw Threads).
 11. All working parts shall be bronze or noncorrosive metal in accordance with the requirements of ANSI/AWWA C502.
 12. All hydrants shall open counter-clockwise.
 13. All hydrants shall have drain outlets at the base of the barrel with the drain plug left out unless noted otherwise on the plans.
- b. Auxiliary Gate Valves

All gate valves and valve boxes shall be furnished and installed in accordance with Section 60.03 - Furnish and Install Valves of this Division.

c. Guard Posts

The contractor shall install guard posts at each hydrant installation in accordance with the Standard Details of these Specifications. If, in the opinion of the Engineer, the guard posts are not to be installed, they shall be delivered to the CBS Water and Wastewater Utility storage yard. Measurement and payment for guard posts shall be incidental to the Bid item "Furnish and Install Fire Hydrant Assembly."

Article 4.3 Construction

The Contractor shall provide all trench excavation, backfill and compaction necessary to install the fire hydrant assembly in accordance with Division 20.00 - Standard Construction Specifications for Earthwork, Section 20.07 - Trench Excavation and Backfill of these specifications.

The Contractor shall install the hydrant assembly and accordance with the Standard Details.

All fire hydrant legs shall be installed level. The fire hydrant barrel shall be installed plumb. Any adjustments to the fire hydrant traffic flange on a CBS contract shall be made by the Contractor at no cost to the CBS.

Hydrants installed but not available for use shall be covered with burlap and securely tied.

In lieu of valve box markers for the auxiliary gate valves, the Contractor shall paint in two (2) inch black lettered stencils, the direction and distances to the nearest one-tenth (1/10) foot the distance to the valve box on the face of the fire hydrant directly below the bonnet flange.

Article 4.4 Measurement

The method of measurement to furnish and install fire hydrants shall be as follows:

a. **Single Pumper Fire Hydrants**

Fire hydrants, complete with six (6) inch leg to main, six (6) inch auxiliary gate valve and valve box, guard post installation, and restrained joints shall be paid for at the unit price as set forth in the Bid Schedule. The price shall include full compensation for furnishing and installing single pumper hydrants as shown in the Standard Details.

Article 4.5 Basis of Payment

Payment for this Work shall be in accordance with Section 60.01 - General, Article 1.4 - Payment - General of this Division and shall include full payment for all Work described in Section 60.04.

Payment shall be made under the following units:

ITEM	UNIT
Furnish and Install Fire Hydrant Assembly (Single Pumper)	Each

SECTION 60.05 FIRE LINES

Article 5.1 General

The Work required under this Section consists of the performance of all Work required for the furnishing and installation of fire lines including mechanical restraint, fittings, valves, and valve boxes.

Article 5.2 Material

Refer to Section 60.02 - Furnish and Install Pipe, Articles 2.2.a and 2.2.e of this Division for material specifications.

Article 5.3 Construction

a. General

A fire line that originates at a water utility main has the primary purpose of providing fire protection inside a building. No connections, other than those for additional fire protection, will be allowed on the fire line outside the building. Domestic water obtained from a fire line will be connected with a saddle-type connection before the sprinkler riser and associated components inside the building. The domestic connection shall be protected from cross-connection as required by the 2000 Uniform Plumbing Code, Section 603.4.18 (2000 UPC, Sec 603.4.18).

Valves and valve boxes shall be installed where shown on the plans.

b. Excavation and Backfill

The Contractor shall provide all excavation, backfill, and compaction necessary to install fire lines in accordance with Division 20.00 - Standard Construction Specifications for Earthwork, Section 20.07 - Trench Excavation and Backfill of these Specifications.

c. Materials Delivery

Refer to Section 60.02, Article 2.3.b for material delivery specifications.

d. Installation

Installation shall be in accordance with Section 60.02, Article 2.3c amended as follows: All joints in the fire line shall be mechanically restrained joints.

e. Alignment and Grade

Refer to Section 60.02 - Furnish and Install Pipe, Article 2.3. - Construction, d. - Alignment and Grade of this Division for alignment and grade specifications.

f. Jointing of Ductile Iron Pipe

All joints shall be made in conformance with AWWA C-600. The Contractor will be required to use mechanical joints on all hydrant leads. The Engineer has the option of checking any or all mechanical joints to assure proper torque as specified by the manufacturer.

Butterfly valves shall be used on lines 12" and larger. Refer to Section 60.03 - Furnish and Install Valves, Article 3.2. - Material, b. - Butterfly Valves for Specifications.

Article 5.4 Fire Hydrants and Valve Boxes

Refer to Section 60.04 - Furnish and Install Fire Hydrants, Article 4.2 - Material for fire hydrant Specifications and Section 60.03 - Furnish and Install Valves, Article 3.2 - Material for valve box Specifications.

Article 5.5 Flushing and Testing

Prior to any tests performed, all newly installed fire lines shall be "Open-Bore" flushed. The Contractor shall then perform the hydrostatic testing and disinfection in that order

a. Flushing

All newly installed fire line shall be "Open-Bore" flushed to remove any foreign matter. "Open-Bore" flushing shall be accomplished prior to hydrostatic testing and disinfection at each extremity of the line, including all stub-outs and dead-ends. The Contractor shall furnish, install, and remove all fittings and pipes necessary to perform the flushing, at no additional cost to the City. Under no circumstances will open bore flushing through hydrants or reduced outlets be permitted.

It will be the Contractor's responsibility to schedule with the Engineer and the City Inspector twenty-four (24) hours in advance of any proposed flushing operations. Flushing of newly constructed mains may be required between the hours of 1:00 a.m. and 6:00 a.m. depending upon the availability of water as authorized by CBS Water Utility. The City will not be responsible for any cost incurred by the Contractor for flushing.

b. Hydrostatic Testing

A hydrostatic test will be conducted on all newly constructed fire lines, fire hydrant leads and stub-outs after "Open-Bore" flushing in the presence of the City Inspector in accordance with the requirements ANSI/AWWA C600. The Contractor shall furnish all necessary assistance, equipment, labor, materials, and supplies (except the test pressure gauge) necessary to complete the test to the satisfaction

of the Engineer. The Contractor has the option of testing the CBS-provided test pressure gauge, or of accepting it as accurate.

All main line valves, fire hydrant auxiliary valves, fire hydrant main valves, and plugs shall be tested. All intermediate valves within the section being tested will be closed and re-opened as directed by the WATER DEPARTMENT during the actual test. Only static pressure will be allowed on the opposite side of the end valves of the section being tested.

All hydrostatic testing will be performed through test copper or fire line riser in building. Use of fire hydrants and service connections for testing will not be allowed.

All fire lines and stubouts for future fire line connections shall be hydrostatically pressure tested at 200 p.s.i. for two hours, in accordance with the Fire Underwriter's requirements as outlined in the National Fire Codes.

If the pressure decreases below the required test pressure during the two (2) hour period, the preceding portion of that test will be declared void. Cracked or defective pipe, gaskets, mechanical joints, fittings, valves, or hydrants discovered as a consequence of the hydrostatic tests shall be removed and replaced with sound material at the Contractor's expense. The test shall then be repeated until the results are satisfactory. Use of leakage tests shall not be allowed.

c. Disinfection

Refer to Section 60.02 - Furnish and Install Pipe, Article 2.4. - Flushing and Testing Disinfection for Specifications.

d. Test and Air Vent Copper Removal

Refer to Section 60.02, Article 2.4d for Test and Air Vent Copper Removal.

Article 5.6 Measurement

Measurement for furnishing and installing fire lines shall be per linear foot of horizontal distance of the various sizes as set forth in the Bid Schedule. Measurement will be from station to station as staked in the field and as shown on the Drawings, except where the grade exceeds twenty-five (25) percent, in which case measurement will be by actual pipe length.

Article 5.7 Basis of Payment

Payment for this Work shall be in accordance with Section 60.01 - General, Article 1.4 - Payment - General of this Division and shall include full payment for all Work described in Section 60.05.

Fittings and appurtenances as shown on the Drawings or not specifically identified for payment under a separate pay item but required for normal completion of fire lines installation, will be considered incidental and shall be included in the linear foot cost of the fire lines. Excavation and backfill shall be paid for under Division 20, Section 20.07 - trench Excavation and Backfill.

Payment shall be made on the following unit:

ITEM	UNIT
Furnish and Install (Size) (Type) Fire Line	Linear Foot

SECTION 60.06 WATER SERVICE LINES

Article 6.1 General

The Work under this Section consists of the performance of Work required for furnishing and installing water service lines including fittings, curb boxes, and valve boxes.

- a. A service line provides potable water to a building or lot for domestic or commercial use.
- b. A utility connection permit shall be obtained from the CBS Public Works office prior to any and all construction (either on or off property in the CBS Water Utility service area).
- c. Twenty-four (24) hours notification shall be first given to the CBS Water Utility and second to the Engineer or his Representative prior to making the connection available for inspection.
- d. Before an on-property service line permit for any new subdivision can be released for construction, an ADEC Approval to Construct Certificate and written acceptance of the subdivision by the CBS Planning, Engineering and Water/Wastewater Utility Departments must be provided. In addition, all property corners shall be established and identified.

Article 6.2 Material

- a. Pipe

Ductile iron pipe or soft drawn seamless copper type "K" shall be used for all service lines.

- b. Curb Box, Valve Box

The curb box or valve box shall provide a clear and unobstructed access to a curb stop or valve to enable the CBS Water Utility operation of the curb stop or valve. Curb boxes or valve boxes shall be installed in the standard location as shown in the Standard Details.

Curb boxes shall be of an acceptable construction as outlined in this Article for construction and as shown in the Standard Details for Typical Water Service Connects.

Valves shall be of an acceptable construction as outlined in the Standard Specifications, Section 60.03 - Furnish and Install Valves, Article 3.2 - Materials and the Standard Details for Typical Valve Box. Valves shall be installed with a standard marker as defined in Standard Specifications, Section 60.03 - Furnish and Install Valves, Article 3.2.e.

c. Corporation Stop, Curb Stop, Curb Box and Saddle (1" and 2" Services)

Corporation stops shall be brass only. The following corporation stops, or approved equivalents, are acceptable:

1" Service - Ford Brand 1" Type FB1000-4 BALLCORP CCxPJ-CTS

2" Service - Ford Brand 2" Type FB1000-7 BALLCORP CCxPJ-CTS

Curb stops shall be brass only. The following curb stops, or approved equivalents, are acceptable:

1" Service: Ford Brand Ball Valve Curb Stop B41-444

2" Service: Ford Brand Ball Valve Curb Stop B41-777

Curb boxes must be furnished with stationary operating rods. Ford Brand 1¼-inch EA2-50-50 only is accepted. Curb boxes shall be supplied with Ford Stationary Rod No. 42 with brass cotter pin.

Saddle shall be Romac 202N w/ CC Tap, or approved equivalent.

Article 6.3 Construction

a. Excavation and Backfill

The Contractor shall provide all excavation, bedding, backfill and compaction necessary to install water service lines in accordance with Division 20.00 - Standard Construction Specifications for Earthwork, Section 20.07 - Trench Excavation and Backfill of these Specifications.

b. Service Connections

A corporation stop or main valve shall be installed at a point in the service line as close to the main water supply as possible. There shall be line pressure in the main at all times connections are being made. All service lines two (2) inches and smaller shall be constructed of seamless, soft drawn, type "K" copper. All service connections larger than two (2) inches shall be made of ductile iron or HDPE. Live taps may be requested to be performed by CBS Water Utility connection crews with the expense borne by the Contractor. The Contractor may make the connection with the permission of the Environmental Superintendent. All ductile iron pipe installations shall be flushed, hydrostatic tested, and disinfected as outlined in Section 60.02 - Furnish and Install Pipe, of this Division.

Contractor shall make the connection to the CBS's main water supply in a manner consistent with the standard specifications and standard details. A water service line shall not cross property lines of adjoining lots. The curb box shall be installed no closer than five feet (5') from adjoining property lines. The connection shall be inspected by the CBS Water Utility at the time the connection is made or the

excavation be exposed in its entirety for inspection. The utility connection permit shall be posted and available at the time of inspection.

A water service line will not have more than one (1) union every one hundred feet (100'). No unions will be allowed in the right-of-way on newly constructed service lines. Water service lines shall be installed with minimal radial distortion (e.g. kinking or crushing), and shall have reasonably smooth bends in accordance with standard practice and acceptance of the Engineer.

c. Excavation

Excavation for service connections shall be unclassified and the Contractor shall excavate whatever substances that are encountered to the depth required for the connections. Cover depth for water service connections will be a minimum of five feet (5') below proposed finished grade, including the ditchline. The five-foot (5') depth below finished grade shall be maintained five feet (5') inside the footings, before the depth shall be less than five feet (5'). Variations in cover from the depth stated above will not be grounds for additional payment. It shall be the Contractor's responsibility to familiarize himself with the depth of water mains for the project. The portion of the right-of-way that extends from the main to the curb box (curb stop) will be excavated in such a manner that will allow the service connection to be installed horizontally (no slope). The Contractor shall excavate for water connections in such a manner that the excavation is 90 degrees to the street line, whenever possible. The ditch shall be long enough to allow the curb box to be set 1-foot inside the right-of-way from the property line.

Trenches shall be of sufficient width at the bottom to allow for laying of the particular service (minimum two and one-half [2-1/2] feet for single service) and as required to provide safety for workmen utilizing the trench per OSHA requirements.

The Contractor shall expose the mains to be tapped for distance of four (4) feet in length. Excavation on both sides of the pipe shall be carried six (6) inches below the bottom of the pipe. Excavation below required level shall be backfilled and compacted with sand or gravel at the Contractor's expense as directed by the Engineer.

The Contractor shall be responsible for, and shall bear the expenses incurred, in the event that a main should be damaged during excavation or backfilling. The Contractor shall bear the cost of all material, labor, and other expenses thereof.

No water service shall be installed within a horizontal distance of three feet (3') from a sewer service.

All on-property installations shall be constructed to the same standard as off-property installations.

d. Backfill

At such time as the Engineer may direct, but only after the service lines and appurtenances have been properly completed and inspected by the CBS Water Utility, the trenches and appurtenant structures shall be backfilled. Utility warning tape shall be placed twenty-four (24) inches above the water service line. Backfilled material, free from large clods, frozen material or stones, shall be placed by the Contractor in conformance with these Standards.

The Contractor shall exercise due care in backfilling to keep the curb box vertical and in place. In the event the curb box is displaced, the Contractor will be required to excavate and restore the curb box to the proper position. Any work necessary to restore the curb box to the proper position will be performed at the Contractor's expense.

Backfill shall not be placed in frozen trenches.

e. Disconnects

If an existing service line is replaced by a new service or becomes unusable due to a replat of the property, it shall be disconnected at the main by removal of the direct tapped corporation stop or saddle and installation of an 8-inch (min.) Romac SS1 Repair Clamp, or approved equal, at no cost to the City. The disconnect shall be witnessed by the CBS Water Utility.

f. Hydrostatic Testing

All newly installed water mains and all new services shall be subject to a hydrostatic pressure test of 150 pounds of pressure. This pressure test may be performed at the same time that the hydrostatic test is performed on the new water main. A bleeder will be installed at each service line curb box and extended one foot (1') above the existing ground. The bleeder will be capped after testing is complete. The bleeder may not be used for the on-property system and must be disconnected at the time of the on-property hook-up.

All 1-inch and 2-inch copper water service lines, fittings, and connections will be inspected for leaks under system pressure prior to backfilling. All water service lines larger than 2" shall undergo the requirements for Flushing, Hydrostatic Testing, and Disinfection as specified in Section 60.02 of these specifications.

Article 6.4 Measurement

Measurement for furnishing and installing water service lines shall be per each of the various sizes as set forth in the Bid Schedule.

Article 6.5 Basis of Payment

Payment for this Work shall be in accordance with Section 60.01 - General, Article 1.4 - Payment - General of this Division and shall include full payment for all Work described in Section 60.06. Fittings

and appurtenances as shown on the drawings or not specifically identified for payment under a separate pay item but required for normal completion of water service line installation, will be considered incidental.

Payment shall be made under the following unit:

ITEM	UNIT
Water Service Connection (Size)	Each

SECTION 60.07 POLYETHYLENE ENCASEMENT

Article 7.1 General

The work under this section consists of providing all operations pertaining to the furnishing and installation of one layer of polyethylene encasement on all ductile iron pipe and fittings if required in the plans and specifications.

Article 7.2 Material

The polyethylene encasement material for pipe shall be 8-mils thick and conform to AWWA C105/ANSI A21.5.

Article 7.3 Construction

The polyethylene encasement shall be installed in strict conformance to the methods described in the most current editions of ANSI/AWWA C105/A21.5 and the Ductile Iron Pipe Research Association's "A Guide for the Installation of Ductile Iron Pipe".

Article 7.4 Measurement

Measurement of all sizes of polyethylene encasement for pipe shall be the same as the measurement of the pipe installed.

Article 7.5 Basis of Payment

Payment for this work shall be in accordance with Section 60.01 General, Article 1.4, Payment - General, and shall be full payment for all work described in Section 60.07.

Payment shall be made on the following basis:

ITEM	UNIT
Polyethylene Encasement	Linear Foot

SECTION 60.08 REMOVE AND SALVAGE EXISTING FIRE HYDRANT

Article 8.1 Description

The Work under this Section consists of the performance of all Work required for removing, disposing of or salvaging, and delivering serviceable portions of removed items (as directed by the Engineer) to CBS designated location.

Article 8.2 Material

All materials used shall conform to the requirements of the City and Borough of Sitka Standard Specifications and other agencies (if any) having jurisdiction over the water line replacement.

Article 8.3 Construction

All construction practices shall conform to the Division 20 - Standard Construction Specifications for Earthwork and Division 60 - Standard Construction Specifications for Water Systems.

Hydrants shall be removed in their entirety including hydrant, hydrant leg, and bollards. For main line to remain in service, leave gate valve in closed position, plug with mechanical joint or blind flange, and remove valve box. Otherwise, remove gate valve and valve box and install mechanical plug or blind flange at the main.

Article 8.4 Measurement

Removing, disposing of or salvaging, and delivery of existing fire hydrant serviceable portions will be measured per each fire hydrant removed and salvaged in accordance with this Section.

Article 8.5 Basis of Payment

Payment for this Work shall be in accordance with Section 60 - General, Article 1.6 - Payment - General, and shall include full payment for all Work described in Section 60.08. Payment for Type A Classified Fill and Backfill will be made in accordance with Section 20.05 all other subsidiary items required to complete the Work in this Section shall be considered full payment.

SECTION 60.09 RAISE OR LOWER WATER SERVICE LINE

Article 9.1 General

The Work under this Section consists of all operations pertaining to raising or lowering existing water lines when the grade(s) of such services interfere(s) with storm drain line under construction, including, but not limited to, trench excavation and backfill, compaction, furnishing trench backfill, disposal of unsuitable or surplus material, and water line piping.

Article 9.2 Construction

Where a conflict in grade occurs between the proposed storm drain line and a water service line, Contractor shall excavate the water service from the point of interception to a sufficient distance to raise or lower the water service such that the grade conflict will be eliminated. In no case will the length of raising or lowering of the water service exceed fifty feet. If the clearance between the raised or lowered water service and the storm drain is less than four (4) feet, Insulation Board (R-18) shall be installed and paid in accordance with Section 70.18 of these specifications. However, in no case shall the vertical separation distance between the service connection and the storm drain be less than 18-inches. All excavation, backfill and pipe laying shall be performed in accordance with the applicable provisions of CBSS Division 20.00 Standard Construction Specifications for Earthwork and CBSS Division 60.00 Standard Construction Specifications for Water Systems. Any materials needed to complete the raising or lowering of a water service shall be provided by Contractor and considered incidental to the Contract.

Article 9.3 Measurement

Measurement for raising or lowering water service lines shall be measured as units, complete in place.

Article 9.4 Basis of Payment

Payment of this Work shall be in accordance with CBSS Division 10 - Standard General Provisions, Section 10.07 Measurement and Payment, as amended in these specifications, and shall include full payment for all Work as described in this Section, unless otherwise noted.

Fittings and appurtenances not specifically identified for payment under a separate pay item, but required for normal completion of raising or lowering water service lines, will be considered incidental, and shall be included in the unit cost of the work.

Payment shall be made under the following unit:

ITEM	UNIT
Raise or Lower Water Service Line	Each

SECTION 60.10 ADJUST VALVE BOX

Article 10.1 General

This item consists of furnishing all labor, equipment and materials necessary to adjust existing mainline valve boxes to finish grade as shown on the plans and in accordance with the applicable standard details of these specifications.

Article 10.2 Construction

All valve box adjustments will be accomplished as directed by the Engineer. Any damage to a mainline valve or valve box resulting from construction under this item shall be repaired or the damaged portion replaced at the Contractor's expense, including debris entering the valve box.

Valve operator extension rods shall be installed whenever the depth to the valve operating nut exceeds forty-eight (48) inches. The costs of furnishing and installing the extension rods shall be considered incidental to Item 60.10.

Article 10.3 Measurement

Mainline valve box adjustments will be measured per unit, complete in place.

Article 10.4 Basis of Payment

Basis of payment for this item shall be in accordance with Section 10.07, and shall include full payment for all work described in this section and all work outlined on the applicable standard details of these specifications, unless otherwise noted.

Payment will be made under:

ITEM	UNIT
Adjust Valve Box to Finish Grade	Each

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STANDARD CONSTRUCTION SPECIFICATIONS FOR MUNICIPAL CONSTRUCTION SURVEYS

SECTION 65.01 GENERAL

Article 1.1 Scope of Work

The Contractor shall furnish all labor and materials necessary to perform all surveying and staking essential for the completion of construction in conformance with the plans, specifications, and contract documents. The Contractor shall perform all the necessary Work and calculations required to accomplish the Work in accordance with the standards set forth in Division 65.00 Construction Specifications For Municipal Construction Surveys.

This section establishes a minimum standard of field survey specifications and procedures to properly control Municipal construction projects. It is the Contractor's responsibility to insure proper survey methods and procedures are followed. Any errors or damages resulting from the Contractor's survey shall be corrected or made whole at the expense of the Contractor. The Owner shall not be held liable for any additional expense. Any method conflicting with these survey specifications must be approved by the Engineer prior to its use.

All survey work shall be performed by a third party Survey Subcontractor retained by the Contractor. All survey work performed shall be under the direct supervision of an Alaskan Registered Professional Land Surveyor working for the Survey Subcontractor. All personnel involved in measuring and recording survey data shall be directly employed by the Surveying Subcontractor and shall not be employed by the Contractor or any of the other Subcontractors for the duration of the project. Failure to adhere to this specification will result in non-payment for all work affected by non-compliance.

The Contractor shall organize and coordinate all Work through the Engineer prior to beginning Work. All requests for information or determinations concerning the project shall be directed to the Engineer.

Payment for conducting the pre-construction survey, developing the proposed final grades, and submitting them for approval shall be considered incidental to the bid item "Construction Survey Measurement" and no separate payment shall be made.

Contractor shall conduct a pre-construction survey to establish the existing road centerline and gutter lip profiles in accordance with CBSS Division 65.00 Construction Survey. Within five (5) calendar days from the date of the Notice-to-Proceed, Contractor shall submit the survey notes and plotted profile drawings to the Engineer. The Engineer will have five (5) days to review the survey notes and profile drawings prior to the start of construction. Profile drawings shall be submitted on 50-scale profile plan sheets in standard Municipal format in conformance with the City's Department of Public Works Design Criteria Manual, CBSS, and shall be stamped by a registered Professional Land Surveyor licensed in the State of Alaska.

Record drawings which may exist shall be made available to Contractor by the Engineer for the purpose of evaluating the work effort required prior to re-establish the street grades. It is the intent of this specification that the new grades will closely align with the previous construction and that there will be no significant deviations unless approved by the Engineer. Copies of the record drawings are available for inspection at the Department of Public Works, Project Management and Engineering Division, during normal business hours.

The Engineer shall provide Contractor the proposed road centerline grades two (2) days prior to the start of construction.

Payment for conducting the pre-construction survey and submitting them to the City shall be considered incidental to the bid item "Construction Survey Measurement" and no separate payment shall be made.

Article 1.2 Payment - General

Payment for all Work included in this Division shall be paid for in accordance with Division 10.07 - Standard General Provisions, Section 10 - Measurement and Payment and Article 2.16 of this Section 65, and shall include full payment for all Work described.

SECTION 65.02 CONSTRUCTION SURVEYING

Article 2.1 Project Control

The Owner may provide reference horizontal and vertical control to facilitate construction staking or the Owner may choose not to provide reference horizontal and vertical control on projects. Whichever the case, it is solely the Contractor's responsibility to establish or check all survey control prior to starting any staking activity to ensure the project is properly located and constructed according to the construction documents. If discrepancies are found between the control and the construction documents, the Contractor shall notify the Engineer immediately.

In the event Contractor is unable to locate certain monuments prior to the start of the project, Contractor shall notify the Engineer immediately and provide five (5) working days for the Engineer to reestablish the missing monumentation.

Contractor shall have no basis for a claim requesting additional compensation for costs incurred due to missing survey control which is shown on the plans, unless the Engineer fails to re-establish said control within five (5) working days after written notification from Contractor. Contractor may be entitled an extension of time as the Engineer may determine. Claim for extension of time shall be in accordance with CBSS Section 10.05.23 Delays and Extension of Time.

Once work has begun, the Contractor is responsible for preserving and protecting all line stakes, grade stakes, reference points, and hubs. In the event of their loss or destruction, the Contractor shall pay all costs for their replacement.

A. Monumentation

1. General Description

A monument is defined as a relatively permanent material object used to physically mark a point on the earth which was determined by a land surveying process. The term monument will be deemed generic to identify public land corners, private property corners and public agency vertical and horizontal control networks. If a question arises as to the validity of a found object being a monument it should be submitted to the Engineer for clarification prior to its disturbance or removal.

2. Existing Monuments Search

Prior to the establishment of construction stakes, a monument search shall be conducted and a record made in the survey control field book stating which monuments were found and which ones were not found. Record plats within the construction limits should be obtained by the Contractor to assist in monument recovery. If a record of monument recovery does not exist to verify that a search was conducted for all monumentation, then the Contractor will be held responsible to satisfy all claims by land owners and public agencies for remonumentation at no additional expense to the Owner.

3. Requirement To File Record Of Monument

A RECORD OF MONUMENT (AS 34.65.040) shall be filed with the State District Recorders Office immediately after establishment of survey control and prior to clearing and grubbing and/or excavation work for all applicable monuments. Monumentation for which a record of monument shall be filed are defined as follows:

- o U.S. public lands survey monument established by a cadastral land survey.
- o Alaska state land survey monument established by a cadastral land survey.
- o City and Borough of Sitka land survey monument established by a cadastral land survey.
- o Exterior boundary monument controlling a record survey.
- o Geodetic control monument established by a Federal, State, or City agency.

Proof of recording shall be submitted to the Engineer in the form of a copy of the monument of record bearing the State District Recorders stamp before the monument is disturbed or removed.

A second RECORD OF MONUMENT shall be filed for each monument after the monument has been replaced (refer to AS 34.65.040). The record of monument shall be filed within five (5) working days of the date the monument was installed. Proof of recording shall be submitted to the Engineer in the form of a copy of the record of monument bearing the State District Recorders stamp.

B. Requirement To Establish Monumentation

1. General Applicability

The Contractor shall replace any monument that exists within the construction limits if it is disturbed or removed due to project activity. All monumentation disturbed or removed shall be replaced with the same type monument or monument approved by the Engineer. If the monument had a self identifying cap then a new cap shall be attached bearing the same information which was stamped on the original cap. The new cap shall bear the license number of the Surveyor and the year the monument was replaced. Monuments that are located in gravel road surfaces, fill slopes, back slopes or ditches shall be installed six (6) inches below the finished surface. When a monument cannot be re-established in the proper location, then one or more reference marks shall be established. The establishment of reference marks shall be coordinated with the Engineer.

2. Monumentation Of Road Upgrades and Reconstruction Projects

Projects which include paving of the road surface shall establish monuments installed in a monument casing at all project centerline PC's, PT's, angle points, and street intersections. Monumentation established to identify street intersections, angle points, and PC's/PT's of curves shall be center punched and stamped with the following information:

- o centerline stationing
- o year set
- o surveyor's license number
- o the initials COP.

Existing subdivision lot corner monumentation located within paved portions of a public use easement shall be replaced with a like monument installed flush with the top of finished pavement grade.

3. Maintenance And Utility Projects

Maintenance and utility projects, such as pavement overlays, storm drains, traffic signalization/channelization and gravel surface re-grading and reshaping projects, do not require the establishment of new monumentation. However, in accordance with B.1., above, the Contractor is responsible for replacing any existing monumentation disturbed or removed during the Work.

Existing centerline monumentation on overlay projects shall be re-established in a monument case to conform to monument specifications stated within this article.

4. Standard Monument And Monument Case Specifications

The standard monument for street or roadway centerline and intersection monumentation shall be a two inch (2") diameter pipe with a three inch (3") brass cap attached. The monument case shall conform to AASHTO M-105, Class 30A or DOT/PF standard drawing M-16.00. The case shall be coated with coal-tar pitch varnish. The top of the monument case shall be installed 0.03 below finish grade of asphalt surfaces, in gravel surfaced streets top of the case shall be 0.5 feet (six inches) below finish grade. The top of a monument installed in a case shall be 0.4 feet below the top of the case.

5. Request To Install Additional Monumentation

The Owner may request that additional monumentation be established and installed. Additional monumentation is extra to the project and not identified in the construction documents. The monumentation would be established and installed according to paragraphs B.1, and B.4. The request to install additional monumentation is at the direction of the Engineer and the cost for installation will be determined by negotiated cost between the Contractor and the Engineer.

C. Project Control Accuracy

1. Horizontal Control

The maximum permissible linear error allowed in establishing horizontal control is 1:5000 feet. The maximum error allowed in unadjusted angular closure shall be calculated by the formula "30 times the square root of N". The term "N" signifies the number of transit set ups in a traverse and "30" signifies thirty seconds.

2. Vertical Control

Vertical datum shall originate from the COP Benchmark Network or NGS Vertical Level Line System. All level circuits run to establish temporary bench marks shall have an accuracy no less than the value computed by the equation (0.03 feet times the square root of the distance in miles). Foresights and backsights shall be balanced. The maximum sighting distance shall not exceed 300 feet. All leveling circuits establishing TBM's will be adjusted utilizing recognized standard surveying adjustment methods. Side shots to establish an elevation on TBM's will not be allowed.

A minimum of two known bench marks shall be utilized when establishing TBM's to verify correct elevation information. A sufficient number of TBM's shall be set to control a project with a maximum spacing of 800 feet between marks. Typically, a TBM should not be greater than 200 feet outside the construction limits of the project. All TBM's shall be located and be comprised of sufficient materials such that their integrity will not be compromised throughout the life of the project.

D. Construction Centerline

1. Establish Centerline

The construction centerline location and stationing shall conform to that shown on the construction documents. Any errors found in the line shall be corrected and shown on the specific plan view with reference to the centerline stationing. If control points do not exist they shall be established and referenced so that the line can be readily re-established when required. A minimum of two reference points shall be established to reference each project control point or monument. Each reference point shall be visible to the other reference point. The method of referencing control points shall be done in accordance to the standard details of these specifications. Reference points shall be placed at locations where there is the least possibility of their being disturbed during the construction period. Measurements and sketches of the reference points shall be kept in the horizontal control survey field book.

2. Check Existing Ground Profile

A centerline profile shall be run prior to establishing construction grade stakes. The existing ground elevations shall be checked against the existing profile elevations shown on the plans to verify design grade relative to the existing ground conditions. The Contractor shall review the centerline profile information and immediately notify the Engineer of any elevations that do not match the plan profile information. The Engineer will direct the Contractor how to proceed.

Article 2.2 Field Notes

The Owner will supply the Contractor with survey field books. Field books will only be issued to the Contractor. No survey Subcontractor will be allowed to check out field books. The Owner has the right to inspect and take possession of the field books at any time throughout the project. Each book shall be indexed and its contents referred to by page number prior to returning them to the Owner. All field books containing field note information shall be sealed and signed by an Alaskan Registered Professional Land Surveyor on the title page of each field book. The date, weather conditions, survey crew personnel, and instruments used shall be shown at the beginning of each day's notes. As a general rule, field notes for each phase of the work shall be placed in a separate series of field books. All field books used for the project shall be submitted to the Owner upon completion of the project.

Field notes shall be neatly logged as follows:

- o observations recorded directly in field book
- o notes shall be in pencil
- o notes shall be complete and reduced
- o sketches and traverse data shall be graphic
- o stationing shall increase from the bottom to the top of the page
- o notes shall be precise and sufficiently detailed

Refer to Section 65.02, Article 2.13 for procedures for logging field notes with the use of electronic data collectors.

Pegging of notes and erasures of information will not be acceptable. A line shall be drawn through those portions of the notes in error leaving the original note legible. The correction shall be noted above the original entry. Corrections shall be initialed and dated. Where appropriate, a note of explanation shall be included.

Field notes shall conform to the note format shown in the standard details section. All survey work will be stopped until the notes are brought into conformance with this requirement. A copy of each day's field book notes shall be reduced and delivered to the office of the Engineer by 12:00 Noon the following work day. The Engineer may issue a stop work order at the Contractor's expense until the field notes are delivered within this time frame.

Failure on the part of the Contractor to keep and maintain complete and accurate field notes, as required by this Section, shall be sufficient reason to withhold payment for those items of Work where survey is required. No final project payment will be made to the Contractor until the field books have been submitted and approved by the Engineer.

Article 2.3 Party Chief's Daily Diary

The survey party chief shall keep a factual daily diary of all work performed by the survey crew on the project. As a minimum, the diary shall contain the following information:

- o date
- o crew
- o type and location of work performed
- o work accomplished
- o orders from the Engineer
- o signature of Party Chief

This record shall be kept on the project site and submitted to the Engineer upon request. At completion of the project this diary shall become the property of the Owner.

Article 2.4 Clearing and Grubbing Stakes

The Contractor shall stake the clearing and grubbing limits as shown on the construction documents and/or as directed by the Engineer. If possible, stakes shall be adjusted to avoid sharp breaks in the width of the clearing line. The staking of clearing limits shall be approved by the Engineer prior to the start of the clearing operations.

Distances shall be measured to the nearest foot and standard lath/flagging shall be placed to clearly designate the intended limits. Intervals for placement of lath/flagging shall vary based on the terrain and foliage density, with a minimum of 50 feet and no greater than 100 feet between lath. In areas of heavy timber, clearing stakes shall be placed to avoid leaving trees on the clearing line. If, as the work progresses, revisions are required to the originally staked clearing distances, the revisions shall be duly noted in the field notes.

Article 2.5 Cross Sections

The Contractor shall perform all cross sections necessary for determination of excavation and fill or backfill quantities, including intermediate and/or remeasure cross sections as may be required. Cross sections shall be required before excavation activity begins unless otherwise specified. When clearing and grubbing work is included in the contract the original cross sections shall be taken immediately after grubbing work is complete. Cross sections measured for pay quantities shall clearly identify in the field notes whether the Work was done before excavation or after excavation. When both usable and unusable excavation are a part of the project, the limits of usable or unusable materials shall be clearly identified in the cross sections, in the field book.

A. Methods And Procedures

1. Equipment

Cross sections may be accomplished with 1) an engineers level, 2) a self compensating surveyor's level, or 3) an electronic (laser) level, or 4) by electronic data collection and radial survey method. Neither radial methods nor electronic leveling shall be employed without prior approval from the Engineer. When radial methods or electronic leveling methods are used the survey shall comply with or exceed the accuracy established in this article. Conditions under which these methods may be used shall be discussed at the initial pre-construction meeting with the Engineer. For radial methods see Article 2.13 of this section.

2. Procedure And Accuracy

When an engineering level, self compensating surveyor's level, or an electronic (laser) level is used, cross sections shall be taken perpendicular to the centerline along tangents and on radial lines along curves. A right angle prism shall be used to determine perpendiculars. The height of the instruments (H.I.'s) shall be recorded to the nearest hundredth of a foot. All cross sectioning work shall be part of a closed level loop. If only one TBM is used the level set-up shall be broken and a different instrument height obtained before closing into the same TBM. The maximum allowable error for level loops used for cross sectioning shall be three hundredths of a foot. Cross section readings shall be recorded to the nearest tenth of a foot. Horizontal measures shall be recorded and accurate to the nearest tenth of a foot. Work shall not be paid for if it does not meet the stated accuracy requirements.

3. Original Ground Measures

Cross section measures of original ground shall be taken at each 50-foot station as indicated on the construction plan drawings. Intermediate stations shall be measured by cross section wherever grade breaks occur. Additional cross sections shall be taken at stations to include quantities measurement of retaining walls, drainage structures, etc. Elevation shots for original ground cross sections shall be taken at the centerline of construction according to the construction drawings and as a minimum, at the following points perpendicular to and on each side of the centerline:

- o grade breaks
- o edge of pavement
- o curb and gutter
- o shoulder of road
- o toe of slope
- o centerline of ditch

- o top of bank
- o all other physical features within the project limits

In areas where overbreak or slides are anticipated, sections shall be extended out from centerline to include the anticipated disturbed ground area.

4. After Excavation Measures

Cross sections shall be taken at the same stations as the original ground cross sections. Elevation shall be for the bottom, sides and top of excavation at the following points on each side and perpendicular to the centerline:

- o centerline
- o grade breaks
- o toe of excavation
- o top edge of cut
- o original ground at a minimum of ten (10) feet beyond the limits of excavation

All work performed otherwise will not be accepted by the Engineer for quantities payment.

B. Notification Prior To Cross Section Work

The Contractor shall notify the Engineer 24 hours prior to conducting any survey measurements involving pay quantities. The Engineer or his representative shall approve the excavation prior to any cross sectioning taking place and shall have the opportunity to be present during the survey. Pay quantity work done without the Engineer's notification and approval, or any work covered up before proper remeasure is made, shall be just cause for non-payment.

Article 2.6 Slope Stakes

Slope stakes shall be required for each cross section station and at additional intervals such as points of curvature and tangency of curves, street intersections, vertical curve intermediate stations to include the high or low point of the curve, and at grade breaks. The stakes are to be set at points where the cut or fill slopes intersect the surface of original ground.

Staking notes shall record the location of the slope stake in relation to the construction centerline, the existing elevation shot at the catch point, the planned elevation that the slope stake is identifying, what level of the design prism the catch point is identifying (i.e., top of unclassified fill, top of subbase, etc.), the percent of slope for cut/fill, the distance to point slope staked, and the station of the slope stake.

The information to be shown on a slope stake is as follows:

- o distance from the catch point to the point being staked

- o percent of slope of the cut/fill
- o amount of cut/fill
- o stake's location in reference to the centerline
- o centerline station of the slope stake written on the back of the stake

The use of hand levels for setting slope stakes shall be limited to one turning point up or down from the instrument to the catch point. Hand level turning points shall be clearly noted in the field book.

A reference stake shall be set for each slope stake. The reference stake shall be set a minimum of 10 feet and a maximum of 15 feet beyond the slope stake. The reference stake shall re-state the slope stake information in the event the slope stake is disturbed or destroyed. A hub shall be driven flush with the ground at the reference stake and all elevations and distances referenced to the hub.

Article 2.7 Grade Stakes

A. Cut Or Fill Stakes

Vertical cut/fill stakes shall be used where the design prism does not contain sloped shoulders and ditches and a slope stake would not be needed. The cut/fill stake shall be comprised of a standard wooden hub driven flush with ground surface and accompanied by a guard lath with the following information written on it:

- o amount of cut or fill
- o distance to the point of cut/fill from the hub
- o description of the cut or filled type, i.e., subgrade, top classified
- o offset distance from construction centerline to the cut/fill point
- o centerline station written on the back of the lath of cut/fill point
- o elevation of the top of hub

Cuts shall be given to the nearest tenth of a foot. Elevations of the top of hubs shall be given to the nearest hundredth of a foot. Stakes shall be required at each 50-foot station identified on the construction drawings and at additional intervals such as points of curvature and tangency of curves, street intersections, vertical curve intermediate stations to include the high or low point of the curve, and at grade breaks. A record of the cut/fill, the design grade, the distance offset from centerline, the centerline station and the type of cut/fill being staked shall be written in the survey field book.

B. Finish Grade

Grade hubs shall be set to verify that the road prism is at the correct elevation prior to the placement of leveling course material. Wooden hubs, painted or topped with colored whiskers, shall be set at the top of classified fill, within two hundredths of a foot tolerance. Stationing shall be 50 feet on tangent and 25 feet on curves unless the Engineer approves otherwise. All grade breaks, vertical curve intermediate

points to include the high/low point of the curve, PC and PT of horizontal curves, and street intersections shall be staked.

Hubs shall be established on the centerline of the road prism as a minimum where poured curb and gutter is incorporated into the designed road prism. Otherwise, hubs shall be established at the shoulder of the designed road prism, as well as the centerline of the road prism.

When parking aprons are staked, hubs shall be set on a 50-foot grid pattern unless approved otherwise by the Engineer. The field book shall contain the centerline station, the design finish grade elevation of the point staked, the elevation of the hub, and a description of the material being staked.

Article 2.8 Drainage Facilities

The location, type, size, length, and invert elevations for drainage facilities are given on the construction plan drawings. Minor changes in locations and grades to meet existing field conditions may be made where necessary, but only with the approval of the Engineer. If the planned design grade is found to be unworkable in the field, the Engineer shall be notified immediately and all grade staking of the facility shall cease until further notice from the Engineer.

A. Storm Drains, Cleanouts, Outfalls, Catch Basins, Oil and Grease Separators, Culverts

A ground line profile shall be run directly above the centerline of the pipe before trenching occurs. The line and grade for storm drain pipe shall be given from reference hubs offset from each manhole, catch basin, angle point, outfall or cleanout. Reference hubs for culvert installation shall be offset from the pipe ends on the extended centerline of the culvert. One reference hub is required at each end of a culvert. Guard stakes shall be provided for each hub and shall identify the following information:

- o station
- o size, length and type of pipe
- o the amount of cut or fill from the top of the hub to the invert at the end of the pipe
- o the horizontal distance from the reference hub to the center of a manhole, cleanout, catch basin, angle point in a pipe, outfall or end of a culvert pipe.

For each structure, the field book shall show the location, type, and size of the structure with a staking diagram showing all distances and pertinent elevations. Two reference hubs shall be set for each manhole, cleanout, catch basin, angle point, and outfall. The reference hubs shall be offset no greater than 25 feet from the facility they are referencing.

B. Headwalls

Headwalls for storm drains and culverts shall be staked by setting a hub accompanied by a guard stake on each side of the storm drain or culvert. The hubs shall be on line with the face of the headwall, or as

directed by the Engineer. An elevation shall be established on the hubs and written on the guard stake along with the offset distance to the center of the headwall.

C. Dikes and Ditches

Dikes/ditches shall be staked to the alignment, grade and slopes shown on the plans. Dikes/ditches shall be slope staked to the shoulder or flow line of the improvement with distances referenced to the improvement centerline. The criteria outlined in Article 2.6 shall govern the establishment of slope stakes for this work.

D. Riprap and Slope Protection

All rip rap and slope protection shall be staked as soon as possible after the pipe, fill, channel change or dike has been constructed. Slope stakes shall be set if needed. See Article 2.6 for slope staking criteria.

E. Curb and Gutter

Reference stakes shall be set at even 50 foot stations on tangents as shown on the construction plan drawings. Horizontal curves shall be staked on even 25 foot stations. All grade breaks, PVC's, PVT's, low points and high points on vertical curves shall also be staked. A hub and tack shall be set at an offset distance of three (3) feet to the top back of curb. A lath will be set behind the hub and tack with the offset distance marked below the offset and the station marked on the back of the lath. The cut and fill will be to the top back-of-curb within three hundredths of a foot. All radius points at curb returns will be staked and additional stakes set breaking up the arc of the curve between curb returns. If valley gutters are to be built, they shall be staked and referenced.

Article 2.9 Water Systems

The Contractor shall stake in the field the alignment and grade for work to be done under the Contract. Two offset hubs and lath shall be set for each tee, hydrant, water service, valve, angle point, and grade break in the alignment. The lath shall identify the feature being staked and state the elevation of the hub, the offset distance to the center of the feature, and the station of the feature as shown on the construction plan drawings. The offsets shall be set at a reasonable distance to protect them from disturbance.

The Contractor shall be responsible for, and pay all costs for, the transfer of the control points from the reference hubs to such hubs or batter boards as required for the prosecution of the work. An original ground line profile directly above the water line shall be run prior to excavation. The ground line profile refers to the elevation of the ground directly above the centerline of pipe and the grade line refers to the elevation of the bottom of pipe, except where otherwise noted. The field notes shall record the profile, the hub elevations, offset of the hubs, and the station of the feature being staked.

Article 2.10 Sanitary Sewer Systems

Line and grade for sanitary sewer pipe shall be given from a minimum of two reference hubs for each manhole, outfall or cleanout. Guard stakes shall be provided for each hub showing the information necessary to construct the facility. The minimum information to be shown on the reference stakes and in the field book is as follows:

- o centerline of pipe station
- o size and type of pipe
- o cut or fill from the hub to the invert at the end of the pipe
- o offset distance from the hub to the end of the pipe or center of the structure

Article 2.11 Major Structures

Construction survey procedures shall be reviewed by the Engineer prior to commencing any construction staking. The Engineer's review and approval of survey procedures is required prior to commencing construction activities for major structures including bridges, docks, piers, piling foundations, drainage control facilities and large buildings.

Horizontal and vertical control for the project shall be verified by the Contractor prior to any construction activity. The Contractor shall verify existing field elevations where planned foundations, pilings, piers and support structures are to be placed prior to any construction activity. The Contractor shall verify depth of water and existing ocean or lake bottom elevations for all dock and pier construction prior to commencing pile driving and excavation activity. If any discrepancies are found between plan design and existing conditions the Contractor shall inform the Engineer immediately.

Article 2.12 Miscellaneous Construction

The Contractor shall provide sufficient stakes for adequate control of all structures and incidental construction not specifically covered above. A staking diagram with respect to centerline and measurements for pay quantities shall be maintained in the field notes. Other items such as horizontal and vertical control shall be shown in the field book and shall be governed by procedures established in previous articles of this specification.

Article 2.13 Electronic Data Collection and Radial Surveys

Data gathered by electronic data collection or by radial methods shall be submitted in AutoCAD/ DCA drawing file format on a 5 1/2" or 3 1/4" double sided high density disk compatible with DOS systems. The Contractor shall be guided by the following specifications:

- A. A standard field book shall be used to record the date of survey, weather conditions, instrumentation and data collector used, crew, project description and sketches, listing of horizontal

and vertical control points used and established, and other information needed to set up the reconstruction of the survey.

- B. A printout of the unedited output from the data collector or a copy of the radial field book entries to include: code descriptors, horizontal circle information, vertical circle information based on zenith, and slope distance expressed in feet. A sheet containing the explanation of the codes used to identify the various shots.
- C. A printout of the reduced and adjusted data represented by point number, station left or right of centerline, elevation, descriptor and coordinates of the point.
- D. A plot drawing, showing the control points used, points occupied and the radial observations expressed by point number.
- E. All cross section data shall be submitted in an unedited points file so it can be independently run through a DTM program by the Engineer.
- F. A cross section plot of each station shall be submitted to the Engineer for verification showing the following information:
 - o centerline or control line and station
 - o point of elevation and offset from centerline
 - o design grade road template with superimposed before and after excavation surfaces
 - o quantity of cut or fill expressed in cubic yards
 - o summary table of each sections cut or fill and total amount of quantities expressed in cubic yards

Article 2.14 As-Built Surveys and Record Drawings

Upon approval of the marked set of prints the Owner's Representative will provide the Contractor AutoCAD files, in the CBS's current version, of the contract drawings, for making of reproducible on "Mylar" film As-Built drawings, the costs of which shall be borne by the Contractor. The As-built plans shall be at the same scale as the construction plans. The year constructed shall be shown. These reproducibles shall be the hard copy submitted prior to final completion. In addition, the Contractor shall provide a CD containing all As-Built drawing files prior to final acceptance.

Employ only personnel who are proficient in the preparation of architectural or engineering drawings to standards satisfactory and acceptable to the Owner's Representative for the modification of the CAD files or to prepare additional new drawings.

All additions and corrections shall be neat, clean, and legible and shall match the adjacent existing line work, pen settings, and lettering being annotated in type, density, size, and style.

The Owner's Representative will review all "as-built" drawings for accuracy and conformance to the standards stated above. Contractor shall make all corrections, changes, additions, and deletions required to conform to those standards.

Delivery by the contractor of the approved "as-built" drawings and "as-built" CD, bearing certification of their correctness, to the Owner at the completion of the Contract shall be a condition for the acceptance of the Work and the authorization of final payment.

Buried or unmarked appurtenances are not acceptable reasons for not providing complete As-Built Plans. If necessary in order to provide the required information, the Contractor shall uncover and expose the appurtenances so that the necessary measurements may be obtained to provide complete As-Built Plans. The Contractor shall backfill all such excavations using methods and materials specified in the appropriate sections of the contract, to the satisfaction of the ENGINEER. All such work shall be solely at the CONTRACTOR's expense.

The following abbreviations and symbols shall be used on the Record Drawings to denote a deviation from the construction plan drawings:

- ASB "As-Built" - The actual horizontal, vertical, dimension, or quantity measured by survey after it has been constructed.
- F.C. "Field Change" - Revision or change of original design made in the field.
- "DELETED" - Not constructed.
- Revision clouds shall be utilized to delineate modifications on the final AutoCAD drawings.

Minimum requirements for construction of Record Drawings:

- o Record drawings shall be submitted on double matte 3 mil mylar sheets. In addition, the Contractor shall submit electronic record drawing files in current CBS AutoCAD version.
- o All pipelines, power, telephone, and telecommunication conductors and/or poles, street lights, pedestals, transformers, and other related items shall be clearly shown and identified in their as-constructed or as-found locations.
- o Swing-ties to prominent site features shall be provided for valves, curb stops and corporation stops in their as-constructed or as-found locations.
- o A straight line drawn through stationing, elevations, and notes shall show a change, deletion, or omission and shall be followed with the appropriate symbol.
- o Storm sewer, water, sanitary sewer, gas lines, or any construction that has been deleted or relocated will be cross-hatched.
- o Crossed out information should still remain legible.

- o The scale of new gas lines, water, sewer, or any new construction not shown should conform to the scale of the drawings.
- o Reference information used to prepare Record Drawings, such as change orders, and field books, shall be noted on the drawings.
- o Profile changes will be made with elevations or stationing only. The profile line need not be re-drawn unless the change is significant.
- o As-Builts for water, sewer, gas lines, and storm drain systems shall be accurate within 0.03 feet vertically and 0.5 feet horizontally. As-Built Information shall be referenced to existing subdivision survey control and/or monumented centerline of the right-of-way control.
- o As-Builts for structures shall be accurate to within one-half inch vertically and horizontally.
- o Provide photocopies of As-Built field notes daily for preceding day's work.
- o The name of the Record Drawing preparer, the employer, and the date of the preparation shall appear in the appropriate title block on each Record Drawing sheet.
- o Each As-Built Plan sheet shall be signed by the CONTRACTOR's Project Superintendent. Adjacent to the signature, the following statement shall appear:

"I hereby certify that the as-built measurements and modifications shown hereon were made by myself or under my direction, and are correct."

The construction of Record Drawings is incidental to other work and no measurement or payment will be made for this work.

Article 2.15 Method of Measurement

The method of measurement for surveying services shall be a lump sum cost item on the bid schedule, to be measured at the completion of this project. The lump sum cost for Construction Survey Measurement shall include all project control, project staking, monumentation, and quantities measurement for payment by unit price Work as required by the construction documents.

When the bid schedule contains an item, Three Person Survey Crew, the measurement will be the cost per hour for a crew. The item, Three Person Survey Crew, shall be used only for extra, additional, or unanticipated work required for changes in the project as directed by the Engineer. If staking for extra or unanticipated work is performed by a two person survey crew, payment shall be made at seventy-five (75) percent of the bid amount per hour of a three person crew. Additional survey work requiring one person shall be paid at forty-five (45) percent of the bid amount per hour of a three person crew.

When the bid schedule contains an item "Survey Monument Installed," the measurement shall be the cost to purchase the materials and install a monument (see Article 2.1.B.4 for monumentation specifications). When the bid schedule contains an item "Survey Monument Installed In Monument Case," the measurement shall be the cost to purchase the materials and install a monument in a monument case (see Article 2.1.B.4 for monument and case specifications).

Computer time is incidental to other work and will not be measured. Certified payrolls and daily time records are required for all work to be measured by the hour and survey monuments installed.

Article 2.16 Basis of Payment

Payment for this item shall be in accordance with Division 10, Standard General Provisions, Section 10.07, Measurement and Payment of this Specification, and shall include full payment for all work described in this section.

Payment shall be made under the following units:

ITEM	UNIT
Construction Survey Lump Sum	
Survey Monument Installed in Monument Case	Each
Survey Monument Installed	Each
Replace Disturbed Monument	Each
Three Person Survey Crew	Hour

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DIVISION 70
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**STANDARD CONSTRUCTION SPECIFICATIONS
MISCELLANEOUS**

SECTION 70.01 GENERAL

Article 1.1 Scope of Work

The Work covered by these Specifications consists of providing all plant, labor, equipment, supplies, materials, transportation, handling and storage, and performing all operations in connection with the adjustment and/or construction of miscellaneous facilities as provided in this Division.

Article 1.2 Applicable Standards

The latest revision of the following standards of the American Society for Testing and Materials (ASTM) and the American Association of State Highway and Transportation Officials (AASHTO) are hereby made a part of these Specifications.

ASTM A-112	Specification for Zinc-Coated (Galv.) Steel Tie Wires
ASTM A-120	Specification for Black and Hot-Dipped Zinc-Coated (Galv.) Welded and Seamless Steel Type for Ordinary Uses
ASTM A-121	Specification for Zinc-Coated (Galv.) Steel Barbed Wire
ASTM A-153	Specification for Zinc-Coated (Hot Dip) on Iron and Steel Hardware
ASTM A-227	Specification for Hard-Drawn Steel Spring Wire
ASTM A-307	Specification for Low-Carbon Steel Externally and Internally Threaded Standard Fasteners
ASTM A-392	Specification for Zinc-Coated Steel Chain Link Fence Fabric
AASHTO M-133	Specification for Preservatives and Pressure Treatment Processes for Timber
AASHTO M-145	Classification of Soils
AASHTO M-180	Specification for Corrugated Sheet Steel Beams for Highway Guardrail

SECTION 70.02 ADJUST MANHOLE CONE TO FINISH GRADE

Article 2.1 General

The Work under this Section consists of providing all operations pertaining to the adjustment of existing manhole cones to finish grade.

Article 2.2 Material

All materials used in the adjustment of manhole cones including mortar, steps, barrel sections, block, etc., shall conform to the requirements for manholes as outlined in Division 55 Standard Construction Specification for Storm Drain Systems, Section 55.04 - Manholes and Catch Basin Manholes. Radial concrete manhole blocks may be used for upward adjustments in certain cases if approved by the Engineer.

Article 2.3 Construction

The Contractor shall remove the existing cone and add to or remove portions of the barrel of each manhole requiring a cone adjustment. Any damage to manholes resulting from construction under this Contract shall be repaired or the damaged portion replaced at the Contractor's expense. All inverts, benchwalls, and/or catch areas shall be left clean and free from any foreign materials.

Article 2.4 Measurement

Manhole cone adjustments shall be measured as units, complete in place.

Article 2.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10 - Standard General Provisions, Section 10.07 - Measurement and Payment, of the Specifications, and shall include full payment for all Work described in Section 70.02.

Payment for cone adjustments shall include compensation for changes in height per the applicable Standard Details, unless otherwise directed by the Engineer. In no case will payment for both ring and cone adjustments be made for the same manhole.

Payment shall be made under the following unit:

ITEM	UNIT
Adjust Manhole Cone	Each
Adjust Catch Basin manhole Cone	Each

SECTION 70.03 ADJUST MANHOLE RING TO FINISH GRADE

Article 3.1 General

The Work under this Section consists of providing all operations pertaining to the adjustment of existing manhole rings to finish grade.

Article 3.2 Material

All materials used in the adjustment of manhole rings shall conform to the requirements for manholes as outlined in Division 55 - Standard Construction Specifications for Storm Drain Systems, Section 55.04 - Manholes and Catch Basin Manholes.

The Contractor may utilize Neenah R-1979 Series Manhole Adjusting Rings or an approved equal, for adjusting the manhole to finished grade.

Article 3.3 Construction

The Contractor shall adjust the manhole rings in accordance with the applicable Standard Details. Any damage to manholes resulting from construction under this Contract shall be repaired or the damaged portion replaced at the Contractor's expense.

Article 3.4 Measurement

Manhole ring adjustments shall be measured as units, complete in place.

Article 3.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10 - Standard General Provisions, Section 10.07 - Measurement and Payment, of these Specifications, and shall include full payment for all Work described in Section 70.03.

Payment for ring adjustment shall include full compensation for changes in height. In no case will payment for both ring and cone adjustments be made for the same manhole.

Payment shall be made under the following units:

ITEM	UNIT
Adjust Manhole Ring	Each
Adjust Catch Basin Ring	Each

SECTION 70.04 ADJUST STANDARD CATCH BASIN TO FINISH GRADE

Article 4.1 General

The Work under this Section consists of providing all operations pertaining to the adjustment of existing catch basins to finish grade.

Article 4.2 Material

All materials used in the adjustment of catch basins shall conform to the requirements for catch basins as outlined in Division 55 - Standard Construction Specifications for Storm Drain Systems, Section 55.06 - Construct Catch Basin.

Article 4.3 Construction

Rotational as well as vertical displacement of the catch basin top and casting might occur. All adjustments will be accomplished as directed by the Engineer. Any damage to catch basins resulting from construction under this Contract shall be repaired or the damaged portion replaced at the Contractor's expense.

Article 4.4 Measurement

Catch basin adjustments shall be measured as units, complete in place.

Article 4.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10 - Standard General Provisions, Section 10.07 - Measurement and Payment, of these Specifications, and shall include full payment for all Work described in Section 70.04.

Payment shall be made under the following unit.

ITEM	UNIT
Adjust Standard Catch Basin to Finish Grade	Each

SECTION 70.05 ADJUST BLOCK TYPE CATCH BASIN OR CATCH BASIN MANHOLE TO FINISH GRADE

Article 5.1 General

The Work under this Section consists of providing all operations pertaining to the adjustment of existing block type catch basin manholes to finish grade.

Article 5.2 Material

All material used in the adjustment of catch basins and catch basin manholes shall conform to the requirements for catch basin manholes as outlined in Division 55 - Standard Construction Specifications for Storm Drain Systems, Section 55.04 - Manholes and Catch Basin Manholes.

Article 5.3 Construction

The Work consists of lifting the pre-cast concrete slab and adding or removing concrete blocks as required. Any grout used in bond beam construction shall conform to Class B concrete course aggregate Size 7 (ASTM C-33), maximum 6" slump. All damage to catch basin manholes resulting from construction under this Contract shall be repaired or the damaged portion replaced at the Contractor's expense. All inverts, benchwalls, and/or catch areas shall be left clean and free from any foreign materials.

Article 5.4 Measurement

Adjustments shall be measured as units, complete in place.

Article 5.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10 - Standard General Provisions, Section 10.07 - Measurement and Payment, of these Specifications, and shall include full payment for all Work described in Section 70.05.

Payment shall be made under the following units.

ITEM	UNIT
Adjust Block Type Catch Basin Manhole to Finish Grade	Each
Adjust Block Type Catch Basin to Finish Grade	Each

SECTION 70.06 RELOCATE CATCH BASIN OR CATCH BASIN MANHOLE

Article 6.1 General

The Work under this Section consists of providing all operations pertaining to relocating of existing catch basin or catch basin manholes.

Article 6.2 Material

All materials used in relocation of catch basins or catch basin manholes shall conform to the requirements for catch basins as outlined in Division 55 - Standard Construction Specifications for Storm Drain Systems, Section 55.04 - Manholes and Catch Basin Manholes, and Section 55.06 - Construct Catch Basin.

Article 6.3 Construction

The Contractor's attention is called to the fact that he may be required to relocate more than one type of catch basin or catch basin manholes under this Contract. All excavation, trenching and backfill necessary for the removal and relocation shall be considered incidental to this item. The Contractor shall backfill the excavation with suitable, nonfrost susceptible material and compact it to not less than ninety-five (95) percent of maximum density as directed by the Engineer. If additional material is required for backfill it will be paid for under the item "Furnish Trench Backfill." Existing leads may require relocation up to a maximum length of 15' to provide proper alignment. Such relocation shall be considered incidental to the item. Any pipe leads in addition to this fifteen (15) feet will be paid for under Division 55. Relocation of existing pipe leads and any additional pipe leads shall be incidental Work. Pipe used shall be the same size and type as the existing leads. The relocated catch basin or catch basin manholes shall be adjusted to finish grade as directed by the Engineer.

Article 6.4 Measurement

Relocation of catch basins or catch basin manholes will be measured on a basis of units complete in place at the new location and accepted by the Engineer.

Article 6.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10 - Standard General Provisions, Section 10.07 - Measurement and Payment, of these specifications, and shall include full payment for all Work described in Section 70.06.

Payment shall be made under the following units:

ITEM	UNIT
Relocate Existing Catch Basin	Each
Relocate Existing Catch Basin	
Manhole	Each

SECTION 70.07 REMOVE EXISTING MANHOLE OR CATCH BASIN

Article 7.1 General

The Work under this Section consists of providing all operations pertaining to the removal and disposal or salvage of existing manholes or catch basins.

Article 7.2 Construction

Materials that are to be salvaged shall be removed in a workman-like manner and delivered to a site as directed by the Engineer. A disposal site for non-salvageable materials shall be provided by the Contractor.

Any excavation required in the removal shall be considered incidental to this item. The Contractor shall backfill the excavation with a suitable, non-frost susceptible material and compact it to not less than ninety-five (95) percent of maximum density as directed by the Engineer. If additional material is required for backfill, it will be paid for under the Item "Furnish Trench Backfill." Existing pipes shall be suitably plugged and abandoned unless otherwise noted.

Article 7.3 Measurement

Removal of existing manholes or catch basins will be measured as units.

Article 7.4 Basis of Payment

Payment for this Work shall be in accordance with Division 10 - Standard General Provisions, Section 10.07 - Measurement and Payment, of these specifications, and shall include full payment for all Work described in Section 70.07.

Payment shall be made under the following units:

ITEM	UNIT
Remove Existing Manhole	Each
Remove Existing Catch Basin	Each

SECTION 70.08 ADJUST MAINLINE VALVE BOX TO FINISH GRADE

Article 8.1 General

The Work under this Section consists of providing all operations pertaining to adjustment of existing mainline or hydrant valve boxes to finish grade including the replacement of any and all broken valve box sections, lids and dust pans.

Article 8.2 Material

All materials used in the adjustment of mainline valve boxes shall conform to the requirements of the utility company having jurisdiction over the water system.

Article 8.3 Construction

All valve box adjustments will be accomplished as directed by the Engineer. Any damage to a mainline valve box resulting from construction under this contract shall be repaired or the damaged portion replaced at the Contractor's expense. The Contractor shall be responsible to assure that the valve box is vertical, clean, to proper grade and readily accessible for operation of the valve.

Contractor shall adjust the valve box to finish grade prior to placement of asphalt pavement. After-the-fact cutting of new asphalt for adjustments will not be accepted. Any adjustment(s) requiring cutting of new asphalt will not be paid and will be deducted from the plan quantity.

Article 8.4 Measurement

Mainline valve box adjustments will be measured per unit, complete in place.

Article 8.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10 - Standard General Provisions, Section 10.07 - Measurement and Payment, of these specifications, and shall include full payment for all Work described in Section 70.08.

Payment shall be made under the following unit:

ITEM	UNIT
Adjust Mainline Valve Box to Finish Grade	Each

SECTION 70.09 ADJUST SERVICE VALVE BOX TO FINISH GRADE

Article 9.1 General

The work under this Section consists of providing all operations pertaining to adjusting existing service valve boxes to finish grade.

Article 9.2 Material

All materials used in the adjustment of service valve boxes shall conform to the requirement of the utility company having jurisdiction over the water system.

Article 9.3 Construction

All valve box adjustments shall be accomplished as directed by the Engineer. Any damage to service valve boxes resulting from construction under this Contract shall be repaired or the damaged portion replaced at the Contractor's expense. The Contractor shall be responsible to assure that the valve box is vertical, clean, to proper grade, and readily accessible for operation of the valve.

Contractor shall adjust the service valve box to finish grade prior to placement of asphalt pavement. After-the-fact cutting of new asphalt for adjustments will not be accepted. Any adjustment(s) requiring cutting of new asphalt shall not be paid and shall be deducted from the plan quantity.

Article 9.4 Measurement

Service valve box adjustments shall be measured per unit, complete in place.

Article 9.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10 - Standard General Provisions, Section 10.07 - Measurement and Payment, of these specifications, and shall include full payment for all Work described in Section 70.09.

Payment shall be made under the following unit:

ITEM	UNIT
Adjust Service Valve Box to Finish Grade	Each

SECTION 70.10 ADJUST CLEANOUT TO FINISH GRADE

Article 10.1 General

The Work under this Section consists of providing all operations pertaining to adjustment of existing cleanouts to finish grade.

Article 10.2 Material

All materials used in the adjustment of cleanouts shall conform to the requirements for cleanouts as outlined in the Division 50 - Standard Construction Specifications for Sanitary Sewers, Section 50.12 - Construct Cleanout, Division 55 - Standard Construction Specifications for Storm Drain Systems, Section 55.09 - Construct Cleanout.

Article 10.3 Construction

The Contractor's attention is called to the fact that he may be required to adjust more than one type of cleanout under this Contract. All adjustments will be accomplished as directed by the Engineer. Any damage to cleanouts resulting from construction under this Contract shall be repaired or the damaged portion replaced at the Contractor's expense.

Contractor shall adjust the cleanout to finish grade prior to placement of asphalt pavement. After-the-fact cutting of new asphalt for adjustments will not be accepted. Any adjustment(s) requiring cutting of new asphalt shall not be paid and shall be deducted from the plan quantity.

Article 10.4 Measurement

Cleanout adjustments will be measured per unit, complete in place.

Article 10.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10 - Standard General Provisions, Section 10.07 - Measurement and Payment, of these specifications, and shall include full payment for all Work described in Section 70.10.

Payment shall be made under the following unit:

ITEM	UNIT
Adjust Cleanout to Finish Grade	Each

SECTION 70.11 RAISE OR LOWER SEWER SERVICE

Article 11.1 General

The Work under this Section consists of all operations pertaining to raising or lowering existing sanitary sewer services when the grade(s) of such services interfere with a utility under construction. Every effort has been made in the preparation of the Drawings to avoid conflict in grades with existing sewers; however, there may be some locations where conflict occurs.

Article 11.2 Construction

Where a conflict in grade occurs, the Contractor will be required to excavate the sewer service from the point of interception sufficient distance to raise or lower the sewer service such that the grade conflict will be eliminated, and a minimum of 2%, or 1/4" fall per foot will be maintained in the service. In no case will the length of raising or lowering of the sanitary sewer service exceed fifty (50) feet. All excavation, backfill, and pipe laying shall be performed in accordance with the provisions of Division 20.00 - Standard Construction Specifications for Earthwork and Division 50.00 - Standard Construction Specifications for Sanitary Sewers of these Specifications.

Article 11.3 Measurement

Raising or lowering sewer services will be measured as units, complete in place.

Article 11.4 Basis of Payment

Payment for this Work shall be in accordance with Division 10 - Standard General Provisions, Section 10.07 - Measurement and Payment, of these Specifications, and shall include full payment for all Work described in Section 70.11 unless otherwise noted. Any materials needed to complete the raising or lowering of a sewer service shall be provided by the Contractor and considered incidental to the price bid for this item. Compaction, where required will also be considered incidental to the price bid.

Payment shall be made under the following unit:

ITEM	UNIT
Raise or Lower Sewer Service	Each

SECTION 70.12 RESET FENCE

Article 12.1 General

The Work under this Section consists of providing all operations pertaining to resetting any existing fence.

Article 12.2 Material

All materials which can be re-used shall be salvaged from the existing fence. Those materials which cannot be salvaged or are damaged by the Contractor's operations shall be replaced, at the Contractor's expense, with new materials which as nearly as possible duplicate the kind and quality of materials in the original installation.

Nails, staples, fastening wires or devices, and all materials required for the construction of such anchors, end posts or other portions of the fence which can be replaced more efficiently than they can be moved, shall be furnished by the Contractor.

If the property owner elects to replace any of the existing fencing materials with other materials in better condition, he shall furnish and deliver such materials to the site of the Work.

Article 12.3 Construction

The fence shall be set in close conformity with the line shown on the plans or as directed by the Engineer. Posts and anchors shall be set at the same depth and spacing as in the original fence. Wire shall be drawn taut but care shall be taken to avoid over-stressing the salvaged materials. Permanent anchors, end posts or other parts which cannot be economically moved shall be replaced by equivalent construction. If any new materials require painting, they shall be painted to match the original materials as nearly as possible. If a match cannot be attained to the satisfaction of the Engineer, the entire fence will be painted. The reset fence shall be placed in at least as good condition as the existing fence before it was moved.

Article 12.4 Measurement

Resetting fence will be measured by length in linear feet in its final position.

Article 12.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10 - Standard General Provisions, Section 10.07 - Measurement and Payment, of these specifications, and shall include full payment for all Work described in Section 70.12.

Payment shall be made under the following unit:

ITEM	UNIT
Reset Fence	Linear Foot

SECTION 70.13 GUARDRAIL

Article 13.1 General

The Work under this Section consists of providing all operations pertaining to the construction of guardrails.

Only one type of material shall be used on any one specific guardrail installation, unless otherwise approved by the Engineer.

Article 13.2 Material

a. Steel rail elements shall be used conforming to the requirements of AASHTO M-180, Class B unless a lighter weight rail is specifically called for on the Drawings or in the Specifications. Terminal sections shall not be less than twelve (12) gauge.

b. The bolts and nuts shall be galvanized steel and shall conform to the requirement of ASTM A-153, Class C and ASTM A-307.

c. Guardrail posts shall be of either wood or steel as specified.

- 1) Wood posts shall be grade posts and timbers, or better, as rated by the West Coast Lumber Inspection Bureau, and shall be fabricated from one of the following timber species, unless otherwise approved: a) Douglas Fir; b) Western Pine; c) Larch, or; d) Hemlock. The length and cross section of the posts shall be as shown on the Standard Details unless otherwise noted. Timber posts shall be treated with one of the following preservative treatments: a) Creosote Oil; b) Creosote-coal tar solution; c) Creosote-petroleum solution; d) Pentachlorophenol. Preservative treatments for wood shall conform to the applicable requirements of AASHTO M-133.
- 2) Steel posts shall be of the section and length as specified or as shown on the plans. They shall be of copper bearing steel when so specified. Steel shall conform to the requirements of ASTM A 36 for the grade specified, or, for new railroad rail posts, of ASTM A 1 for the unit weight of rail specified.

The posts shall be galvanized or shop painted as may be specified.

Article 13.3 Construction

The construction of guardrails shall be in conformance with the manufacturer's recommendations, the Standard Details and as directed by the Engineer.

Article 13.4 Measurement

Guardrails will be measured per linear foot along the face of the rail, including end sections.

Article 13.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10 - Standard General Provisions, Section 10.07 - Measurement and Payment, of these specifications, and shall include full payment for all Work described in Section 70.13.

Payment shall be made under the following unit:

ITEM	UNIT
Guardrail (including gage)	Linear Foot

SECTION 70.14 SEWER ENCASUREMENT

Article 14.1 General

The Work under this Section consists of providing all operations pertaining to encasing sewer mains with concrete as shown on the Drawings or directed by the Engineer.

Article 14.2 Construction

A sewer line that **is not** designed to the same requirements as a potable water pipe (for example: concrete or steel pipe) must be concrete-encased or double-pipe-encased with structural support if:

1. it crosses above a water main;
2. it runs within a closer horizontal distance of ten feet (10') to a water main; or
3. the vertical separation is less than eighteen inches (18") edge to edge (outside diameter) of a water main.
4. it crosses above or below a water main at any vertical distance where the sewer line joints are less than nine feet (9') from the water line joints.
5. it is required otherwise by local, state or federal standard/regulation.

A sewer line that **is** designed to the same requirements as a potable water pipe such as ductile iron or a non-shearing equal must be concrete-encased or double-pipe-encased with structural support when:

1. it has a vertical separation distance of less than eighteen inches (18") edge to edge of a water main, or
2. it crosses above or below a water main and the sewer line joints are less than nine feet (9') from water line joints (measured horizontally from the intersection of the crossing).
3. it cannot withstand a pressure test to ensure watertightness.
4. it is required otherwise by local, state, or federal standards/regulations.

In any case, the Engineer may direct encasement to protect the integrity of the water or sewer system. Design plans, reports, or drawings supporting a request for a lesser vertical or horizontal distance between water and sewer lines must be sealed by a registered engineer.

Encasement, as required above, shall envelop the sewer line for a distance of ten feet (10') each side of a crossing. The thickness of encasement, including that of the pipe joints, shall not be less than four

inches (4"). Where the eighteen inch (18") vertical separation cannot be maintained, the water main shall be relocated (or constructed) as in Division 70.00, Section 70.17, "Relocate Water Main." (Refer to the Standard Details for these Specifications.)

Welded wire fabric or other types of wire mesh, approved by the Engineer, shall be placed around the sewer main prior to encasement with concrete to minimize cracking. Construction of concrete encasement will be in accordance with the applicable Standard Details of these Specifications. Ductile-iron encasement may be substituted for concrete when approved by the Engineer.

Article 14.3 Measurement

Encasing sewer mains with concrete will be measured by each encasement. Excavation in excess of normal trench excavation required to install the encasement shall be considered incidental.

Article 14.4 Basis of Payment

Payment for this Work shall be in accordance with Division 10 - Standard General Provisions, Section 10.07 - Measurement and Payment, of these Specifications, and shall include full payment for all Work described in Section 70.14.

Payment shall be made under the following unit:

ITEM	UNIT
Sewer Encasement	Each
Sewer Encasement	Lineal Foot

SECTION 70.15 RELOCATE WATER MAIN

Article 15.1 General

The Work under this Section consists of providing all operations pertaining to relocating water mains. In the preparation of the Drawings, efforts have been made to determine exact elevations of live utilities; however, elevations of utilities shown are not represented as exact and are shown to include approximate location only. The Engineer shall have the final say as to whether the main is raised or lowered.

Article 15.2 Construction

Where a water main crosses the location of a sewer, the water main shall be raised or lowered sufficiently to permit a minimum (outside diameter) vertical distance of 18 inches (18") from the sewer line. If the water main elevation is below the sewer line elevation refer to Section 70.16, "Sewer Encasement." The Contractor may employ either of the following methods for raising or lowering a water main. He may raise or lower lengths of the water main as necessary on either side of the proposed sewer to allow the main to pass under or over the sewer, providing the deflection at any joint does not exceed the pipe manufacturers recommendations, or the water main may be raised or lowered using four (4) pipe bends not to exceed 22-1/2 deg. In special cases only, and when approved by the Engineer in advance, 45 deg. bends may be used. The method of lowering and materials to be used shall be approved by the Engineer prior to commencing work. The Contractor shall give forty-eight (48) hours notice to the Utility and Engineer, prior to any planned water shut-off.

Water lines two (2) inches in diameter and smaller shall not be construed as water mains. Any necessary lowering of water lines two (2) inches and smaller shall be included under the conditions set forth in the General Provisions for the moving and relocation of utilities occupying space within the area of construction. With the approval of the Engineer, the Contractor may lower water lines two inches (2") in diameter and smaller, but separate payment shall not be made for such lowering. The cost shall be included in the unit bid price for "Trench Excavation and Backfill".

Article 15.3 Measurement

Raising or lowering existing water mains will be measured as units complete in place without regard to the diameter of the water main or length required to be lowered.

Article 15.4 Basis of Payment

Payment for this Work shall be in accordance with Division 10 - Standard General Provisions, Section 10.07 - Measurement and Payment, of these Specifications, and shall include full payment for all Work described in Section 70.15.

Payment shall be made under the following units:

ITEM	UNIT
Raise or Lower Existing Water Main	Each

SECTION 70.16 INSULATION

Article 16.1 General

The Work under this Section consists of performing all operations including labor and materials pertaining to the placement of insulation for roadway construction. The insulation board shall be a polystyrene insulation, extruded or expanded, in conformance with the drawings and these specifications.

The Work under this Section shall also include shaping and compacting a level area under the horizontal insulation boards and placing the insulation as indicated on the plans.

Article 16.2 Materials

The insulation board shall have a minimum full board size of 2' x 8', have the specified R-Value or better, and shall conform to the requirements of AASHTO M230, except that extrusion is not required.

R-Value of insulation shall be based on manufacturer's warranted R-Value. The insulation board shall be rigid, homogeneous, and conform to the following:

Property	Test Method	Value
Compressive Strength psi, minimum at yield or 5 percent strain	ASTM D-1621	60.0
Water Absorption, maximum percent by volume	AASHTO M230	0.10
Thermal Resistance, minimum R-Value at 75°F, °F-Ft ² - Hr/BTU	ASTM C-177	As Specified (R=4.5, min.)

Article 16.3 Construction

The insulation board shall be installed with staggered joints. Layering of insulation to obtain the specified R-Value shall be allowed as long as joints are overlapped at least one foot. Prior to placing the insulation board, the area shall be bladed, shaped, and compacted in accordance with CBS Division 20 Standard Specifications for Earthwork. The subgrade shall be shaped to the lines and grades shown on the drawings and provide a smooth surface on which to place the insulation board. Prior to placing the insulation board on the prepared subgrade, the Contractor shall furnish straightedges to the Inspector for checking surface uniformity. Surface irregularities shall not exceed one inch within eight feet, or 3/8 inch in two feet. The subgrade shall be uniformly compacted. Ridges left by the compaction equipment shall be hand-raked smooth and recompacted.

The horizontal insulation boards shall be set accurately to the line and grade established and in such a manner as to hold the board firmly in place by mechanically connecting it to the subgrade.

Contractor shall replace or repair any insulation panels broken, crushed, or cracked, as determined by the Engineer, at no cost to the Owner.

The insulation board shall be covered with approved D-1 Bedding material, placed to six-inches (6”) above the insulation, and compacted for the full width of the insulation layer prior to placing subsequent lifts. Placing, spreading, and all compaction shall be accomplished in such a manner as not to damage the insulation board. Spreading and compacting equipment shall be approved prior to its use.

Article 16.4 Measurement

The insulation board shall be measured per square foot regardless of thickness, complete and accepted in place.

Additional Work required for preparing the subgrade to the smoothness required shall be considered incidental to the bid item “Insulation Board” and no separate payment shall be made.

Article 16.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10 - Standard General Provisions, Section 10.07 - Measurement and Payment, of these Specifications, and shall include full payment for all Work described in Section 70.16.

Payment shall be made under the following unit:

ITEM	UNIT
Insulation Board (Thickness)	Square Foot

SECTION 70.17 TRAFFIC MARKINGS

Article 17.1 General

The Work under this Section consists of performing all operations pertaining to furnishing all materials and placing painted traffic markings, applying glass spheres thereto, and methyl methacrylate traffic markings. All Work shall be in accordance with these specifications and shall be placed at the locations shown on the plans.

Article 17.2 Materials

- a. Paint for Traffic Markings - General Requirements
 - 1) The Contractor shall furnish the name of the company that will manufacture the paint and the location of the plant from where shipments will be made. No material shall be shipped by the manufacturer until it has been sampled, tested, and approved.
 - 2) Traffic Lane Paint shall conform to AASHTO M248, Type III F.
- b. Glass Spheres for Reflectoring Highway Pavement Markings. Reflective Glass Beads shall conform to AASHTO M247 Type I, and shall be supplied with a moisture-resistant coating.
- c. Methyl Methacrylate Pavement Markings
 1. General Requirements:
 - a. Methyl methacrylate traffic markings shall be manufactured and formulated from new materials and shall be free from defects and imperfections that might adversely affect the serviceability of the finished product. Traffic markings shall be free from dirt and other foreign material such as, but not limited to, surface oils or existing road marking materials, and shall cure to a tough serviceable film within the time specified by the manufacturer.
 - b. Methyl methacrylate traffic markings shall be a spray-applied, ambient temperature curing, two-component system for application on either asphalt or cement concrete surfaces. Traffic markings shall be composed of a Part "A" methyl methacrylate based resin and Part "B" benzoyl peroxide in liquid plasticizer. The mix ratio shall be four parts of "A" to one part of "B."
 - c. Glass beads for drop-on applications shall be those recommended in writing by the traffic marking material manufacturer and approved by the Engineer.

- d. Methyl methacrylate traffic markings shall be Dura-Stripe Type V, manufactured by:
Morton Traffic Markings
1675 Commercial Street N.E.
Salem, Oregon 97303
Phone (503) 364-2277,

or an approved equal.

Article 17.3 Construction

a. General

This work shall be done as soon as possible after paving is completed to facilitate traffic.

b. Paint Color

All pavement markings shall conform to the colors shown on the plans.

c. Preparation of Surface

Paint will not be applied to pavements which are excessively dirty, damp, or cold. Paint shall not be applied when the pavement temperature is less than 40 degrees F.

All dirt, oil, grease, and other foreign matter shall be removed from the areas of the pavement upon which the traffic markings are to be painted by an approved method.

d. Types of Lines

The type and color of the lines shall be as shown on the plans.

e. Width of Lines

The width and spacing of all lines shall be shown on the plans.

f. Application

1) Paint

- a) The paint shall be applied with atomizing spray type striping machine, approved by the Engineer. The markings shall have clear-cut edges, true and smooth alignment and uniform film thickness. The wet film thickness shall be 17 mils with a nominal variation not to exceed 2 mils.

- b) The wet film thickness of the in-place paint shall be measured as follows:
- c) Convenient to the location where the road service lines will be placed, test lines shall be laid to adjust the pavement-marking machine. In the path of the test line laid without glass spheres, place a weighted sheet of aluminum foil 18 by 11-inch, thumbtacked to a 3/4-inch plywood board. Immediately after the motorized striper (spraying a 4-inch strip along the 18-inch dimension of aluminum foil) passes over the aluminum foil, quickly roll it up, slip an elastic band over the roll, and weigh it to the nearest 0.1 g. within 30 sec. from the net weight of paint on the foil and the weight per gallon of the sample, calculate the film thickness using the following formula.

$$\begin{aligned} \text{Film thickness, in} &= \frac{A \times 231}{453.6 \times 18 \times 4 \times B} \\ &= \frac{A \times 0.007073}{B} \end{aligned}$$

Where: A = Weight of paint on foil in grams.

B = Weight per gallon of sample in pounds.

- 2) Methyl Methacrylate
 - a. The roadway areas to receive the methyl methacrylate pavement markings shall be prepared in accordance with this Section and the manufacturer's recommendations. Contractor shall submit a current copy of manufacturer's recommendations at least five working days prior to application of traffic markings.
 - b. Methyl methacrylate pavement markings shall be applied at a minimum thickness of 60 mils. The thickness will be measured without glass beads.
 - c. A manufacturer's representative shall be present on the first day of striping for each type (sprayed or extruded) and any additional days as required by the Engineer.
 - d. Striping shall not be applied to new asphalt until the asphalt has cured to the satisfaction of manufacturer's representative or the Engineer.
 - e. The minimum application rate of beading on sprayed markings shall be 20 pounds of beads per gallon and 12 pounds of beads per 100 square feet for extruded markings.
 - f. The surface temperature of the roadway shall be in the range of 30° to 105° Fahrenheit for stripe application. The roadway surface shall be thoroughly clean and dry.

g. Methyl methacrylate stripe material shall be applied with equipment designed and capable of properly mixing at the point and time of application in accordance with the manufacturer's recommendations.

3) Glass Beads

a) Glass beads shall be applied over the wet painted stripes in a uniform pattern at the rate of five pounds of glass beads per gallon of paint. The bead dispensers shall be of a type that will mechanically and automatically give such performance. Glass beads shall be applied to all painted traffic markings by the drop-on method.

h. Paint Removal

Pavement markings shall be removed to the fullest extent possible from the pavement by any method that does not materially damage the surface or texture of the pavement or surfacing. Sand or other material deposited on the pavement as a result of removing traffic stripes and markings shall be removed as the work progresses. Accumulations of sand or other material which might interfere with drainage or might constitute a hazard to traffic will not be permitted.

Pavement markings no longer applicable which may create confusion in the minds of motorists shall be removed or obliterated before any change is made in the traffic pattern.

Pavement markings shall be removed by such methods that will cause the least possible damage to the pavement or surfacing. Any damage to the pavement or surfacing caused by pavement marking removal shall be repaired by the Contractor at his expense by acceptable methods.

Where blast cleaning is used for the removal of pavement markings or for removal of objectionable material, and such removal operation is being performed within 10 feet of a lane occupied by public traffic, the residue, including dust shall be removed immediately after contact between the sand and the surface being treated. Such removal shall be by a vacuum attachment operating concurrently with the blast cleaning operation, or by another approved methods.

i. Preliminary Spotting

The Contractor will provide the necessary control points at intervals including all changes of direction and changes in the basic configuration of striping such as at the beginning and ending of no-passing zones on a two-way, two-lane roadway. These points shall be used in preliminary spotting of lines before striping is commenced. The Contractor shall be responsible for preliminary spotting of the lines to be painted and he must obtain approval for all his spotting before striping may begin. Preliminary spotting is required for all longitudinal striping.

j. Tolerances of Lane Striping

The Contractor shall keep his work within the following allowable tolerances:

- 1) Length of stripe. The longitudinal error within a 40-foot length of lane line shall not be more than plus or minus 6 inches.
- 2) Width of stripe. The width of stripe shall not vary more than plus or minus ½ inch.

Article 17.4 Measurement

Method of measurement for all yellow and white methyl methacrylate traffic markings will be measured by length in linear foot of traffic marking of the specified width in its final position.

Removal of traffic stripes and pavement markings as well as repair of any damaged pavement or surfacing caused by the pavement marking removal operations shall be incidental to other items of work.

Article 17.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10 - Standard General Provisions, Section 10.07 - Measurement and Payment of these Specifications, and shall include full payment for all work described in Section 70.17.

Payment for traffic markings shall be full compensation for cleaning of pavement, and application of painted traffic markings, application of methyl methacrylate traffic markings, glass beads, furnishing paint, methyl methacrylate, and all other materials necessary to complete the Work described in this Section.

Payment shall be made under the following units:

ITEM	UNIT
Traffic Markings (width-color)	Linear Foot
Painted Traffic Markings	Linear Foot
Traffic Markings Words and Legends	Lump Sum

SECTION 70.18 STANDARD SIGNS

Article 18.1 General

This work shall consist of furnishing and installing signs, guide markers, object markers and mileposts. The sign location and type of installation will be as shown on the plans or as designated. Work under this section shall also include removal and relocation, as well as removal and disposal of existing signs, mileposts, and markers.

Article 18.2 Materials

All standard regulatory, warning, and guide signs for permanent installation shall be fabricated with Type I Level A (encased lens) reflective sheeting and single-span aluminum panels unless otherwise designated on the plans.

All orange construction and maintenance signs shall be fabricated with Type II (encapsulated lens) reflective sheeting and either single-span sheet aluminum panels.

All new standard signs for permanent installation shall be of new materials. All sign layouts, if not shown on the plans, shall be in accordance with "Alaska Sign Design Specifications". Any sign delivered or installed which does not conform to these specifications shall be replaced by the Contractor at no additional cost to the City.

Aluminum Sheet

The sheet aluminum shall be alloy 6061-T or alloy 5155-H36 as specified in ASTM B 209. The thickness of the aluminum sheet shall be as .080 inches unless otherwise specified. Alloy and temper designations shall be verified by mill certification.

The aluminum base metal sheets shall be treated with chromate conversion coating for aluminum conforming to the requirements of ASTM B-449, Class 2. The cleaned and coated base metal shall be handled only by mechanical device or by operators wearing clean cotton or rubber gloves. After cleaning and coating operation, the panels shall be protected at all times from contact or exposure to greases, oils, dust, or other contaminants.

A sign panel shall be a continuous sheet for all lengths 72 inches or less in the horizontal directions. Sign panels longer than 72 inches may be constructed of more than one panel. No more than one vertical splice may be used for signs up to 144 inches in length and 48 inches or less in height. Sign panels larger than 48 inches in height may have more than one vertical splice.

The Dimensional Tolerance of the panels shall be 1/16 inch. Metal panels shall be cut to size and shape and shall be free of buckles, warp, dents, cockles, burrs, and any other defects resulting from

fabrication. All possible fabrication, including shearing, cutting and punching of holes shall be completed prior to the base metal preparation.

Concrete for light sign structure embedment shall conform to Class B-3 under Section 30.01.

**TABLE 730-1
COLOR SPECIFICATION LIMITS AND REFERENCE STANDARDS
TYPE I SHEETING**

Color	Chromaticity Coordinates* (Corner Points)								Reflectance Limits (%Y)		Ref. Std. (Munsell Papers)
	1 x	y	2 x	y	3 x	y	4 x	y	Min.	Max.	
White**	.305	.290	.350	.342	.321	.361	.276	.308	35	--	6.3GY 6.77/0.8
Red	.602	.317	.664	.336	.644	.356	.575	.356	8	12	8.2R 3.78/14.0
Orange	.535	.375	.607	.393	.582	.417	.535	.399	18	30	1.5YR 5.5/14.0
Brown	.445	.353	.604	.396	.556	.443	.445	.386	4	9	5.0YR 3/6
Yellow	.482	.450	.532	.465	.505	.494	.475	.485	29	45	1.25Y 6/12
Green	.135	.385	.175	.405	.155	.460	.110	.440	4	9	0.65BG 2.84/8.45
Blue	.147	.075	.176	.091	.176	.151	.106	.113	2	4	5.8PB 1.32/6.8

*The four pairs of Chromaticity coordinates determine the acceptable color in terms of the CIE 1931 standard colorimetric system measured with standard illumination source C.

**Silver white is an acceptable color designation.

**TABLE 730-2
COLOR SPECIFICATION LIMITS AND REFERENCE STANDARDS
TYPE I SHEETING**

Color	Chromaticity Coordinates* (Corner Points)								Reflectance Limits (%Y)		Ref. Std. (Munsell Papers)
	1 x	y	2 x	y	3 x	y	4 x	y	Min.	Max.	
White**	.303	.287	.368	.353	.340	.380	.274	.316	27	--	5.0PB 7/1
Red	.613	.297	.708	.292	.636	.364	.558	.352	2.5	11	7.5R 3/12
Orange	.550	.360	.630	.370	.581	.418	.516	.394	14	30	2.5YR 5.5/14
Yellow	.498	.412	.557	.442	.479	.520	.438	.472	15	40	1.25Y 6/12
Green	.030	.380	.166	.0346	.286	.428	.201	.776	3	8	10G 3/8
Blue	.144	.030	.244	.202	.190	.247	.066	.208	1	10	5.8PB 1.32/6.8

*The four pairs of Chromaticity coordinates determine the acceptable color in terms of the CIE 1931 standard colorimetric system measured with standard illumination source C.

**Silver white is an acceptable color designation.

Sheet Reflective Materials

The sheeting shall have a pre-coated adhesive backing protected by a removable liner and shall be either of the following two types as detailed on the plans or specified in the Special Provisions.

Type I enclosed lens sheeting shall conform to AASHTO M 268, except that Table 730-1 shall be substituted for Table 1.

Type II encapsulated lens sheeting shall conform to AASHTO M 268 and to the following additional requirements:

1. Color Requirements. Through instrumental color testing the diffuse day color of the sheeting shall conform to the requirements of Table 730-2.
2. Reflective Intensity. The reflective sheeting shall have minimum reflective values at 0.2° and 0.5° divergence, as shown in Table 730-3, expressed as candlepower per foot candle per square foot.

TABLE 730-3
MINIMUM SPECIFIC INTENSITY PER UNIT AREA (SIA)

(Candelas Per Foot-candle Per Square Foot)
TYPE III SHEETING
A-Glass Bead Retro-Reflective Element Material

Observation Angle (°)	Angle (°)	White	Red	Orange	Yellow	Entrance	
						Green	Blue
0.2	.4	250	45	100	170	45	20.0
0.2	+30	150	25	60	100	25	11.0
0.5	.4	95	15	30	62	15	7.5
0.5	+30	65	10	25	45	10	5.0

Color Testing

Color testing shall be determined in accordance with ASTM E 97, "Standard Method of Test for 45 Degree, 0-Degree Directional Reflectance of Opaque Specimens by Filter Photometry." (Geometric characteristics must be confined to illumination within 10 degrees of, and centered about a direction of 45 degrees from the perpendicular to the test surface; viewing is within 15 degrees of, and center about, the perpendicular to the test surface. Conditions of illumination and observation must not be interchanged.) The standards to be used for reference shall be the MUNSELL PAPERS designated in Tables 730-1 and 730-2. The papers must be recently calibrated on a spectrophotometer. The test instrument shall be one of the following approved equal:

1. GARDNER multipurpose Reflectometer or Model XL20 Color Difference Meter.
2. GARDNER Model AC-2a Color Difference Meter or Model XL30 Color Difference Meters.
3. MEECO Model V Colormaster.
4. HUNTERLAB D25 Color Difference Meter.

Specular Gloss

The reflective sheeting shall have an 85 degree specular gloss of not less than 40 for types I and II when tested in accordance with ASTM D 523.

Color Processing

The sheeting shall permit cutting and color processing with compatible transparent and opaque process inks in accordance with the manufacturer's recommendation at temperatures of 60° F. to 100° F. and relative humidity R.H. at 20 to 80 percent. The sheeting shall be heat resistant and permit force curing without straining of applied or unapplied sheeting at temperatures as recommended by the manufacturer.

Color processing for Type III material shall be restricted to sheeting with that activated adhesive backing unless otherwise recommended by the manufacturer.

Shrinkage

A 9-inch by 9-inch reflective sheeting specimen with liner shall be conditioned a minimum of 1 hour at 72° F and 50 percent relative humidity. The liner shall be removed and the specimen placed on a flat surface with adhesive side up. Ten minutes after liner is removed and again after 24 hours, the specimen shall be measured to determine the amount of dimensional change. The reflective sheeting shall not shrink in any dimension more than 1/32 inch in 10 minutes nor more than 1/8 inch in 24 hours.

Flexibility

Types I and II Sheeting Material: The sheeting, applied according to the manufacturer's recommendations to a clean, etched 0.020-inch by 2-inch by 8-inch aluminum panel of alloy 6061-T6 conditioned a minimum of 48 hours and tested at 72° F and 50 percent relative humidity shall be sufficiently flexible to show no cracking when bent around a 3/4 inch mandrel.

Non-adhesive sheeting shall show no signs of cracking or crazing when flexed repeatedly over a 1/16-inch mandrel to 180° at 72° F.

Adhesive

The reflective sheeting shall include a pre-coated pressure sensitive adhesive backing (Class 1) or a tack-free heat activated adhesive backing (Class 2) either of which may be applied without necessity of additional adhesive coats on either the reflective sheeting or application surface.

The Class I adhesive shall be a pressure sensitive adhesive of the aggressive tack type requiring no heat solvent or other preparation for adhesion to smooth clean surfaces.

The Class 2 adhesive backing shall be a tack-free adhesive activated by applying heat in excess of 175° F to the material as in the heat-vacuum process of sign fabrication.

The protective liner attached to the adhesive shall be removed by peeling without soaking in water or other solvents without breaking, tearing or removing any adhesive from the backing. The protective liner shall be easily removed following accelerated storage for 4 hours at 160° F under a weight of 2.5 pounds per square inch.

The adhesive backing of the reflective sheeting shall produce a bond to support a 1 3/4 pound weight for 5 minutes, without the bond peeling for a distance of more than 2.0 inches when applied to a smooth aluminum surface.

Impact Resistance

Type I and II reflective sheeting material, applied according to the manufacturer's recommendations to a cleaned, etched aluminum panel of alloy 6061-T6, 0.04 inches by 3.0 inches by 5 inches and conditioned for 24 hours at 72° F and 50 percent R.H., shall show no cracking when the face of the panel is subjected to an impact of a 2.0 pound weight with a 5/8 inch rounded tip dropped from a 10-inch pound setting on a Gardner Variable Impact Tester, 1G-1120.

Accelerated Weathering

When applied in accordance with recommended procedures, the reflective material shall be weather resistant and, following cleaning in accordance with manufacturer's recommendations, shall show no appreciable discoloration, cracking, blistering or dimensional change. Following exposure, the panels shall be washed with a 5% HCL solution for 45 seconds, rinsed thoroughly with clean water, blotted with a soft clean cloth, brought to equilibrium at standard conditions and tested. It shall have not less than the percent of the minimum SIA specified in the table below when subject to accelerated weathering in accordance with ASTM G23, Type E or EH Weatherometer with the humidifier off.

Type of Material	Hours Tested	Minimum Specific Intensity Per Unit Area
I	1,000	50% of Table III
II	1,000	50% of Table IV

Splices in the Reflective Sheeting

1. Vacuum applied sheeting. There shall be no splices in the reflective sheeting on panels with a minor dimension of 48 inches or less. On all rectangular signs with a minor dimension of more than 48 inches, the splice shall be horizontal.
2. Squeeze roller applied sheeting. No splices other than those occurring in the manufactured roll of reflective sheeting will be allowed, and no roll shall contain more than one splice for every 60 feet of material.,
3. No sign shall have a splice within 2 inches of the sign edge. Where splices do occur, the adjoining reflective sheeting shall be color matched under both incident and reflective light.

Thickness. The thickness of the reflective sheeting without the protective liner shall be no more than 0.010 inch.

Solvent Resistance. After immersion in methyl alcohol, kerosene, turpentine, toluol, or xylol, the reflective sheeting, and tape shall show no evidence of dissolving, puckering, or blistering.

Edge Sealing. The edges of each completed reflective sheeting sign face and of all cut out letters, numbers, arrows, symbols, and borders shall be sealed in a manner and with a sealing solution as recommended by the manufacturer of the reflective sheeting.

Tensile Strength and Elongation. The reflective material shall have a tensile strength of not less than 5.0 pounds per inch of width. Elongation shall not be less than 10 percent.

Resistance to Heat, Cold, and Humidity. The reflective material, when exposed to heat, cold, and humidity shall not crack, peel, chip, or delaminate from the test panel.

Rainfall performance measurements shall be conducted in accordance with Standard rainfall test specified in the latest edition of Federal specifications L-S-300 and the brightness of the reflective sheeting totally wet by rain, shall not be less than 90% of the values in Table 730-2 and AASHTO M 268.

Letters, Numerals, Arrows, Symbols, Border

Letters, numerals, arrows, symbols, border, and other features of the sign messages shall be of the type, size, and series shown on the plans or as specified by the Alaska Traffic Manual or the Alaska Sign Design Specifications.

Completed letters, numerals, and other units shall be formed to provide continuous stroke width with smooth edges and shall present a flat surface free of warp, blisters, wrinkles, burrs, and splinters.

The message shall be one of a combination of the following types:

1. Silk Screened or reverse silk screened with a "process paste" as supplied or recommended by the manufacturer of the reflective sheeting.
2. Type I, Class 1, cut-out reflective sheeting.
3. Type II, Class 1, cut-out reflective sheeting when specified on the plans.
4. Demountable Characters with Type II Reflective Sheeting when specified on the plans.

The Type II Reflective sheeting with letters, numerals, symbols, and borders shall be silver color unless otherwise specified on the plans.

The reflective sheeting shall be applied to 0.032-inch minimum thickness aluminum sheeting conforming to ASTM B 209, Alloy 3003-H14.

Spacing of mounting holes for aluminum rivets or other approved non-corrosive fasteners shall be determined by character size and shape and in no case shall be more than 8 inches on center.

Frames

All rectangular signs, over 53 inches measured along the horizontal axis, and all diamond shape signs 60 inches x 60 inches and larger shall be framed unless otherwise specified. The frames shall be constructed to aluminum as indicated on the plans. All framing dimensions shall have a 1/8-inch tolerance unless otherwise specified.

The frame shall be affixed to the sign with 3/16-inch diameter aluminum rivets. The maximum rivet spacing shall be 12 inches on centers. No rivets shall be placed closer than 3/8 inch from edge of the aluminum face sheet.

All joints of the aluminum frame may be welded with an inert gas shielded - arc welding process using 4043 electrode filling wire in accordance with good shop practice. The width of the fillet shall be equal to the wall thickness of the smallest framing member being welded.

Test Procedures and Inspections

Adherence. The test panel after a 72 hour curing time, shall be immersed in 95° F. $\pm 3^\circ$ water for a period of 24 hours. Immediately after removal from the bath, the reflective sheeting shall be sufficiently bonded so that it cannot be readily removed from the aluminum surface with a 1-inch round nose

spatula. If the sheeting can be peeled rather than chipped from the surface, the bond is considered unsatisfactory.

Solvent Resistance. Test shall be in accordance with Federal Specification L-S300B 4.3.6

Accelerated Weathering. Test shall be in accordance with Federal Specification L-S 300B 4.3.9.

Resistance to Heat, Cold, and Humidity. Test shall be in accordance with Federal Specification L-S-300B 4.3.10.

Tensile Strength and Elongation. Test shall be in accordance with Federal Specification L-S 300B 4.3.15.

Post Materials

All Standard Regulatory, Warning, and Guide signs which are to be permanently installed shall have posts which conform with the following specifications. Standard Construction and Maintenance signs shall also be erected in accordance with the following specifications or on such supports as may be approved by the Engineer. Supports for Construction and Maintenance signs shall provide a stable, rigid mounting in compliance with the Alaska Traffic Manual and as detailed in the plans.

1. Perforated Steel Posts.

- a. Perforated steel posts shall conform to the standard specification for cold-rolled carbon steel sheets, commercial quality ASTM A-366. Sheets for post fabrication shall be zinc coated, commercial quality (1.25 oz.) conforming to ASTM A-525 in U.S. Gauge steel, rolled to size and welded in the corner.
- b. All members shall be perforated for their entire length with 7/16-inch diameter holes on 1-inch centers.
- c. Furnished members shall be straight and shall have a smooth, uniform finish.
- d. It shall be possible to telescope consecutive sizes freely with a minimum of play. All perforations and cut off ends shall be free from burrs. Tube sizes shall be from 1 inch to 2-½ inches in ¼ increments. The length and tube size shall be as specified in the plans.

Article 18.3 Construction

All posts shall be placed in excavated holes. Depth of embedment shall be as shown on the Municipal sign installation detail unless otherwise directed.

Surplus excavated material shall be disposed of along the adjacent roadway as directed.

Guide Marker reflectors shall be installed after the posts have been set in place.

Sign panels shall be attached to posts, electroliers, traffic signal standards, bridge rails, piers, and abutments with fastening hardware of the types and sizes shown on the plans. All fastening hardware shall be furnished by the Contractor.

Existing signs and mile posts that are removed and relocated shall conform to the details shown on the plans or as directed.

Inspection: All materials and finished signs are subject to inspection and acceptance in place. All surfaces exposed to weathering shall be free of any defects in the coating that may impair the serviceability or detract from the general appearance or color match. The finished signs shall be clean and free from all chatter marks, burrs, sharp edges, loose rivets, delaminated reflective sheeting, and aluminum marks. No repairs shall be made to the face sheet. All signs not conforming to these specifications shall be rejected.

Article 18.4 Measurement

The quantity of Standard Regulatory, Warning, and Guide Signs for permanent installation to be paid for shall be the total square footage of legent bearing sign and panel erected in place. No deductions in quantity for corner rounding shall be made. Nominal dimensions for sign sizes indicated on the plans shall be used for the purpose of calculating sign pay quantities.

Removal and relocation of existing signs shall be measured per each sign, completed and accepted in final position. Sign components damaged or destroyed due to the Contractor's operation shall be replaced by the Contractor at no additional expense to the City. Object Markers and Guide Markers shall be measured per each, complete in place. One post equipped with two reflectors shall be considered a single marker.

Article 18.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10 - Standard General Provisions, Section 10.7 - Measurement and Payment of these Specifications, and shall include full payment for all work described in Section 70.18.

Payment will be made under:

ITEM	UNIT
Standard Sign	Square Foot
Remove and Relocate	

Existing Signs	Each
Remove and Relocate	
Mile Posts	Each

SECTION 70.19 TRAFFIC MAINTENANCE

Article 19.1 Scope of Work

This Work shall consist of the necessary measures to protect and control traffic during the life of the individual project, including, but not limited to, furnishing, erecting, maintaining, replacing, cleaning, moving and removing the traffic control devices, construction signs, portable concrete barriers, safety fences, and flagging required to safeguard the traveling public and all administrative responsibilities necessary to implement this Work.

Contractor shall maintain all roadways, pedestrian and bicycle facilities within the project limits and construct and maintain such approaches, crossings, intersections and other features as may be necessary throughout the life of the Contract. Contractor shall also have a powered broom and water truck with high pressure capabilities to clean the paved surfaces and along the haul routes.

A Traffic Control Plan (TCP) is required for this project. Contractor shall provide a TCP approved by the Engineer and, **when the project limits include state right-of-way**, the Alaska Department of Transportation and Public Facilities (ADOT&PF) Permit Section prior to commencement of this project in accordance with the provisions of C.P.S.S. Section 10.04.13, as herein amended. Contractor may submit approved amendments to the TCP prior to commencement of this project. All approvals shall be obtained by Contractor and shall be considered incidental to the Contract and no separate payment shall be made. **Contractor shall notify ADOT&PF at least 48 hours before commencing construction at (907) 266-1541.**

Contractor is required to have at least one (1) I.M.S.A.- or A.T.S.A.A.-certified person on the job site during working hours for traffic control and implementation. The person(s) designated will supply the Engineer with a twenty-four (24) hour emergency telephone number.

All traffic channelization, detours, lane closures and/or street closures shall conform to the TCP and SECTION 10.04 ARTICLE 4.13 STREET CLOSURES of these Special Provisions.

Article 19.2 Traffic Control Plan

A Traffic Control Plan (TCP) is a drawing or drawings indicating the method or scheme for safely and efficiently routing traffic during construction. The TCP may include, but not be limited to, such items as signs, portable concrete barriers, barricades, traffic cones, special signs, warning lights, portable changeable message board signs, flaggers, pilot cars, work zone pavement markings, temporary roadways, and all other items required to direct traffic through or around the construction zone in accordance with these specifications and the Alaska Traffic Manual (ATM). These TCP's shall also address placement of traffic control devices including location, size, mounting height, and type. The details shown for signs shall include the code designation, size, and legend in accordance with the Alaska Traffic Manual and the Alaska Sign Design Specifications (ASDS). A Traffic Control Plan

(TCP) shall also indicate the method of safely routing pedestrian and bicycle traffic through or around the construction zone.

Contractor shall prepare a TCP for the project. The TCP must be approved by the Engineer and, if the Engineer determines that a state route is affected by the TCP, approval of the State of Alaska Department of Transportation and Public Facilities Regional Engineer. The Engineer will issue road closure and/or work-in-roadway permit(s) upon approval of the TCP. Changes in the TCP resulting from emergency circumstances may be allowed during construction, provided a minimum of 48-hours are allowed for review, and the changes are approved by the Engineer. Contractor shall respond and make field changes as the Engineer directs.

There shall be no Work within rights-of-way or easements for public streets, highways or other public improvement projects until Contractor has implemented an approved TCP for the Work proposed. The number of signs indicated on the TCP are a minimum. If unsafe conditions occur, the Engineer may require additional signs.

Article 19.3 Pedestrian Traffic

Pedestrian access shall be provided in accordance with the requirements of Section 10.04 Scope-of-Work, Article 4.9 Protection of Persons and Property and Article 4.10 Public Convenience and Access.

In addition, Contractor shall provide and maintain a pedestrian traffic route through the project for the duration of the project or until a permanent pedestrian walkway has been completed. The route shall be signed and delineated such that it is obvious and recognizable to the pedestrian. It shall be established in a location within the project limits, at a distance which will help to eliminate interference between pedestrians and construction operations. The location of the route may change throughout the duration of the project, depending on locations of construction operations, and each location shall be approved by the Engineer. Safety fencing shall be required along the pedestrian route as necessary to separate work zone from the pedestrian route.

Article 19.4 Work-Site Traffic Supervisor

Contractor shall provide a Work-site Traffic Supervisor who shall be responsible for Contractor's maintenance of traffic operations on a 24-hour basis. The Work-site Traffic Supervisor shall meet the following minimum requirements:

1. Be currently certified as a Work-site Traffic Supervisor by the American Traffic Safety Services Association (ATSSA), or,
2. Be currently certified as a Work Zone Traffic Safety Specialist or a Work Zone Safety Specialist by the International Municipal Signal Association (IMSA), or,

3. Be currently certified as a Work-site Traffic Technician by ATSSA.

If the individual is certified under Items 2 or 3 above, Contractor shall submit documentation prior to Work requiring traffic control that the individual has also obtained:

1. A minimum of twelve months of supervisory level work in Work-site traffic control, or,
2. One year of having been in responsible charge of such Work. The term "in responsible charge" shall be construed to mean having been in a position of accountability for the selection of devices and for their placement in the traffic control system, or for the continued operation of the system. Having persons that actually perform the labor under one's control would satisfy this requirement. Provide at least one reference, including current address and telephone number, for each project which "in responsible charge" experience is claimed.

The Work-site Traffic Supervisor's duties shall include the following:

1. Understand the requirements of the Alaska Traffic Manual, the Plans and the Specifications.
2. Prepare the TCP's and public notices and coordinate traffic maintenance operations with the Engineer.
3. Inspect the condition and position of all traffic control devices in use on the project at least daily, and ensure that all traffic control devices are in proper working order, clean, visible, and conform to the approved TCP in use. All devices shall be inspected during hours of darkness so that effectiveness of the device placement can be evaluated and adjustments made, if required, to afford maximum nighttime visibility and delineation. These inspections shall be documented in a bound field. The field book shall be made available to the Engineer for review on a daily basis and shall become the property of the Engineer.
4. Supervise the repair or replacement of damaged or missing traffic control devices.
5. Review and anticipate appropriate traffic maintenance needs and ensure that the proper traffic control devices necessary for safe and efficient traffic movement are available.
6. Hold weekly traffic safety meetings with the superintendents and foremen of Contractor and subcontractors prior to beginning construction. The Engineer shall be provided the opportunity to attend these meetings.

Article 19.5 Materials

Materials for traffic control devices shall conform to the requirements set forth below:

1. Signs. Permanent Construction Signs, Construction Signs and Special Construction Signs including sign supports shall conform to the requirements of Section 615 Standard Signs ADOT&PF Standard Specifications for Highway Construction, the Alaska Traffic Manual and the Alaska Sign Design Specifications. The size of each Special Construction Sign shall be clearly and neatly marked in 3-inch high black numerals on its back.
2. Portable Sign Supports. Portable sign supports shall be wind resistant with no external ballasting and capable of supporting a 48" x 48" traffic control sign such that the height of the sign above the adjacent roadway surface is that required by the ATM. The sign support shall support the traffic control sign vertically.
3. Barricades and Vertical Panels. Barricades and vertical panels shall be constructed of wood, metal, or plastic, and conform to the requirements of the Alaska Traffic Manual and ADOT&PF Standard Drawing C-01. Type III barricades shall have a minimum width of 8 feet. Barricades shall be equipped with warning lights.
4. Warning Lights. Warning lights shall be Type A (low intensity flashing), Type B (high intensity flashing), or Type C (steady burn) conforming to the requirements of the Alaska Traffic Manual.
5. Drums. Drums shall be plastic and conform to the requirements of the Alaska Traffic Manual.
6. Traffic Cones. Traffic cones and/or tubular markers shall conform to the requirements of the Alaska Traffic Manual. The minimum height shall be 28-inches. All cones and tubular markers shall be reflectorized.
7. Portable Changeable Message Board Signs. Portable changeable message board signs shall be truck or trailer mounted with a self-contained power supply for the sign and shall have the following features:
 - a. Message sign panel large enough to display three lines of 9-inch high characters.
 - b. Eight character display per message line.
 - c. Message modules containing at least 36 different preprogrammed messages (three line displays) to be selected by the Engineer.
 - d. The capacity to create, preview, and display new messages and message sequences.
 - e. A waterproof, lockable cover for the controller keyboard.

- f. An operator's manual, a service manual, and wiring diagram.
 - g. Quick release attachments on display panel cover.
 - h. Variable flash and sequence rates.
 - i. Manual and automatic dimming capability on lamp bulb matrix models.
 - j. The ability to mount at least 7-feet above the pavement to the bottom of the message sign panel.
 - k. The capacity to operate with a battery pack for 2-hours under full load.
8. Portable Concrete Barriers. Portable concrete barriers shall conform to the requirements of ADOT&PF Standard Drawing G45. Portable concrete barriers shall be equipped with warning lights.
9. Work Zone Pavement Markings. Work zone pavement markings shall be either paint with glass beads or performed marking tape (removable or non-removable).

Article 19.6 Public Notice

The Work-site Traffic Supervisor shall give notices of changes, delays, or lane/road closures to the following local officials and transportation organizations, including but not necessarily limited to:

- 1. Sitka Chamber of Commerce
- 2. Alaska State Troopers
- 3. Local Police Department
- 4. Local Fire Department
- 5. Local Schools
- 6. Local Emergency Medical Services
- 7. Local Media
- 8. U.S. Postal Service

Contractor shall run one-sixteenth page newspaper advertisements for a minimum of one (1) week in advance of any street or lane closures. Contractor shall then run continuous one-sixteenth page newspaper advertisements for the duration of that closure. The advertisements shall be published in the local newspaper.

Contractor shall indicate in the ad order a first preference for the local news section and an exclusion for the classified section. These advertisements shall have the project name, a map, detailed traffic information, and effective dates of the closure.

Advertisements shall be promptly canceled when they have served their purpose. The Work-site Traffic Supervisor shall submit proof of advertisements, to the Engineer for review and approval at least forty-eight (48) hours prior to intended release and a copy of the Proof of Publication with tear sheet immediately after publication.

Contractor shall also provide the Alaska State Troopers, local police, and fire departments with radio frequencies and cellular telephone numbers used on the project, and the 24-hour telephone numbers of the Work-site Traffic Supervisor and the Project Superintendent. These shall be for alerting Contractor of emergencies which will require passage of emergency vehicles through the project. When so notified, Contractor shall use all equipment and effort necessary to expedite rapid passage.

Article 19.7 Traffic Control Devices

Prior to the start of construction operations, Contractor shall erect such permanent and temporary traffic control devices as may be required by the approved Traffic Control Plan. Traffic control devices shall be operated only when they are needed and only those devices that apply to conditions that exist shall be used. Advisory speeds, when necessary, shall be provided in the TCP and approved by the Engineer.

Following the completion of Work in a closure area, all traffic control devices relating to the closure shall be removed. Sign panels that are not removed shall be entirely covered with either metal or plywood sheeting.

Reflective sheeting on signs, drums, barricades and other devices shall be kept clean. Any devices with scratches, rips, or tears in the sheeting will be deemed unacceptable and shall be promptly replaced by Contractor.

Article 19.8 Authority of the Engineer

When, in the opinion of the Engineer, conditions are such that the safety and/or convenience of the traveling public are adversely affected, Contractor will be immediately notified in writing. The notice will state the defect(s), the corrective action(s) required, and the time required to complete such action(s). In no case shall this time exceed 24-hours. In the event that Contractor fails to take the corrective action(s) within the specified time, (a) the Engineer will immediately direct that the offending operations cease until the defect(s) is (are) corrected, and (b) the Engineer reserves the right to order the corrective action(s) be accomplished by outside forces. The cost of Work by outside forces shall be deducted from any moneys due or that may become due under the terms of this contract.

Article 19.9 Execution

Contractor shall maintain traffic control in accordance with the approved TCP. Contractor shall submit a new TCP each time traffic control is revised. Approval of all new TCP's is required.

All traffic control devices necessary to fulfill the requirements of this specification, including construction signs, barricades, portable concrete barriers, safety fence, and flaggers, shall be furnished by the Contractor and shall be considered incidental to this item. All such devices shall conform to the Alaska Traffic Manual. Paved road detours and gravel pedestrian detours are also incidental to this item.

Open trenches, ditches, pavement edge drop-offs and other excavations and hazardous areas shall be protected with barricades and adequately delineated as required by OSHA. Open trenches with drops of two feet or greater adjacent to the roadway shall have portable concrete barriers installed with sloping end(s). All barricades and portable concrete barriers in place at night shall have warning lights installed in accordance with the Alaska Traffic Manual.

Unless otherwise provided herein, Contractor shall maintain all roadways open to traffic. Temporary closure of residential, commercial, or street approaches requires prior approval of the Engineer. Contractor shall provide access through the project for emergency vehicles. All locations requiring redirection or stopping of the traveling public shall be properly signed and/or flagged by Contractor.

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 by Contractor.

Flagger(s) shall be required at all times that safety may be affected by Contractor operations, as directed by the Alaska Traffic Manual or as directed by the Engineer. Flagger(s) shall be required at all times when one-lane traffic is in effect. All flagging operations shall be in accordance with the procedures outlined in the Alaska Traffic Manual.

Article 19.10 Method of Measurement

All Work in this section shall be measured by lump sum and shall consist of all labor, materials, and equipment required to provide the Work-site Traffic Supervisor, all required TCP's and TCP revisions, public notices, and all traffic control devices as required.

Article 19.11 Basis of Payment

Payment of this Work shall be in accordance with Division 10 - Standard General Provisions, Section 10.07 Measurement and Payment, as amended in these specifications, and shall include full payment for all Work as described in this Section.

Payment shall be under the following unit:

ITEM	UNIT
Traffic Maintenance	Lump Sum

SECTION 70.20 WORK INCIDENTAL TO THE CONTRACT

Several items of work, not covered in the Bid Proposal, will be considered incidental to the cost of the contract. These items shall include, but are not limited to, the following:

1. Sheeting, shoring and bracing of trench walls.
2. Shoring power poles.
3. Remove and replace concrete barriers.
4. Erosion control plan and its implementation.
5. De-watering of excavation and pipe trenches for excavation purpose and for achieving required compaction.
6. Resetting of disturbed property corners or monuments.
7. Post-construction cleanup.
8. Providing safe hauling and traffic control plan prior to beginning construction for hauling unusable excavation and site access.
9. Removal and reinstallation of manholes, catch basins, removal and replacement of storm drain and subdrain pipes and cleanouts.
10. Other items indicated on the plans.

SECTION 70.21 ADJUST ELECTRICAL/TELEPHONE MANHOLE TO FINISH GRADE

Article 21.1 Scope of Work

The Work under this Section consists of providing all operations and materials required for the preparation and adjustment of electric/telephone manhole lids and rings to finish grade.

Article 21.2 Materials

All concrete and cement used in the adjustment of electrical/ telephone manholes shall conform to the requirements for manholes as specified in Section 55.04 - Manholes and Catch Basin Manholes.

Contractor may utilize Neenah Manhole Adjusting Rings P1979-077, Part No: 19790053, Catalog 1797-01, or an approved equal, for adjusting the electrical and telephone manhole to finish grade.

Article 21.3 Construction

All manholes to be adjusted shall be inspected by Contractor and the applicable utility's representative to verify size, condition and any necessary replacement of the existing lids. Inspection, replacement, and cost of lids will be considered incidental to the Contract and no separate payment will be made. Manholes may be adjusted by installing grade rings and/or grouting. Manhole adjustment by grouting shall consist of bringing the manhole grade ring and lid to final grade, then grouting underneath the ring. Contractor shall have an assortment of adjustment rings of various thicknesses on the project site to preclude after-the-fact cutting for adjustment.

After-the-fact cutting of new asphalt for adjustments will not be accepted; rings will be inventoried before authorization to pave is given. Any utility adjustments requiring cutting of new asphalt will not be paid, and will be deducted from the plan quantity.

Contractor shall contact the local Telephone Utility Engineering Foreman and the local Light and Power Utility Line Superintendent, at least forty-eight (48) hours prior to beginning the overlay operation to schedule a representative of that utility to be on site to supervise the manhole adjustments to finish grade.

Prior to placement of any grade ring adjustment, the existing seat should be cleaned and all loose material shall be blown out or wire brushed to assure a proper fit.

Article 21.4 Measurement

Adjustments of electric/telephone manholes to finish grade shall be measured as units, complete in place and adjusted to the required grade.

Article 21.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10 - Standard General Provisions, Section 10.07 Measurement and Payment, as amended in these specifications, and shall include full payment for all Work as described in this Section.

Payment shall be under the following unit:

ITEM	UNIT
Adjust Small Electric/Telephone Manhole to Finish Grade	Each
Adjust Large Electric/Telephone Manhole to Finish Grade	Each

SECTION 70.22 RELOCATE EXISTING MAILBOX

Article 22.1 Scope of Work

The Work covered under this Section shall consist of all operations pertaining to the removal and resetting of existing mailboxes affected by construction of this project. The Engineer will designate which mailboxes will be affected.

Article 22.2 Materials

All materials which can be reused shall be salvaged from the existing mailboxes. Those materials which can not be salvaged or are damaged by Contractor's operations shall be replaced, at Contractor's expense, with new materials which as nearly as possible duplicate the kind, quality and capacity of the original installation.

Nails, staples, fastening wires or devices, and all materials required for the construction of such anchors, posts or other portions of the mailbox which can be replaced more efficiently than they can be moved, shall be furnished by Contractor.

If the property owner elects to replace any of the existing mailbox materials with other material(s) in better condition, she/he will be responsible for furnishing and delivering such material(s) to the site of the Work.

Article 22.3 Construction

Temporary mailbox placement and access shall be provided by Contractor. The mailbox shall be set in reasonable close conformity to its original location with respect to access points or as directed by the Engineer. Posts and anchors shall be set at the same depth as in the original mailbox. Permanent anchors, posts or other parts which cannot be economically moved shall be replaced by equivalent construction. If any new materials require painting, they shall be painted to match the original materials as nearly as possible. If a match cannot be attained to the satisfaction of the Engineer, the entire mailbox and support will be painted. The relocated mailbox shall be placed in at least as good condition as the existing mailbox before it was moved. The relocated mailbox shall be placed behind the curb and gutter in the same location or as close to the same location from which it was removed or as directed by the Engineer. The face of the mailbox shall be forty-four (44) to forty-eight (48) inches above the top back of curb and placed behind the curb and gutter or in a location approved by the U.S. Post Office.

Article 22.4 Method of Measurement

Relocating mailboxes shall be measured by each unit permanently relocated and complete in place. No payment shall be made for temporary mailbox placement or relocation. Each unit shall consist of a stand having a single mailbox or a variable number of mailboxes.

Article 22.5 Basis of Payment

Payment of this Work shall be in accordance with Division 10 - Standard General Provisions, Section 10.07 Measurement and Payment, as amended in these specifications, and shall include full payment for all Work as described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Relocate Existing Mailbox	Each

SECTION 70.23 REMOVE EXISTING PIPE

Article 23.1 Scope of Work

The Work under this Section shall consist of all operations pertaining to the removal and disposal or salvage of existing pipes.

Article 23.2 Construction

Pipes that are to be salvaged shall be removed in a workmanlike manner and delivered to a site as directed by the Engineer. A disposal site for non-salvageable material shall be provided by Contractor in accordance with the provisions of Section 10.04.9 Disposal Sites.

Any excavation required in the removal shall be considered incidental to this item. Contractor shall backfill the excavation with suitable, non-frost susceptible material and compact it to not less than ninety-five (95) percent of maximum density as directed by the Engineer. Existing pipe ends shall be suitably plugged and abandoned.

Article 23.3 Method of Measurement

Removal of existing pipes shall be measured per linear foot.

Article 23.4 Basis of Payment

Payment for this Work shall be in accordance with Division 10 - Standard General Provisions, Section 10.07 Measurement and Payment, as amended in these specifications, and shall include full payment for all Work as described in this Section.

Payment shall be under the following unit:

ITEM	UNIT
Remove Existing Pipe	Linear Foot

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**STANDARD CONSTRUCTION SPECIFICATIONS FOR
LANDSCAPING IMPROVEMENTS**

SECTION 75.01 GENERAL

Article 1.1 Scope of Work

The work covered by these Specifications consists of providing all plant, labor, equipment, supplies, material, transportation, handling and storage, and performing all operations in connection with the construction of the landscaping improvements as provided for in this Division.

Article 1.2 Payment - General

Payment for all Work included in this Division shall be paid for in accordance with Division 10.00 - Standard General Provisions, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described.

SECTION 75.02 LANDSCAPING

Article 2.1 GENERAL

a. Scope of Work

The work under this Section consists of providing all operations pertaining to the planting and maintenance of trees, shrubs, ground cover, annual beds, grass and seeded areas.

b. Agency Standards: Nomenclature

All plant materials used shall be true to name and size in conformity with the following standards:

- 1) American Standard for Nursery Stock, Copyright 1986. (Published by the American Association of Nurserymen, Inc., 230 Southern Building, Washington, D.C., 20005).
- 2) Sunset New Western Garden Book, Lane Publishing Co., Menlo Park, California, 1984.
- 3) Trees of North America, Thomas S. Elias, Van Nostrand Reinhold Co., New York, 1980.

c. Definition

The term "replanting areas" as used in this Specification, shall mean all areas to be planted with trees, shrubs, ground cover, annuals, and seeded areas.

Article 2.2 Materials

a. Plant Materials

1) Plant List:

A complete list of plants, including a schedule of quantities, sizes, and other requirements is shown on the planting plan drawings. No substitutes shall be accepted, except with the written permission of the Engineer. The Contractor shall submit all substitution requests, noting the source of plants, location, size, and condition, within 30 days prior to receiving the Notice to Proceed. In the event of plant count discrepancy between the planting list, as shown on the landscape plans, and the plants counted on the drawings, the drawings shall prevail.

2) Quality

All plants shall be typical of their species or variety. All plants shall have normal, well-developed branches and vigorous root systems. They shall be sound, healthy, vigorous, free from defects, disfiguring knots, abrasions of the bark, sunscald injuries, plant diseases, insect eggs, borers, plant and all other forms of infection.

3) Size and Grading Standards

Size and grading standards shall conform to those of the American Association of Nurserymen unless otherwise specified. A plant shall be dimensioned as it stands in its natural position. Stock furnished shall be a fair average between the minimum and maximum sizes specified. Large plants which have been cut back to the specified sizes will not be accepted.

4) Preparation of Plants

A. Field collected

Field collected plants shall be taken from a subgrade favorable to good root development and shall have been root pruned 12 (min.) to 24 (max.) months in advance of their digging and removal and use. In preparing field collected plants for transplanting, all precautions customary to good trade practice shall be taken. Workmanship that fails to meet the highest standards will not be accepted. All plants shall be dug immediately before moving and planted within four hours. An antidesiccant such as "Wilt-Pruf", or approved equal, shall be applied per manufacturer's recommendations to all deciduous plants, one hour prior to digging out of ground and transferring to planting area.

B. Balled and Burlap

Balled and burlapped plants shall have a solid ball of earth of minimum size as specified in the American Standard for Nursery Stock, held in place securely by burlap and stout rope or wire. Oversize or exceptionally heavy plants are acceptable if the size of the ball or spread of the roots is proportionately increased to the satisfaction of the Engineer. Broken, loose, or manufactured balls will be rejected.

C. Container Stock/Nursery Grown

All container grown plants shall be healthy, vigorous, well rooted and established in the container in which they are sold. The established plant shall

have been grown in that container sufficiently long for new fibrous roots to have developed so that the root mass will retain its shape and hold together when removed from the container. The container shall be sufficiently rigid to hold the ball shape protecting the root mass during shipping.

5) Delivery

All plants shall be packed, transported, and handled with utmost care to insure adequate protection against injury damage to the root ball, and desiccation. Plants coming from out-of-state growers and/or suppliers shall be certified by State and Federal authorities to be free from disease and infestation. Any inspection certificates required by law to this effect shall accompany each shipment invoiced or order of stock, and on arrival, the certificate shall be filed with the Engineer.

6) Quantities

Discrepancies between the quantity shown on the plant list and those required by the drawing shall not entitle the Contractor to claim any additional compensation, nor relieve him of the obligation to complete the Work shown on the Drawings.

7) Inspection

The Engineer shall make periodic inspections during the installation and maintenance periods of the work. Should plant materials, installation procedures, or other conditions be observed not in keeping with the plans, details, and these specifications, the Engineer will direct the Contractor to correct by repair, and/or replacement as appropriate. The Engineer shall be the sole judge of the conditions of quality and acceptability and will direct all corrections in writing to the Contractor. All rejected materials shall be immediately removed from the site and replaced with specified materials at no additional cost to the owner.

b. Wood Chips:

Wood chips to consist of wood products having a size of 2 1/2" minus with a thickness not greater than 3/8". Wood chips to be uniform in overall appearance, color, quality, and size and are subject to approval by the Engineer. Wood chips are to be free of sawdust, dirt, twigs, excessive bark, or any other debris.

c. Rock Mulch:

Rock mulch to consist of either crushed or pit run rock of uniform mixture and gradation ranging from 1/2" to 2" diameter.

d. Anti-desiccants:

Anti-desiccants to consist of "Wilt-Pruf" or approved equal.

e. Topsoil:

Refer to Section 75.04, Art. 4.2

f. Fertilizer/Lime:

Refer to Section 75.05 item b. Fertilizer, and item c. Limestone

g. Water:

Water used for the planting, establishment, and all operations of maintenance to consist of potable quality water only. The contractor is to make all arrangements and be responsible to provide a water source unless waived by written authorization from the Engineer.

h. Pruning Paint:

Pruning paint to consist of "Tree Seal" or an approved equal pruning compound as specifically formulated for this purpose.

i. Wood Stakes:

To consist of 2x2x8' long wood stakes which are sound, straight, and free from excess warpage, knots, or obvious defects, and sufficient to support the tree throughout the establishment and maintenance periods. Wood stakes to receive one (1) coat semi-transparent stain color to be approved by the Engineer.

j. Guying Materials:

Guy wire to consist of 1/8" woven galvanized wire or approved equal. Wire used for tree collars to consist of 14 gauge wire covered with 1/2" minimum diameter rubber, clear vinyl tubing or approved equal.

k. Tree Wrap

Deciduous trees shall be wrapped with 3M wrapping material or equal. All substitutions to be approved in writing by the project Engineer.

Article 2.3 Construction

a. Time of Planting

Spring planting and maintenance shall not begin before May 1, and planting operations may commence as soon as the ground is frost free. Planting and maintenance shall not occur later than October 1, unless otherwise specified or approved in writing by the Engineer.

b. Layout

Plants shall be located where shown on the plans except where obstructions overhead or below ground are encountered or where changes have been made in construction. No planting holes shall be dug until the proposed locations have been staked on the ground by the Contractor, and until such locations have been approved by the Engineer. Prior to the excavation of planting areas or plant pits, the Contractor shall ascertain the location of all utility lines, electric cables, sprinkling systems, and conduits so that proper precautions may be taken not to disturb or damage any subsurface improvements. Should obstructions be found, the Contractor shall promptly notify the Engineer who will arrange to relocate the plant material. Necessary adjustments shall be approved by the Engineer.

c. Setting Plants

Each plant shall be planted straight and plumb per standard planting details. All holes shall be dug with straight vertical sides and crowned bottoms, or as otherwise directed. All plants shall be set to ultimate finished grade, so that they will be left in the same relation to the surrounding grade as they have stood before being moved.

No filling will be permitted around trunks or stems. All ropes, wire, stakes, etc., shall be removed from hole before filling in. Burlap shall be properly cut and laid back from the top of the ball. When hole depth is specified, it shall be understood as meaning depth below finish grade. A layer of topsoil six inches (6") thick or as specified on the planting details shall be placed on the bottom of each hole and then lightly tamped. Excess excavation from all holes shall be removed from the site.

d. Backfilling Planting Pits and Planting Beds

Backfill with approved topsoil (see Section 75.04 Topsoil). Planting pits and beds shall be backfilled carefully as specified to fill all voids and to avoid breaking root ball or bruising roots. Tamp backfill firm to prevent settlement. When pit is nearly filled, water thoroughly and allow water to soak away. If settling of the backfill occurs after watering, add more backfill to bring to finish grade.

e. Trees

Any repositioning of trees shall be by holding or supporting of the root ball. In-place trees which have become loose in the root ball shall be rejected and replaced at no additional cost to the owner. Topsoil shall be made firm under the root ball by tamping. Topsoil shall be backfilled in layers of not over nine

inches (9") in depth and each layer watered sufficiently to settle before the next layer is put in place. Enough topsoil shall be used to bring the surface to finish grade when settled. A continuous 6" soil berm shall be formed around each tree to act as a watering basin; except where noted on the drawings and/or details. This berm shall be repaired as necessary to continue functioning throughout the maintenance period.

f. Shrubs

All shrubs shall be planted in holes at least one (1) foot greater in diameter than the ball of earth or spread of roots. The depth of the holes shall be at least one foot (1') and greater as is necessary to properly set the plant at finish grade. After preparation of the hole, the plant shall be placed in the center of the hole. Roots of bare rooted plants shall not be matted together, but arranged in their natural position with soil worked in among them. The hole shall be filled with topsoil and settled thoroughly by watering. A continuous 4" soil berm shall be formed around each shrub to form a watering basin; except where noted on the drawings and/or details. This basin shall be repaired as necessary to continue functioning throughout the maintenance period.

g. Groundcover

Excavate a hole sufficient to receive spread of the roots and backfill around plants with topsoil and tamp soil to hold plant in place.

h. Seeding

Planting of seeded areas shall be as specified in Section 75.05 Seeding.

i. Topsoil for Backfill

Topsoil used for backfill around plant materials shall meet the requirements of Section 75.04. Prior to backfilling, the topsoil shall be further amended by the incorporation and thorough mixing of 8-32-16 fertilizer at the rate of 2 lb. / cubic yard.

j. Mulching

After planting has been approved by the Engineer, mulch materials as specified shall be placed and spread where indicated on the Drawings. The boundaries of this mulch shall include planting "saucers" around the trees and shrubs unless otherwise indicated.

k. Watering

Thoroughly water each plant immediately following planting. Under no condition shall plants not be watered in the same day as planting. The Contractor shall water per maintenance specifications, Article

2.4 b. Water is to be supplied by the Contractor unless otherwise specified. The Contractor will assume full responsibility for plant failure as a direct result of insufficient watering.

l. Pruning and Repair

All plants shall be neatly pruned to remove dead or broken limbs in a manner that preserves the natural character of the plants, and to the satisfaction of the Engineer. No plants shall be pruned prior to delivery except with the permission of the Engineer. Broken or badly bruised branches shall be removed with a clean cut. All pruning shall be done with sharp tools in accordance with standard nursery practice. Pruning cuts one inch (1") in diameter or larger shall be painted over with approved pruning compound. All damage to trees and shrubs occurring prior to acceptance of the plant materials which is not so great as to necessitate removal of a branch or replacement of a plant, shall promptly be treated as required in accordance with recognized horticultural practices and the instructions of the Engineer.

m. Staking

1) Deciduous Trees.

All deciduous trees, five (5') foot in height or taller shall be secured with a minimum of two (2) wood stakes eight (8) feet long. Stakes are to be driven in a vertical, upright position and secured to trees with specified collars and wire. Guying materials are to be as specified and installed to remain in place throughout the maintenance period without damaging the tree.

2) Coniferous Trees.

Conifers shall be guyed with a minimum of three equally spaced ties anchored with 2 x 2 x 18' wooden stakes, and stained with one (1) coat semi-transparent stain, color to be approved by the Engineer. Stakes to be located approximately at line of branch spread. Wire ties to be as specified under Article 2.2, item j, guying materials.

n. Tree Wrap

For deciduous trees six (6') height and over, wrap trunks with approved tree wrap material from base of tree to first major lateral branch, securing tree wrap with tape or other approved material. Tree wrap to be securely fastened and replaced should tree wrapping come loose during planting and/or maintenance periods. Under no circumstances shall tree wrap be secured with rope, wire, or any material which could promote girdling injury to the tree.

o. Clean-up

The contractor shall keep the project site clean and free of trash, excess equipment, materials, and rubbish. Cleanup will be one of the conditions to be met prior to all phases of planting acceptance.

p. Winter Shut-down

Winter shut-down of all installation work shall occur between October 1, and May 1, of the following Spring. During winter shut-down periods or work suspensions, the Contractor shall comply with Division 10 provisions regarding responsibilities and protection of all work under the contract.

q. Plant Replacement

The Contractor shall repair to the satisfaction of the Engineer, or replace dead or damaged plant materials at no additional cost to the Owner within five (5) working days after receiving written notice to do so by the Engineer. For each day plant materials are not replaced within the specified five (5) day period, an equal number of days shall be added to the specified 60 day maintenance period for all planting work.

r. Landscape Inspection

Upon completion of all planting and seeding operations, the Contractor shall (per Section 10.00 Art. 5.26) submit a written request for an inspection of plants and seeded areas. Upon written acceptance of all work by the project engineer, the sixty (60) day maintenance period shall begin.

Article 2.4 Maintenance

a. General

Contractor to furnish all labor, materials, supplies and equipment, required to establish, maintain, and protect the planted and seeded areas, for a minimum period of sixty (60) days from date of acceptance of the Landscape Inspection. However, maintenance activities shall commence immediately after each item is planted or when areas have been seeded.

The Contractor shall supply a maintenance schedule to the Engineer, thirty (30) days prior to the Landscape Inspection. The Contractor shall also be responsible for protection of his work during the maintenance period, and shall repair and replace all materials and seeded areas damaged or destroyed within the scope of the contracted work, regardless of cause. The Contractor shall have on his staff, supervisory personnel experienced in landscape maintenance. The Work Force is to be experienced and familiar with maintaining plant materials in subarctic conditions.

b. Watering

A proposed watering schedule shall be submitted to the Engineer thirty (30) days prior to installation of plant materials. The Contractor shall deep water all trees and shrubs providing water penetration throughout the root zone to the full depth of the planting pits.

The Contractor shall deep water all trees and shrubs twice each week during the maintenance period. Watering shall cease at first hard frost in the Fall and shall resume upon ground thaw in the Spring.

If at any time during the maintenance period weather conditions (such as extended period with no rain or continuous drying winds) cause the plant root zone to dry out, the Engineer may direct the Contractor to deep water all trees and shrubs. Any supplemental watering is to be done immediately and at no additional cost to the City.

Water application shall be applied at a rate that will provide moisture penetration throughout the entire root zone with a minimum of water run-off. Should soil conditions be encountered not conducive to water absorption, the Contractor shall take whatever corrective actions that may be required to correct this condition, without additional cost to the owner.

Turf, seeded, bulb areas, and annual flower beds shall be watered at such frequency as weather conditions require to maintain soil moisture within the root zone. When establishing turf and seeded areas, the soil shall be watered often enough to maintain a moist seedbed to promote healthy seed germination resulting in an even and uniform coverage.

c. Pruning

Trees and shrubs shall be pruned to select and develop permanent scaffold branches that are smaller in diameter as the trunk or branch to which they are attached; to reduce toppling and wind damage by thinning out crowns; to maintain a natural appearance, or intended shape, and to balance the crown with the roots. Under no circumstances will stripping of lower branches ("raising up") of young trees be permitted, nor will pruning back damaged portions that reduce the plant materials to a condition which no longer meets minimum specifications be permitted. Lower branches shall be retained in a "tipped back" or pinched condition with as much foliage as possible to promote caliper trunk growth. The primary pruning of deciduous trees is to be done during the dormant season. Damaged trees or those that constitute health or safety hazards shall be pruned at any time of the year as required. Use "tree seal" or an approved pruning paint, to protect all cuts one inch (1") or greater in size.

d. Staking and Guying

Stakes and guys are to be inspected and adjusted as necessary throughout the maintenance period to prevent girdling of trunks or branches, and to prevent rubbing that causes bark wounds. Damaged or missing tree stakes shall be immediately replaced by the Contractor at no additional cost to the Owner.

e. Plant Repair and Replacement

Contractor shall repair/replace damaged plant materials, regardless of cause, immediately upon notification by the Engineer. Repair shall include pruning, treating wounds, guying, staking, etc., as necessary. Should repair of plant materials reduce their acceptance to less than minimum specified conditions, the Contractor shall replace plants with specified plant replacements at no additional cost to the owner.

f. Fertilization

If the construction or maintenance period extends into a second growing season, representative soil tests from the project site shall be taken by the Contractor and submitted to an approved testing lab no later than May 5th for fertility testing. The results of these tests and recommendations for fertilization and limestone application shall be provided to the Engineer and will be the basis for establishing required application rates. All necessary applications shall be completed prior to June 15 or before the end of the maintenance period, whichever occurs first.

- 1) Trees: For trees with 3" caliper or greater in diameter, fertilizer shall be placed by drilling 3/4" diameter X 12" deep holes not more than 12" apart in the ground around the dripline of the tree, and equally distributing the fertilizer in the holes. The application shall be per Table 70.17.1.

For trees under 3" caliper, apply fertilizer by broadcasting around tree to the dripline of the tree. The application shall be per Table 70.17.1.

- 2) Shrubs and Groundcover: A complete fertilizer shall be broadcast at the minimum rates specified in Table 70.17.1. Leaves of the plants shall be dry at the time of application, with the fertilizer to be thoroughly watered into the ground to promote its penetration.
- 3) Seeded areas: Fertilizer shall be evenly spread over specified areas applied in two (2) directions, using the application rates and fertilizer types shown in Table 70.17.2 and/or as may be amended by soil test results. Seeded areas are to be watered the same day following fertilizer applications.

MAINTENANCE FERTILIZATION FOR SECOND GROWING SEASON

TABLE 70.17.1

TREE AND SHRUB MAINTENANCE FERTILIZER SCHEDULE

PLANT TYPE	FERTILIZER	APPLICATION RATE **
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Deciduous Trees	8-32-1	1 lb. for each 1" caliper
Evergreen trees	16-16-16	1/4 lb. for each 3" caliper
Shrubs and and Groundcovers	16-16-16	4.0 lb. per 1,000 S.F. before June 1 and again before August 1

TABLE 70.17.2

SEEDED AREAS MAINTENANCE FERTILIZATION SCHEDULE

PLANT TYPE	pH*	FERTILIZER	APPLICATION RATE**
Unmowed seed mixes Schedules B and C	6-7.0	16-16-16	10.0 lb. per 1,000 S.F.
Mowed seed mixes Schedules A and D	6-7.0	16-16-16	15.0 lb. per 1,000 S.F.

* Contractor to apply sufficient limestone to seeded areas to attain required pH. (No more than fifty pounds of dolomitic limestone per 1,000 square feet to be applied at one time. If more than fifty pounds is required, subsequent applications of no more than fifty pounds up to required amount shall be applied at thirty (30) day intervals.)

** Before June 1st of each year.

g. Diseases and Pests

A State of Alaska approved pesticide, fungicide, insecticide, or other control material shall be applied as necessary to maintain plant materials in a healthy and growing condition. Contractor shall apply all materials in complete accordance with all State, Federal, and local regulations, and shall supply the Engineer written proof of their safety and acceptability by State, Federal and Local jurisdictions.

In the event a "restricted use" (dangerous) chemical is to be applied, appropriate permits and certification must be obtained by the Contractor from the State of Alaska, Department of Environmental Conservation. Proof of certification shall be transmitted to the Engineer prior to application of the above chemicals.

h. Weeding

Contractor is to maintain all areas in a weed - free condition. Weed removal shall be a routine maintenance activity. Chemical weeding shall be in complete accordance with all applicable State, Federal, and local regulations.

i. Cleanup

The Contractor shall keep the project site clean and free of all trash and excess equipment, materials, rubbish, including plant tags, wire, burlap, ribbon, and all debris found within the project work limits. Cleanup will be one of the conditions to be met prior to acceptance of landscape installation and Final Maintenance Acceptance.

j. Mowing

Areas seeded with Schedule A and D seed mix shall be mowed each week or when grass exceeds a height of two and one-half inches (2-1/2S). Clippings shall not be caught and removed unless they are determined by the project Engineer to be unsightly or damaging to the lawn. Contractor is not to mow areas seeded with Schedule B and C seed mix.

The final mowing of the grass in fall should be left at a height of two inches (2").

k. Other Tree and Shrub Maintenance Requirements

To protect coniferous trees during the winter from excessive desiccation, apply an anti-desiccant such as "Wilt-Pruf" (or approved equal) prior to the winter shut-down period. Complete coverage of all foliage is required.

l. Inspection

The Engineer shall make periodic maintenance inspections of the work. All deficiencies noted shall be corrected within five (5) calendar days from written notice to do so, at no additional cost to the owner. All de lays beyond the five day period, shall result in an equal number of days added to the 60 day maintenance period.

Article 2.5 Final Maintenance Acceptance

A Final Maintenance Acceptance Inspection of the project will occur after completion of the designated maintenance period. Conditions governing final acceptance of the planted and seeded areas are that in the opinion of the Engineer all plants and seeded areas are a live, uniform, and in a sound and healthy condition; exhibiting vigorous growth, free of disease, insect infestation and physical damage, and free of weeds, rubbish and construction debris. Should the site NOT be accepted, the Contractor shall correct

all deficiencies until acceptance is received from the Engineer. All costs associated with correcting the noted deficiencies are to be provided without additional cost to the owner. Should said corrections and deficiencies not be made within thirty (30) days after the initial Final Maintenance Acceptance Inspection, the Contractor shall be assessed liquidated damages per Section 10.05 Control of Work, Article 5.27, until all project work is complete and accepted by the Engineer.

Article 2.6 Measurement

The quantity of plants to be paid for shall be by individual plant count, or by area as specified. Upon the Engineers written approval of the Landscape Inspection, a 75% Payment for installation of all landscape work to be made upon the Contractors application for partial payment. Final payment to be made upon the Engineers written approval of the Final Maintenance Acceptance Inspection.

Article 2.7 Basis of Payment

Payment for this Work shall be in accordance with Division 10.00 General Provisions, and shall include full payment for all Work described in Section 75.02, including maintenance activities.

Payment shall be made on the following basis:

ITEM	UNIT
Trees (by species and size as indicated on Drawings)	Each
Shrubs (by species and size as indicated on Drawings)	Each
Ground Cover (by species and size as indicated on Drawings)	1,000 S.F

SECTION 75.03 SOIL STABILIZATION

Article 3.1 General

The Work under this Section consists of providing all operations pertaining to placing and maintaining soil Stabilization Matting material on the areas and according to the details shown on the Drawings or specified herein.

Article 3.2 Material

a. Jute Mesh

Jute Mesh shall be cloth of a uniform, open, plain weave 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 requirements as follows:

1. Width - 48 inches, plus or minus one inch.
2. 78 warp-end per width of cloth (minimum).
3. 41 weft-ends per yard (minimum).
4. Weight to average 1.22 pounds per linear yard with a tolerance of plus or minus 5%.

Staples shall be U-shaped and shall be approximately 6 inches long and 1 inch wide. Machine-made staples may be of No. 11 gauge or heavier steel wire. Hand-made staples shall be made from No. 9 gauge or heavier steel wire.

b. Glass Fiber

Glass Fiber material shall consist of glass processed from the molten state into fibrous form. A multitude of continuous glass fibers (approximately 60 ends) shall be collected together and wound into a package of cylindrical shape. The glass fibers shall be lightly bound together in a ribbon without the use of clay, starch or like deleterious substances and not more than 0.75 percent of saponifiable acids. It shall be of a consistency suitable for application by compressed air. It shall contain no petroleum solvents or other agents known to be toxic to plant or animal life.

c. Nylon Matting

Nylon matting shall be made from Nylon 6, with a minimum content of 0.5% by weight of carbon black, monofilaments fused at their intersections to form a bulky mat of open construction. Nylon matting shall be furnished in rolled strips a minimum of 38 inches wide.

Staples shall be a minimum of 10 inches in length and shall be either T-staples, U-staples, or wood stakes. Metal staples shall be 8 to 11 gauge steel.

d. Excelsior Blankets

Excelsior blankets shall consist of a machine produced mat of curled wood excelsior of 80% six-inch or longer fiber length, with consistent thickness and the fiber evenly distributed over the entire area of the blanket. The top side of each blanket shall be covered with a photodegradable extruded plastic mesh. The blanket shall be made smolder resistant without the use of chemical additives. Excelsior blankets shall be furnished in rolled strips and shall meet the requirements as follows:

1. Width - 48 inches, plus or minus one inch
2. Length - 180 feet average
3. Weight Per Roll - 78 pounds, plus or minus 10%

Staples shall be made of wire 0.091 inches in diameter or greater, "U" shaped. Size and gauge will vary with soil conditions.

Article 3.3 Construction

This Work shall be accomplished within forty-eight (48) hours after finish grading of the subgrade or topsoil has been completed.

The rates of application shall be as shown on the plans.

Matting material shall not be applied on days when the wind or rain would cause undue erosion or displacement of the material. The soil shall not be disturbed more than necessary. Use of vehicles and tracked equipment will be permitted by the Engineer only if such use does not cause rutting and displacement of the subgrade or topsoil.

Article 3.4 Surface Requirements

The surface shall be smoothed and all gullies and potholes backfilled prior to applying the matting. All rocks or clods larger than two inches (2") in size and all sticks and other foreign material which will prevent contact of the matting and surface shall be removed. If the surface of the subgrade or topsoil is extremely dry, watering may be required by the Engineer prior to placement of the matting. Such watering will be incidental to the work.

Article 3.5 Application

The matting shall be spread uniformly at the locations shown and shall be loose enough to allow sunlight to penetrate and air to circulate, but dense enough to shade the ground, reduce rate of water evaporation, and prevent or reduce water or wind erosion.

a. Jute Mesh

If seeding is specified, the jute matting shall be spread within twenty-four (24) hours after the seed has been placed.

Check slots shall be installed as detailed on the Drawings and shall consist of separate full-width four feet (4') 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 made by burying a tight fold of jute mesh vertically in the soil and tamping and stapling in place.

Check slots shall be spaced so that one check slot, junction slot, or anchor slot of the jute mesh occurs every seventy-five feet (75') on gradients of less than 4% and every fifty feet (50') on gradients of more than 4%. On slope drains, a check slot or an end slot shall occur every twenty-five feet (25').

Edges of matting shall be buried around the edges of catch basins and other structures as herein described. Matting must be spread evenly and smoothly and in contact with the soil at all points.

Jute matting shall be held in place by approved wire staples, pins, spikes, or wooden stakes driven vertically into the soil. Matting shall be fastened at intervals not more than three (3) feet apart in three (3) rows for each strip of matting with one (1) row along each edge and one (1) row alternately spaced in the middle. All ends of the matting and check slots shall be fastened at six (6) inch intervals across their width.

b. Glass Fiber Matting

Glass fiber matting shall be of such consistency that it can be applied by use of a blower. Other equipment capable of spreading the continuous glass fiber strands uniformly may be used if approved by the Engineer. Equipment which cuts or breaks the glass fibers shall not be permitted.

Glass fiber matting shall be held in place by the application of an CRS-1 asphalt emulsion applied at the rate shown on the plans. A hand operated boom from a spreader may be used to spray the emulsion evenly over the mulch material.

All glass fibers shall be placed and tacked with emulsion, in the specified areas within twenty-four hours (24) after seeding, or as directed by the Engineer.

CRS-1 Cathionic emulsion will not be measured or paid separately but will be included in the price paid for glass fiber matting.

c. Nylon Matting

Matting shall be installed peaked side down. Adjacent strips are to be overlapped two inches (2") to three inches (3") and ground fastened at three to five feet (3'-5') intervals. The entire perimeter of the

matting shall be ground fastened in twelve inches (12") deep trenches at three to five-foot intervals and covered with soil.

If seeding is specified, the seeding shall be accomplished within twenty-four (24) hours after placing the nylon matting.

d. Excelsior Blankets

Excelsior blankets shall be unrolled with the netting on top and the fibers in contact with the soils over the entire area. In ditches, the blankets shall be applied in the direction of flow, butted at ends and sides. On slopes, the blankets shall be applied either horizontal or vertical to the slope; ends and sides shall be butted. Staples shall be spaced approximately two linear yards apart, on each side, and one row in the center alternately spaced between each side. Use a common row of staples on adjoining blankets.

If seeding is specified, the excelsior blankets shall be placed within twenty-four hours (24) after the seed has been placed.

Article 3.6 Maintenance and Repair

The Contractor shall maintain the areas covered by matting until all Work on the Project has been completed and accepted. Prior to acceptance of the Work, the damaged areas shall be reshaped, reseeded, and the matting satisfactorily repaired or replaced as herein specified with no additional compensation thereof.

Article 3.7 Measurement

The quantity of Soil Stabilization Matting to be paid for shall be the number of units of 1,000 square feet, measured on the slope of the ground surface.

Article 3.8 Basis of Payment

Payment for this Work shall be in accordance with Section 75.01 - General, Article 1.2 - Payment - General, of this Division, and shall include full payment for all Work described in Section 75.03.

Unit cost payment shall be made on the following basis:

ITEM	UNIT
Soil Stabilization Matting (Type)	1000 Square Feet

SECTION 75.04 TOPSOIL

Article 4.1 General

The Work under this Section consists of providing all operations pertaining to furnishing, transporting, and spreading, of topsoil.

Article 4.2 Materials

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 shredded and free from roots, hard clay, gravel, larger than one inch (1") in any dimension, noxious weeds, tall grass, brush, sticks, stubble, or other litter, and shall have indicated by a healthy growth of crops, grasses, trees, or other vegetation that it is free-draining and non-toxic. Topsoil to contain not more than 10% gravel by dry weight of total sample. For the purposes of this specification gravel is defined per ASTM D-422 modified to include only material passing 1-inch and retained on the No. 4 sieve.

Topsoil shall conform to the following requirements, as tested using the procedures included in ASTM D422, ASTM D2974 and AASHTO T267. The topsoil will be inspected and tested by the Engineer before approval will be granted for its use.

TOPSOIL MIX

Organic Material	15-25% by dry weight of total sample (Organic matter is to be determined by loss-on-ignition of oven dried material in accordance with ASTM D-2974)
Silt	25% to 45% by dry weight:
Sand	35% to 55% by dry weight:

Limestone & Fertilizer: Fertilizer shall be of standard commercial types supplied separately or in mixtures, and furnished in moisture proof containers. Each container shall be marked with the weight and the manufacturer's guaranteed analysis of the contents showing the percentage for each ingredient contained therein.

The proportion of chemical ingredients furnished shall be a mixture such as to provide the total available nitrogen, phosphoric, and potassium as required by the soil analysis or as specified in the Special Provisions.

Tolerances of the chemical ingredient shall be plus or minus 2%.

No Cyanamid compounds or hydrated lime will be permitted in mixed fertilizers.

Limestone shall contain not less than 85 percent of calcium and magnesium carbonates. Agricultural ground limestone suitable for application by a fertilizer spreader shall conform to the following gradation:

<u>SIEVE DESIGNATION</u>	<u>MINIMUM PERCENT PASSING, BY WEIGHT</u>
No. 10	100
No. 20	90
No. 100	50

Pelletized limestone may be used subject to approval by the Engineer.

Sufficient fertilizer and limestone shall be applied to the topsoil such that the total natural and applied chemical constituents are within the following ranges:

Nitrogen	21-35 PPM
Phosphoric Acid	11-20 PPM
Potassium	76-150 PPM
Limestone	Sufficient to Attain a Ph of 6.0 to 7.0

The Contractor shall furnish soil analysis test reports which verify this. Fertilizer and limestone shall be applied at the rates indicated by the soil tests and worked into the topsoil to a uniform depth of two inches.

Organic material for incorporation into topsoil, shall be partially decomposed peat moss. Organic material shall be from a source above the water table. Peat moss may require chopping or shredding to insure thorough mixing with the topsoil.

Article 4.3 Placing

The topsoil shall be evenly spread on the designated areas to a minimum depth after settlement of four inches, unless a greater depth is specified on the plans or in the bid proposal. Spreading shall not be done when the ground or topsoil is frozen, excessively wet, or otherwise in a condition detrimental to the Work.

Settlement shall be achieved by rolling the topsoil with a water-filled drum approved by the Engineer. The Engineer may direct that topsoil placed on slopes be track-walked perpendicular to the slope with a small track dozer. Track-walking shall be incidental to this pay item and no separate payment will be made.

Roadway surfaces shall be kept clean during hauling and spreading operation.

Article 4.4 Measurement

Measurement shall be the number of 1000 square foot units measured to the nearest .1 unit on the ground surface. Stockpiling and rehandling of topsoil during stripping operations, or during placement shall not be measured for payment.

Article 4.5 Basis of Payment

Payment for this Work shall be in accordance with Section 75.01 - General, Article 1.2 - Payment - General, of this Division, and shall include full payment for all Work described in Section 75.04.

Unit cost payment shall be made on the following basis:

ITEM	UNIT
Top Soil (at ___ depth)	1000 Square Feet

SECTION 75.05 SEEDING

Article 5.1 General

The work under this SECTION shall consist of providing all labor, equipment, materials, for the preparation of ground surfaces for the application and maintenance of seeded areas, fertilization, lime application (if necessary), watering, and mulching at locations shown on the drawings or established by the Engineer.

All seeding shall be performed between May 1, and September 1. Seeding at other than the specified dates, will only be allowed upon written approval from the Engineer. Seeding shall not be done during windy conditions or when climatic or ground conditions would hinder placement or proper germination of seed mixes.

Article 5.2 Materials

a. Seed

Seed shall conform to one of the following seed mix types and application rates.

Schedule A Application rate: 5 lbs./1000 S.F.

NAME	PROPORTION BY WEIGHT	PURITY	GERMINATION
Annual Ryegrass	5%	90%	85%
Kentucky Bluegrass:			
Nugget	30%	90%	85%
Merion	25%	90%	85%
Boreal Fescue	40%	90%	85%

Schedule B Application rate: 8 lbs./1000 S.F.

NAME	PROPORTION BY WEIGHT	PURITY	GERMINATION
Red Fescue (Arctared)	25%	90%	85%

Alsike or Dutch White Clover	15%	90%	85%
Annual Ryegrass	20%	90%	85%
Ox-eye Daisy (Chrysanthemum leucanthemum)	7%	90%	85%
Baby Blue Eyes (Nemophila Menzeisii)	14%	90%	85%
Iceland Poppy (Papaver nudicaule)	19%	90%	85%

Schedule C Application rate: 5 lbs./1000 S.F.

<u>NAME</u>	<u>PROPORTION BY WEIGHT</u>	<u>PURITY</u>	<u>GERMINATION</u>
Red Fescue (Boreal, Arctared)	15%	90%	85%
Meadow Foxtail	30%	90%	85%
Hard Fescue (Tournament, Scaldis)	25%	90%	85%
Timothy (Engmo)	30%	90%	85%

Schedule D Application rate: 5 lbs./1000 S.F.

<u>NAME</u>	<u>PROPORTION BY WEIGHT</u>	<u>PURITY</u>	<u>GERMINATION</u>
Red Fescue	30%	90%	85%
Clover	10%	30%	90%

Kentucky Bluegrass:

Merion	20%	90%	85%
Nugget	30%	90%	85%
<hr/>			
Hard Fescue (Tournament, Scaldis)	10%	90%	85%

Schedule E (Alaska Lawn Mix) Application rate: 5 lbs./1000 S.F.

NAME	PROPORTION BY WEIGHT	PURITY	GERMINATION
Boreal Red Fescue	34.42%	90%	85%
Park Kentucky Blue	34.58%	90%	80%
Nugget Kentucky Blue	9.93%	90%	90%
Arctared Fescue	9.79%	90%	85%
Arlene Kentucky	9.90%	90%	91%
Other Crop Seed	0.00%		
Inert Matter	1.38%		
Weed Seed	0.00%		

b. Fertilizer:

Fertilizer shall be of standard commercial types supplied separately or in mixtures, and furnished in moisture proof containers. Each container shall be marked with the weight and the manufacturer's guaranteed analysis of the contents showing the percentage for each ingredient contained therein. The proportion of chemical ingredients furnished shall be a mixture such as to provide the total available nitrogen, phosphoric, and potassium as required by the soil analysis or as specified in the Special Provisions.

Tolerances of the chemical ingredients shall be plus or minus 2%.

No Cyanamid compounds or hydrated lime will be permitted in mixed fertilizers.

c. Limestone:

Limestone shall contain not less than 85 percent of calcium and magnesium carbonates. Agricultural ground limestone suitable for application by a fertilizer spreader shall conform to the following gradation:

<u>SIEVE DESIGNATION</u>	<u>MINIMUM PERCENT PASSING, BY WEIGHT</u>
NO. 10	100
NO. 20	90
NO. 100	50

Fertilizer and limestone for use in a hydraulic sprayer shall be soluble or ground to a fineness that will permit complete suspension of insoluble particles in water.

d. Mulch:

Shall be dried shredded peat moss; or cellulose wood or paper fiber such as "Astromulch", "Silvafibre", "Conwed", or approved equal.

e. Water:

Water used in all operations shall be of potable quality.

Article 5.3 Application

a. Soil Preparation

After grading of areas has been completed in conformity with the lines and grades shown on the Drawings, and before beginning 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 (2"). 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 (1") in diameter and larger; all weeds, plant growth, sticks, stumps, and other debris or irregularities which might interfere with the seeding operation, germination of seed, or subsequent maintenance of the seed covered areas.

b. Fertilizer:

Fertilizer shall be applied at a rate to provide 2 lbs. actual Nitrogen per 1000 Sq. Ft. of area. In the absence of soil tests and direction from the Engineer, the Contractor shall apply 16-16-16 at the rate of 7 lbs per 1000 square feet. Fertilizer shall be in accordance with SECTION 75.04 of these specifications.

c. Limestone:

Limestone, dry form, shall be applied at the rate of 100 lbs per 1000 square feet, raked in prior to seeding.

d. Application Methods

Apply seed mixtures as specified under Article 5.2.a of this SECTION at rates as specified and/or as directed by the Engineer. Seed, fertilizer, limestone, mulch, and water may be applied by the following methods:

1) Hydraulic Method

Seeding by hydraulic methods shall consist of furnishing and placing a slurry made of seed, fertilizer, dried peat moss or cellulose wood fiber and water.

The dried peat moss or cellulose wood fiber shall be added to the water slurry in the hydraulic seeder after the proportionate amounts of seed and fertilizer have been added.

The slurry mixture shall then be combined and applied in such a manner that the rate of application will result in an even distribution of all materials.

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

Mechanical spreader, seed drills, landscape seeder, cultipacker seeder, fertilizer spreader, or other approved mechanical spreading equipment may be used when seed and fertilizer are to be applied in dry form.

Fertilizer shall be spread separately at the specified rates then incorporated in one operation to a minimum depth of two inches (2"). Seeded areas shall be compacted within twenty-four hours from the time the seeding is completed, weather and soil conditions permitting, by cultipacker, roller or other equipment satisfactory to the Engineer. 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 equipment not shall heavy soils be compacted unless directed by the Engineer.

3) Hand Method

Hand broadcasting by means of portable, hand operated mechanical spreaders or "by Hand", may be substituted for the preceding two (2) methods provided that the application rate is twice that of the dry method, and that the application is applied in a minimum of two (2) passes over the areas to be seeded, (at 90 degrees to one another in order to assure uniform and even coverage to all seeded surfaces).

Article 5.4 Maintenance

The Contractor shall protect seeded areas from damage from all traffic; whether people, animals, on or off road vehicles, or any other causes which may damage newly seeded and maintained surfaces. Surfaces damaged shall be repaired by regrading, re-seeding (including all specified amendments), as directed by the Engineer, at no additional cost to the Owner. The Contractor shall otherwise maintain seeded areas in a satisfactory condition until Final Acceptance of the Work. All maintenance shall be in accordance with SECTION 75.02.

Contractor shall apply during the maintenance period, one application of fertilizer (16-16-16) at the rate of 7 lbs. per 1000 square feet, on the 45th day of the maintenance period.

Article 5.5 Measurement

The quantity of seeding to be paid for shall be the number of 1,000 square foot units, measured to the nearest 0.1 unit on the ground surface. The quantity of seeding specified shall include all cultivating, seed, limestone, if required, fertilizer and mulch material of the type specified, completed and accepted.

Article 5.6 Basis of Payment

Payment for this Work shall be in accordance with Division 10.00 Standard General Provisions, Section 10.07 - Measurement and Payment of these Specifications, and shall include full payment for all work described in Section 75.05.

Payment shall be made on the following basis:

UNIT	PAY UNIT
Seeding (Type) 1,000 Sq. Ft.	

When more than one type of seeding is specified for any pay item, letter suffixes shall be included in order to differentiate between different types.

SECTION 75.06 CHAIN LINK FENCE

Article 6.1 General

The Work under this Section consists of providing all operations pertaining to construction of chain link fencing.

Article 6.2 Materials

Material used in the construction of chain link fencing shall be in accordance with the Standard Details of these Specifications and the requirements of the "Chain Link Fence Manufacturers Institute", as described below.

a. General

Posts, gate frames, braces, rails, stretcher bars, and truss rods shall be of steel; reinforcing wires shall be of high carbon steel; and gate hinges, post caps, barbed-wire supporting arms, stretcher bar bands, and other parts shall be of steel, malleable iron or equal except that ties and clips may be of aluminum.

Workmanship shall be of good quality. Parts shall be formed accurately to dimensions. All steel and iron parts shall be zinc coated after fabrication, using zinc grade "E" in accordance with Federal Specifications QQ-Z-351.

The weight of the zinc coating per square foot of actual surface shall average not less than 1.2 ounces and no individual specimen shall show less than 1.0 ounces. Zinc-coated surfaces shall be free from imperfectly coated spots, bruised or scaled coating, drops of zinc, sharp projections, and sal ammoniac spots.

Posts, gate frames, rails, and braces shall conform to the dimensions and weights shown in Table #1, Article 6.3.

b. Fabric

Fencing fabric shall be zinc coated by the hot-dip process after fabrication. The zinc coating shall be commercially uniform. It shall not have less than 1.2 ounces per square foot when tested. Fabric gage shall be as shown in Table III, Article 6.3.

c. Gates

Gates shall be swing or sliding, single or double, as specified, complete with latches, stops, keepers, hinges, or rollers and roller tracks, and, when so specified, with provisions for three strands of barbed wire above the fabric.

Gate frames shall be constructed of tubular members, and shall be constructed in a manner such as to provide a rigid frame and ample strength and shall be free from sag and twist. Where a barbed wire top is specified, the end members of gate frames shall be extended approximately one (1) foot above the top member and arranged for attaching three (3) uniformly spaced strands of barbed wire and furnished with bands or other suitable method for securely attaching the wire. Fabric shall be attached securely to the gate frame at intervals not to exceed fifteen (15") inches.

Hinges shall be of heavy pattern, of adequate strength for the gate, and with large bearing surfaces for clamping them in position. The hinges shall not twist or turn under the action of the gate. The gates shall be capable of being opened and closed easily by one person.

Latches, stops and keepers shall be provided for all gates. Latches shall have the plunger-bar arranged to engage the gate stop, except that for single gates with openings less than ten feet (10') wide, a forked latch may be provided. Latches shall be arranged for locking. Center stops shall consist of a device arranged to be set in concrete and to engage the plunger of the bar latch of double gates. No stop is required for single gates. Keepers shall consist of a mechanical device for securing the free end of the gate when in the full open position.

d. Posts

Posts shall be of the lengths specified and shall be tubular, except that line posts may be Hbeam. Dimension and weight shall conform to Table I, Article 6.3 unless otherwise specified.

e. Post Braces

Post braces shall be provided for each gate, corner, pull, and end post for use with fabric five feet (5') or more in height, and shall consist of a round tubular brace extending to each adjacent post at midheight of the fabric, and a truss consisting of a rod not less than three-eighth inches (3/8") in nominal diameter from the adjacent post back to the gate, corner, pull, or end post, with a turnbuckle or other equivalent provision for adjustment.

f. Post Tops

Post tops shall consist of ornamental tops or combination tops and barbed-wire supporting arms, as specified. When so specified or when a top rail is to be provided, the top shall be provided with a hole suitable for the through passage of the top rail. The post tops shall fit over the outside of the posts and shall exclude moisture from the tubular posts.

g. Barbed-Wire Supporting Arms

Barbed-wire supporting arms, when specified to be furnished, shall be at an angle of approximately 45 deg., and shall be fitted with clips or other means for attached three lines of barbed-wire. The top

outside wire shall be approximately twelve (12) inches horizontally from the fence line and the other wires spaced uniformly between the top of the fence fabric and the outside barbed-wire.

h. Top Rails

Top rails shall be round (tubular), shall be in lengths not less than eighteen feet (18'), and shall be fitted with couplings for connecting the lengths into a continuous run. The coupling shall be not less than six inches (6") long, shall provide a substantial connection, and shall allow for expansion and contraction of the rail. Suitable ties or clips shall be provided in sufficient number for attaching the fabric securely to the top rail at intervals not exceeding two feet (2'). Means shall be provided for attaching the top rail to each gate, corner, pull, and end post.

i. Stretcher Bars

Stretcher bars shall not be less than three-sixteenth inch ($3/16$ ") by three quarter inch ($3/4$ ") and shall be of lengths one inch (1") 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.

j. Ties or Clips

Ties or clips of adequate strength shall be provided for attaching the fabric to lineposts.

k. Fabric Bands

Fabric bands of adequate strength shall be provided for attaching the fabric and stretcher bars to all terminal posts.

l. Tension Wires

A bottom tension wire shall be provided unless otherwise specified. Top tension wire shall be provided, when so specified, in lieu of a top rail. The tension wires shall be of coiled spring wire not less than 7 gage 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 (2').

m. Barbed-Wire

Barbed-wire shall consist of two strands of 12-1/2 gage wire with 14 gauge 4 point barbs spaced approximately five inches (5") apart. All wire shall be zinc coated with a minimum coating of .80 ounces per square foot of surface area on 12-1/2 gage wire.

n. Vinyl Clad Fencing

Those components specified to be vinyl-clad or coated shall have an vinyl covering 10-14 mils in thickness. Fabric is to be 9 gage wire. Products are to be Colorbond II as manufactured by Colorguard Corporation, or approved equal.

Article 6.3 Tables

TABLE #1 - DIMENSIONS AND WEIGHTS

Use and Section		Outside Diameter or Dimensions, Nominal	Weight Per Foot Nominal
End, corner, and pull posts (tubular for fabric heights:		Inches	Pounds
6 feet and less	Round	2.375	3.65
Over 6 feet:	Round	2.875	5.79
Gate posts for nominal width of gate, single, or one leaf of double			
6 feet and less	Round	2.875	5.79
Gate with 13 feet and less:	Round	4.00	9.10
Gate width over 13 feet to 18 ft., including:	Round	6.625	18.97
Gate width over 18 ft.	Round	8.625	24.70
Gates: exterior frames for fabric heights:			
Less than 6 ft.	Round	1.660	1.806
6 feet and over	Round	1.90	2.085
Interior bracing heights:			
Less than 6 ft.	Round	1.315	1.055

6 feet and over	Round	1.660	1.806
<hr/>			
Rails and post braces (tubular)	Round	1.660	1.806
<hr/>			
Intermediate posts for fabric heights: 6 feet and Less:			
Tubular	Round	1.90	2.72
H-Section		1.875X1.625X.113	2.70
Over 6 feet			
Tubular	Round	2.375	3.65
H-Section		2.25X1.95X.143	4.10

TABLE #2 - PERMISSIBLE TOLERANCE IN DIMENSIONS AND WEIGHTS

Tubular Diameter	Tolerance O.D.	Tolerance lbs/ft
Up to 1-1/2" inclusive	+ -1/64" - 1/32"	+ - 5%
2" and over	+ 1% - 1%	+ - 5%
H-Section		
1.875 X 1.625	+ -.0625"	+ - 5%
2.25 X 1.95	+ -.0937"	+ - 5%

Note: Where tolerances are not specified in this table or elsewhere in this Specification, standard commercial tolerances shall apply.

TABLE #3

Ht. of Fabric	Mesh Size	Gage	Nominal Dia. of Wire
---------------	-----------	------	----------------------

36" through 144"	2"	6	0.192"
36" through 144"	2"	9	0.148"
36" through 84"	2"	11	0.120"
96" through 144"	1-3/4"	11	0.120"

Article 6.4 Construction

a. Grading

All trees, brush and other obstacles which would interfere with the construction of the fence shall be removed and disposed of at a Contractor-provided disposal area and shall be considered incidental. The fence shall be constructed in such a manner as to follow a smooth profile. Throughout the fence length the distance between the ground surface and the bottom tension wire shall not be greater than four inches (4"), nor less than two inches (2"). Where excavation is necessary to meet this requirement, the ground will be graded level not less than one foot (1') on either side of the fence and backslopes of one and one-half to one (1-1/2:1) provided. Where backfill is necessary to meet this requirement, natural surface vegetation will be removed prior to placing fill material. The top of the fill shall be level for one foot (1') on either side of the fence line and the shoulder slopes shall be one-half to one (1/2 to 1). Grading for all specific conditions shall be such that water will not be allowed to pond in the immediate area of the fence. Where drainage is required across the fence line, the Engineer shall be consulted and channels provided in accordance with his decision.

b. Posts

All posts shall be set in Class B 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. The dimensions of the footings shall be as shown on the plans. The footings shall be allowed to cure for a period of at least seven (7) days before attaching fabric.

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 (10') center. On straight runs, pull posts shall be provided at intervals not to exceed 500 lineal feet. Changes in line of 30 deg. or more shall be considered as corner posts. Steep slopes and abrupt changes in topography may require changes in various elements of the fence. The chain link fabric shall be stretched taut and securely fastened to end, corner, or gate posts. The top edge of the fabric shall be fastened to the top rail, and the lower edge of the fabric shall be fastened to the bottom tension wire.

c. Fabric

Fabric shall be placed on the side specified, stretched taut, and securely fastened to the posts. Fastening to end, gate, corner and pull posts shall be with stretcher bars and fabric bands spaced at intervals of fifteen inches (15") or less. Fastening to line posts shall be with ties or clips at fifteen-inch (15") intervals.

Rolls of wire fabric shall be joined by weaving a single strand into the ends of the rolls to form a continuous mesh. Horizontal splices will not be permitted.

d. Top Rail

Top rails shall pass through the ornamental tops of the line posts, forming a continuous brace from end to ends of each stretch of fence. Lengths of tubular top rail shall be joined by sleeve couplings. Top rails shall be securely fastened to terminal posts by pressed steel fittings or other appropriate means.

e. Tension Wire

One continuous length of tension wire shall be used between pull posts. Sufficient tension shall be applied to avoid excess sag between the posts. Tension Wires shall be tied or otherwise fastened to end, gate, corner or pull posts by methods approved by the Engineer.

f. General Appearance

All runs of fence shall present the same general appearance and 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 or a similar nature that its product is of the type required. No used, re-rolled, or open-seam steel will be permitted in posts, gate frames, rails or braces.

Article 6.5 Measurement

Chain link fencing will be measured per linear foot, in place, from outside to outside of end or corner posts, except for the space occupied by gates.

Gates will be measured per each, complete in place for a particular size.

Article 6.6 Basis of Payment

Payment for this Work shall be in accordance with Section 70.01 - General, Article 1.2 - Payment - General, of this Division, and shall include full payment for all Work described in Section 75.06.

Unit cost payment shall be made on the following basis:

ITEM	UNIT
Chain Link Fence (incl. heights & gage)	Linear Foot
Gate (Type and size)	Each

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