SECTION 200

GENERAL CONDITIONS OF THE CONTRACT

201 DEFINITIONS

201-1 Terms Wherever used in the contract documents, the following terms shall have the meanings indicated which shall be applicable to both the singular and plural thereof:

201-2 Addenda Written or graphic instruments issued prior to the execution of the agreement which modify or interpret the contract documents, drawings and specifications, by additions, deletions, clarifications or corrections.

201-3 Bid The offer or proposal of the bidder submitted on the prescribed form setting forth the prices for the work to be performed.

201-4 Bidder Any person, firm or corporation submitting a bid for the work.

201-5 Bonds Bid, performance, and other instruments of security, furnished by the Contractor and his surety in accordance with the contract documents.

201-6 Change Order A written order to the Contractor authorizing an addition, deletion or revision in the work within the general scope of the contract documents, or authorizing an adjustment in the contract price of contract time.

201-7 Contract Documents The Contract, including Advertisement for Bids, Information for Bidders, Bid, Bid Bond, Agreement, Performance Bond, Notice

of Award, Notice to Proceed, Change Order, Drawings, Specifications, and Addenda.

201-8 Contract Price The total monies payable to the Contractor under the terms and conditions of the contract documents.

201-9 Contract Time The number of calendar days, or weather working days, stated in the contract documents for the completion of work.

201-10 Contractor The person, firm or corporation with whom the Owner has executed the agreement.

201-11 Drawings The part of the contract documents which show the characteristics and scope of the work to be performed and which have been prepared or approved by the Engineer.

201-12 Engineer City of Williston Engineering Department, Williston, North Dakota, or its representative, duly authorized in writing to act for the Engineer.

201-13 Filed Order A written order effecting a change in the work not involving an adjustment in the contract price or an extension of the contract time, issued by the Engineer to the Contractor during construction.

201-14 Notice of Award The written notice of the acceptance of the bid from the Owner to the successful bidder.

201-15 Notice to Proceed Written communication issued by the Owner to the Contractor authorizing him to proceed with the work and establishing the date of commencement of the work.

201-16 Owner A public or quasi-public body or authority, corporation, association, partnership, or individual for whom the work is to be performed.

201-17 Project The undertaking to be performed as provided in the contract documents.

201-18 Resident Project Representative The authorized representative of the Owner who is assigned to the project site or any part thereof.

201-19 Shop Drawings All drawings, diagrams, illustrations, brochures, schedules and other data which are prepared by the Contractor, a Subcontractor, manufacturer, supplier, or distributor, which illustrate how specific portions of the work shall be fabricated or installed.

201-20 Specifications A part of the contract documents consisting of written descriptions of a technical nature of materials, equipment, construction systems, standards and workmanship.

201-21 Subcontractor An individual, firm or corporation having a direct contract with the Contractor or with any other Subcontractor for the performance of a part of the work at the site.

201-22 Substantial Completion That date as certified by the Engineer when the construction of the project or a specified part thereof is sufficiently completed, in accordance with the contract documents, so that the project or specified part can be utilized for the purposes for which it is intended.

201-23 Supplemental General Conditions Modifications to general conditions required by a federal agency for participation in the project and approved by the agency in writing prior to inclusion in the contract documents, or such requirements that may be imposed by applicable State laws.

201-24 Supplier Any person or organization who supplies materials or equipment for the work, including that fabricated to a special design.

201-25 Work All labor necessary to produce the construction required by the contract documents, and all materials and equipment incorporated or to be incorporated in the project.

201-26 Written Notice Any notice to any party of the agreement relative to any part of this agreement in writing and considered delivered and the service thereof completed, when posted by certified or registered mail to the said party at his last given address, or delivered in person to said party or his authorized representative on the work.

202 ADDITIONAL INSTRUCTIONS AND DETAIL DRAWINGS

202-1 The Contractor may be furnished additional instructions and detail drawings, by the Engineer, as necessary to carry out the work required by the contract documents.

202-2 The additional drawings and instructions thus supplied will become a part of the contract documents. The Contractor shall carry out the work in accordance with the additional detail drawings and instructions.

203 SCHEDULES, REPORTS AND RECORDS

203-1 The Contractor shall submit to the Owner such schedule of quantities and cost progress schedules, payrolls, reports, estimates, records and other data where applicable as are required by the contract documents for the work to be performed.

203-2 Prior to the first partial payment estimate, the Contractor shall submit construction progress schedules showing the order in which he proposes to carry on the work, including dates at which he will start the various parts of the work, estimated date of completion of each part and, as applicable:

203-2.1 The dates at which special detail drawings will be required; and

203-2.2 Respective dates for submission of shop drawings, the beginning of manufacture, the testing and installation of materials, supplies and equipment.

203-3 The Contractor shall also submit a schedule of payments that he anticipates he will earn the course of the work.

204 DRAWINGS AND SPECIFICATIONS

204-1 The intent of the drawings and specifications is that the Contractor shall furnish all labor, materials, tools, equipment, and transportation necessary for the proper execution of the work in accordance with the contract documents and all incidental work necessary to complete the project in an acceptable manner, ready for use, occupancy or operation by the Owner.

204-2 In case of conflict between the drawings and specifications, the specifications shall govern. Figure dimensions and drawings shall govern over scale dimensions, and detailed drawings shall govern over general drawings.

204-3 Any discrepancies found between the drawings and specifications and site conditions or any inconsistencies or ambiguities in the drawings or specifications shall be immediately reported to the Engineer, in writing, who shall promptly correct such inconsistencies or ambiguities in writing. Work done by the Contractor after his discovery of such discrepancies, inconsistencies or ambiguities shall be done at the Contractor's risk.

204-4 Ownership of Drawings and Specifications All original or duplicated drawings and specifications and other data prepared by the Engineer shall remain the property of the Engineer, and they shall not be reused on other work, but shall be returned to him upon completion of the work.

205 SHOP DRAWINGS

205-1 The Contractor shall provide shop drawings as may be necessary for the prosecution of the work as required by the contract documents. The Engineer shall promptly review all shop drawings. The Engineer's approval of any shop drawing shall not release the Contractor from responsibility for deviations from the contract documents. The approval of any shop drawing which substantially deviates from the requirement of the contract documents shall be evidenced by a Change Order.

205-2 When submitted for the Engineer's review, shop drawings shall bear the Contractor's certification that he has reviewed, checked and approved the shop drawings and that they are in conformance with the requirements of the contract documents.

205-3 Portions of the work requiring a shop drawing or sample submission shall not begin until the shop drawing or submission has been approved by the Engineer. A copy of each approved shop drawing and each approved sample shall be kept in good order by the Contractor at the site and shall be available to the Engineer.

205-4 EQUIPMENT DATA The Contractor shall submit for the Engineer's review complete catalog data for every manufactured item of equipment and all components to be used in the work, including specific performance data, material description, rating, capacity, working pressure, material gauge or thickness, brand name, catalog number and general type. This submission shall be compiled by the Contractor and reviewed by the Engineer before any equipment is ordered.

206 MATERIALS, SERVICES AND FACILITIES

206-1 It is understood that, except as otherwise specifically stated in the contract documents, the Contractor shall provide and pay for all materials, labor, tools, equipment, water, light, power, transportation, supervision, temporary construction of any nature, and all other services and facilities of any nature whatsoever necessary to execute, complete, and deliver the work within the specified time.

206-2 Materials and equipment shall be so stored as to insure the preservation of their quality and fitness for the work. Stored materials and equipment to be incorporated in the work shall be located so as to facilitate prompt inspection.

206-3 Manufactured articles, materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by the manufacturer.

206-4 Materials, supplies and equipment shall be in accordance with samples submitted by the Contractor and approved by the Engineer.

206-5 Materials, supplies or equipment to be incorporated into the work shall not be purchased by the Contractor or Subcontractor, subject to a chattel mortgage or under a conditional sale contract or other agreement by which an interest is retained by the seller.

206-6 Materials Furnished by the Owner Materials specifically indicated shall be furnished by the Owner. The fact that the Owner 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 defect in material furnished by the Owner, he shall notify the Engineer. Unless otherwise noted or specifically stated, materials furnished by the Owner, which are not of local occurrence, are considered to be F.O.B., the nearest railroad station. The Contractor shall be prepared to unload and properly protect all such material from damage or loss. The Contractor shall

be responsible for material loss or damage after receipt of material at the point of delivery.

206-6.1 Index Each data sheet or catalog in the submission shall be indexed according to specification section and paragraph for easy reference.

206-6.2 Relation to Contract Documents Catalog data for equipment reviewed by the Engineer shall not supersede the Engineer's contract documents. The review of 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, nor shall it relieve him from responsibility for errors of any sort in the items submitted. The Contractor shall check the work described in the catalog data with the Engineer's contract documents for deviations and errors.

206-6.3 Contractor's Certification Equipment data shall be submitted by the Contractor with a covering letter indicating that he has reviewed, checked and approved the data submitted, that they are in harmony with the requirements of the project and with the provisions of the contract documents and that he has verified all field measurements and construction criteria, materials, catalog numbers and similar data. Contractor shall also certify that the work represented by the shop drawings is recommended by the Contractor and that his guaranty will fully apply.

207 INSPECTION AND TESTING

207-1 All materials and equipment used in the construction of the project shall be subject to adequate inspection and testing in accordance with generally accepted standards, as required and defined in the contract documents.

207-2 The Owner shall provide all inspection and testing services not required by the contract documents.

207-3 The Contractor shall provide at his expense, the testing and inspection services required by the contract documents.

207-4 If the contract documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any work to specifically be inspected, tested, or approved by someone other than the Contractor, the Contractor will give the Engineer timely notice of readiness. The Contractor will then furnish the Engineer the required certificates of inspection, testing or approval.

207-5 Inspections, tests or approvals by the Engineer or others shall not relieve the Contractor from his obligations to perform the work in accordance with the requirements of the contract documents.

207-6 The Engineer and his representatives will at all times have access to the work. In addition, authorized representatives and agent of any participating Federal

or State agency shall be permitted to inspect all work, materials, payrolls, records of personnel, invoices of materials, and other relevant data and records. The Contractor will provide proper facilities for such access and observation of the work and also for any inspection, or testing thereof.

207-7 If any work is covered contrary to the written instructions of the Engineer it must, if requested by the Engineer, be uncovered for his observation and replaced at the Contractor's expense.

207-8 If the Engineer considers it necessary or advisable that covered work be inspected or tested by others, the Contractor, at the Engineer's request, will uncover, expose or otherwise make available for observation, inspection or testing as the Engineer may require, that portion of the work in question, furnishing all necessary labor, materials, tools, and equipment. If it is found that such work is defective, the Contractor will bear all the expenses of such uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction. If, however, such work is not found to be defective, the Contractor will be allowed an increase in the contract price or an extension of the contract time, or both, directly attributable to such uncovering, exposure, observation, inspection, testing and reconstruction and an appropriate Change Order shall be issued.

208 SUBSTITUTIONS

208-1 Whenever a material, article or piece of equipment is identified on the drawings or specifications by reference to brand name or catalog number, it shall be understood that this is referenced for the purpose of defining the performance or other salient requirements and that other products of equal capacities, quality and function shall be considered. The Contractor may recommend the substitution of a material, article, or piece of equipment of equal substance and function for those referred to in the contract documents by reference to brand name or catalog number, and if, in the opinion of the Engineer, such material, article, or piece of equipment is of equal substance and function to that specified, the Engineer may approve its substitution and use by the Contractor. Any cost differential shall be deductible from the contract price and the contract documents shall be appropriately modified by Change Order. The Contractor warrants that if substitutes are approved, no major changes in the function or general design of the project will result. Incidental changes or extra component parts required to accommodate the substitute will be made by the Contractor without a change in the contract price or contract time.

209 PATENTS

209-1 The Contractor shall pay all applicable royalties and license fee. He shall defend all suits or claims for infringements of any patent rights and save the Owner harmless from loss on account thereof, except that the Owner shall be responsible for any such loss when a particular process, design, or the product

of a particular manufacturer or manufacturers is specified, however, if the Contractor has reason to believe that the design, process or product specified is an infringement of a patent, he shall be responsible for such loss unless he promptly gives such information to the Engineer.

210 SURVEYS, PERMITS, REGULATIONS

210-1 The Owner shall furnish all boundary surveys and establish all base lines for locating the principal component parts of the work together with a suitable number of bench marks adjacent to the work as shown in the contact documents, unless otherwise specified in the contract documents, the Owner shall develop and make all detail surveys needed for construction such as slope stakes, batter boards, stakes for pile locations and other working points, lines, elevations and cut sheets.

210-2 The Contractor shall carefully preserve bench marks, reference points and stakes and, in case of willful or careless destruction, he shall be charged with the resulting expense and shall be responsible for any mistakes that may be caused by their unnecessary loss or disturbance.

210-3 Permits and licenses of a temporary nature necessary for the prosecution of work shall be secured and paid for by the Contractor, unless otherwise stated in the supplemental general conditions. Permits, licenses and easements for permanent structures or permanent changes in existing facilities shall be secured and paid for by the Owner, unless otherwise specified. The Contractor shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the work as drawn and specified. If the Contractor observes that the contract documents are at variance therewith, he shall promptly notify the Engineer in writing, and any necessary changes shall be adjusted as provided in Section 13, Changes in the Work.

211 PROTECTION OF WORK, PROPERTY AND PERSONS

211-1 The Contractor will be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the work. He will take all necessary precautions for the safety of, and will provide the necessary protection to prevent damage, injury or loss to all employees on the work and other persons who may be affected thereby, all the work and all materials or equipment to be incorporated therein, whether in storage on or off the site, and 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.

211-2 The Contractor will comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction. He will erect and maintain as required by the conditions and progress of the work, all necessary safeguards for safety and protection. He will notify owners of adjacent utilities when prosecution of the work may affect them. The

Contractor will remedy all damage, injury or loss to any property caused, directly or indirectly, in whole or in part, by the Contractor or Subcontractor or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, except damage or loss attributable to the fault of the contract documents or to the acts or omissions of the Owner or the Engineer or anyone employed by either of them or anyone for those acts either of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of the Contractor.

211-3 In emergencies affecting the safety of persons or the work or property at the site or adjacent thereto, the Contractor, without special instruction or authorization from the Engineer or Owner, shall act to prevent threatened damage, injury or loss. He will give the Engineer prompt written notice of any significant changes in the work or deviations from the contract documents caused thereby, and a Change Order shall thereupon be issued covering the changes and deviations involved.

212 SUPERVISION BY CONTRACTOR

212-1 The Contractor will supervise and direct the work. He will be solely responsible for the means, methods, techniques, sequences and procedures of construction. The Contractor will employ and maintain on the work, a qualified supervisor or superintendent who shall have been designated in writing by the Contractor as the Contractor's representative at the site. The supervisor shall have full authority to act on behalf of the Contractor and all communications given to the supervisor shall be as binding as if given to the Contractor. The supervisor shall be present on the site at all times as required to perform adequate supervision and coordination of the work.

213 CHANGES IN THE WORK

213-1 The Owner may at any time, as the need arises, order changes within the scope of the work without invalidating the Agreement. If such changes increase or decrease the amount due under the contract documents, or in the time required for performance of the work, an equitable adjustment shall be authorized by Change Order.

213-2 The Engineer, also, may at any time, by issuing a field order, make changes in the details of the work. The Contractor shall proceed with the performance of any change in the work so ordered by the Engineer, unless the Contractor believes that such field order entitles him to a change in contract price or time or both, in which event he shall give the Engineer written notice thereof with seven days after the receipt of the ordered change. Thereafter the Contractor shall document the basis for the change in contract price or time within 30 days. The Contractor shall not execute such changes pending the receipt of an executed Change Order or further instruction from the Owner.

214 CHANGES IN CONTRACT PRICE

214-1 The contract price may be changed only by a Change Order. The value of any work covered by a Change Order or of any claim for increase or decrease in the contract price shall be determined by one or more of the following methods in the order of precedence listed below, and not to exceed 25 percent of the contract amounts. If requested by Contractor in writing:

a. Unit prices previously approved.

b. An agreed lump sum

c. The actual cost for labor, direct overhead, materials, supplies, equipment, and other services necessary to complete the work. In addition, there shall be added a percentage to be agreed upon of the actual cost of the work to cover the cost of general overhead and profit.

215 TIME FOR COMPLETION AND LIQUIDATED DAMAGES

215-1 The date of beginning and the time for completion of the work are essential conditions of the contract documents and the work embraced shall be commenced on a date specified in the Notice to Proceed.

215-2 The Contractor will proceed with the work at such rate of progress to insure full completion within the contract time. It is expressly understood and agreed, by and between the Contractor and the Owner, that the contract time for the completion of the work described herein is a reasonable time, taking into consideration, the average climatic and economic conditions and other factors prevailing in the locality of the work.

215-3 If the Contractor shall fail to complete the work within the contract time, or extension of time granted by the Owner, then the Contractor will pay to the Owner the amount for liquidated damages as specified in the bid for each calendar day that the Contractor shall be in default after the time stipulated in the contract documents.

215-4 The Contractor shall not be charged with liquidated damages or any excess cost when the delay in completion of the work is due to the following, and the Contractor has promptly given written notice of such delay to the Owner or Engineer.

315-4.1 To any preference, priority or allocation order duly issued by the Owner.

215-4.2 To unforeseeable causes beyond the control and without the fault or negligence of the Contractor, including but not restricted to, acts of God, or of the public enemy, acts of the Owner, acts of another Contractor in the performance of a contract with the Owner, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and abnormal and unforeseeable weather; and

215-4.3 To any delays of Subcontractors occasioned by any of the causes specified in Paragraphs 215-4.1 and 215-4.2 of this article.

216 CORRECTION OF WORK

216-1 The Contractor shall promptly remove from the premises all work rejected by the Engineer for failure to comply with the contract documents, whether incorporated in the construction or not, and the Contractor shall promptly replace and re-execute the work in accordance with the contract documents and without expense to the Owner and shall bear the expenses of making good all work of other Contractors destroyed or damaged by such removal or replacement.

216-2 All removal and replacement work shall be done at the Contractor's expense. If the Contractor does not take action to remove such rejected work within ten days after receipt of written notice, the Owner may remove such work and store the materials at the expense of the Contractor.

217 SUBSURFACE CONDITIONS

217-1 The Contractor shall promptly, and before such conditions are disturbed, except in the event of an emergency, notify the Owner by written notice of:

217-1.1 Subsurface or latent physical conditions of the site differing materially from those indicated in the contract documents; or

217-1.2 Unknown physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the contract documents.

217-2 The Owner shall promptly investigate the conditions, and if he finds that such conditions do so materially differ and cause an increase or decrease in the cost of, or in the time required for, performance of the work, an equitable adjustment shall be made and the contract documents shall be modified by a Change Order. Any claim of the Contractor for adjustment hereunder shall not be allowed unless he has given the required written notice; provided that the Owner may, if he determines the facts so justify, consider and adjust any such claims asserted before the date of final payment.

218 SUSPENSION OF WORK, TERMINATION AND DELAY

218-1 The Owner may suspend the work or any portion thereof for a period of not more than 90 days or such further time as agreed upon by the Contractor, by written notice to the Contractor and the Engineer which notice shall fix the date on which work shall be resumed. The Contractor will resume that work on the date so fixed. The Contractor will be allowed an increase in the contract price or an extension of the contract time, or both, directly attributable to any suspension.

218-2 If the Contractor is adjudged a bankrupt or insolvent, or if he makes a general assignment for the benefit of his creditors, or if a trustee or receiver is appointed for the Contractor or for any of his property, or if he files a petition to take advantage of any debtor's act, or to reorganize under the bankruptcy or applicable laws, or if he repeatedly fails to supply sufficient skilled workmen or suitable materials or equipment, or if he repeatedly fails to make prompt payments to Subcontractors or for labor, materials or equipment or if he disregards laws, ordinances, rules, regulations or orders of any public body having jurisdiction of the work or if he disregards the authority of the Engineer, or if he otherwise violates any provision of the contract documents, then the Owner may, without prejudice to any other right or remedy and after giving the Contractor and his surety a minimum of ten days from delivery of a written notice, terminate the services of the Contractor and take possession of the project and of all materials, equipment, tools, construction equipment and machinery thereon owned by the Contractor, and finish the work by whatever method he may deem expedient. In such case, the Contractor shall not be entitled to receive any further payment until the work is finished. If the unpaid balance of the contract price exceeds the direct and indirect costs of completing the project, including compensation for additional professional services, such excess shall be paid to the Contractor. If such costs exceed such unpaid balance, the Contractor will pay the difference to the Owner.

Such costs incurred by the Owner will be determined by the Engineer and incorporated in a Change Order.

218-3 Where the Contractor's services have been so terminated by the Owner, said termination shall not affect any right of the Owner against the Contractor then existing or which may thereafter accrue. Any retention or payment of monies by the Owner due the Contractor will not release the Contractor from compliance with the contract documents.

218-4 After ten days from delivery of a written notice to the Contractor and Engineer, the Owner may, without cause and without prejudice to any other right or remedy, elect to abandon the project and terminate the contract. In such case, the Contractor shall be paid for all work executed and any expense sustained plus reasonable profit.

218-5 If, through no act or fault of the Contractor, the work is suspended for a period of more than 90 days by the Owner or under an order of court or other public authority, or the Engineer fails to act on any request for payment within 30 days after it is submitted, or the Owner fails to pay the Contractor substantially the sum approved by the Engineer or awarded by arbitrators within 30 days of its approval and presentation, then the Contractor may, after ten days from delivery of a written notice to the Owner and the Engineer, terminate the contract and recover from the Owner payment for all work executed and all expenses sustained. In addition and in lieu of terminating the contract, if the Engineer has failed to act on a request for payment or if the Owner has failed to make any payment as aforesaid, the Contractor may upon ten days written notice to the Owner and the Engineer stop the work until he has been paid al amounts then due, in which event and upon resumption of the work, Change Orders shall be issued for adjusting the contract price or extending the contract time or both to compensate for the costs and delays attributable to the stoppage of the work.

218-6 If the performance of all or any portion of the work is suspended, delayed or interrupted as a result of a failure of the Owner or Engineer to act within the time specified in the contract documents, or if no time is specified within a reasonable time, an adjustment in the contact price or an extension of the contract time, or both, shall be made by Change Order to compensate the Contractor for the costs and delays necessarily caused by the failure of the Owner or Engineer.

219 PAYMENTS TO CONTRACTOR

219-1 At least ten days before each progress payment falls due (but not more often than once a month), the Contractor will submit to the Engineer a partial payment estimate filled out and signed by the Contractor covering the work performed during the period covered by the partial payment estimate and supported by such date as the Engineer may reasonably require. If payment is requested on the basis of materials and equipment not incorporated in the work but delivered and suitably stored at or near the site, the partial payment estimate shall also be accompanied by such supporting data, satisfactory to the Owner, as will establish the Owner's title to the material and equipment and protect his interests therein, including applicable insurance. The

Engineer will, within ten days after receipt of each partial payment estimate either indicate in writing his approval of payment and present the partial payment estimate to the Owner, or return the partial payment estimate to the Contractor indicating in writing his reasons for refusing to approve payment. In the latter case, the Contractor may take the necessary corrections and resubmit the partial payment estimate. The Owner will, within 30 days of presentation to him of an approved partial payment estimate, pay the Contractor a progress payment on the basis of the approved partial payment estimate. The Owner shall retain ten percent of the amount of each payment until final completion and acceptance of all work covered by the contract documents. The Owner at any time, however, after 50 percent of the work has been completed, if he finds that satisfactory progress is being made, shall reduce to five percent on the current and remaining estimates. When the work is substantially complete (operational or beneficial occupancy), the retained amount may be further reduced below five percent to only that amount necessary to assure completion. On completion of a part of the work on which the price is stated separately in the contract documents, payment may be made in full, including the retained percentages, less authorized deductions.

219-2 The request for payment may also include an allowance for the cost of such major materials and equipment which are suitably stored either at or near the site.

219-3 Prior to substantial completion, the Owner, with the approval of the Engineer and with the concurrence of the Contractor, may use any completed or substantially completed portions of the work. Such use shall not constitute an acceptance of such portions of the work.

219-4 The Owner shall have the right to enter the premises for the purpose of doing work not covered by the contract documents. This provision shall not be construed as relieving the Contractor of the sole responsibility for the care and protection of the work, or the restoration of any damages work except such as may be caused by agents or employees of the Owner.

219-5 Upon completion and acceptance of the work, the Engineer shall issue a certificate attached to the final payment request that the work has been accepted by him under the conditions of the contract documents. The entire balance found to be due the Contractor, including the retained percentages, but except such sums as may be lawfully retained by the Owner, shall be paid to the Contractor within 30 day of completion and acceptance of the work.

219-6 The Contractor will indemnify and save the Owner or the Owner's agent harmless from all claims growing out the lawful demands of Subcontractor's, laborers, workmen, mechanics, materialmen, and furnishers of machinery and parts thereof, equipment, tools, and all supplies, incurred in the furtherance of the performance of the work. The Contractor shall, at the Owner's request, furnish satisfactory evidence that all obligations of the nature designated above have been paid, discharged, or waived. If the Contractor fails to do so, the Owner may, after having notified the Contractor, either pay unpaid bills or

withhold from the Contractor's unpaid compensation a sum of money deemed reasonably sufficient to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged whereupon payment to the Contractor shall be resumed, in accordance with the terms of the contract documents, but in no event shall the provisions of this sentence be construed to impose any obligations upon the Owner to either the Contractor, his Surety, or any third party. In paying any unpaid bills of the Contractor, any payment so made by the Owner shall be considered as a payment made under the contract documents by the Owner to the Contractor and the Owner shall not be liable to the Contractor for any such payments made in good faith.

219-7 If the Owner fails to make payment 30 days after approval by the Engineer, in addition to other remedies available to the Contractor, there shall be added to each such payment interest at the rate of six percent per annum commencing on the first day after said payment is due and continuing until payment is received by the Contractor.

220 ACCEPTANCE OF FINAL PAYMENT AS RELEASE

220-1 The acceptance by the Contractor of final payment shall be and shall operate as a release to the Owner of all claims and all liability to the Contractor other than claims in stated amounts as may be specifically excepted by the Contractor for all things done or furnished in connection with this work and for every act and neglect of the Owner and others relating to or arising out of this work. Any payment, however, final or otherwise, shall not release the Contractor or his sureties from any obligation under the contract documents or the performance bond.

220-2 Cleaning Up The Contractor shall remove from the Owner's property, and from all public and private property, all temporary structures, rubbish, and waste materials resulting from his operation or caused by his employees, and shall remove all surplus materials leaving the site smooth, clean and true to line and grade.

220-3 Acceptance and Final Payment When the Contractor shall have completed the work in accordance with the terms of the contract documents, he shall certify completion of the work to the Owner and submit a final request for payment, which shall be the contract amount plus all approved additions less all approved deductions and less previous payments made. The Contractor shall furnish evidence (see attached affidavit) that he has fully paid all debts for labor, materials, and equipment incurred in connection with the work, and upon acceptance by the Owner, the Owner will release the Contractor except as to the conditions of the contract bond, any legal rights of the Owner, required guarantees, and correction of faulty work after final payment, and will pay the Contractor's final request for payment. The Contractor shall allow sufficient time between the time of completion of the work and approval of the final request for payment for the Engineer to assemble and check the necessary data.

221 INSURANCE

221-1 The Contractor shall purchase and maintain such insurance as will protect him from claims set forth below which may arise out of or result from the Contractor's execution of the work, whether such execution be by himself or by any Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

221-1.1 Claims under workmen' compensation, disability benefit and other similar employee benefit acts:

221-1.2 Claims for damages because of bodily injury, occupational sickness or disease, or death of his employees;

221-1.3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than his employees;

221-1.4 Claims for damages insured by usual personal injury liability coverage which are sustained (1) by any person as a result of an offense directly or indirectly related to the employment of such person by the Contractor, or (2) by any other person; and

221-1.5 Claims for damages because of injury to or destruction of tangible property, including loss of use resulting therefrom.

221-2 Certificates of Insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the work. These certificates shall contain a provision that coverages afforded under the policies will not be cancelled unless at least 15 days prior written notice has been given to the Owner.

221-3 The Contractor shall procure and maintain, at his own expense, during the contract time, liability insurance as hereinafter specified:

221-3.1 Contractor's general public liability and property damage insurance including vehicle coverage issued to the Contractor and protecting him from all claims for personal injury, including death, and all claims for destruction of or damage to property, arising out of or in connection with any operations under the contract documents, whether such operations be by himself or by any Subcontractor under him, or anyone directly or indirectly employed by the Contractor or by a Subcontractor under him. Insurance shall be written with a limit of liability of not less than $500,000 for all damages arising out of bodily injury, including death, at any time resulting therefrom, sustained by any one person in any one accident; and a limit of liability of not less than $1,000,000 aggregate for any such damages sustained by two or more persons in any one accident. Insurance shall be written with a limit of liability of not less than $100,000 for all property damage sustained by any one person in any one accident; and a limit of liability of not less than $200,000 aggregate for any such damage sustained by two or more persons in any one accident.

221-3.2 The Contractor shall acquire and maintain, if applicable, fire and extended coverage insurance upon the project to the full insurable value thereof for the benefit of the Owner, the Contractor, and Subcontractors as their interest may appear. This provision shall in no way release the Contractor or Contractor's surety from obligations under the contract documents to fully complete the project.

221-4 The Contractor shall procure and maintain, at his own expense, during the contract time, in accordance with the provisions of the laws of the state in which the work is performed. Workmen' Compensation Insurance, including occupational disease provisions, for all of his employees at the site of the project and in case any work is sublet, the Contractor shall require such Subcontractor similarly to provide Workmen's Compensation Insurance, including occupational disease provisions for all of the latter's employees unless such employees are covered by the protection afforded by the Contractor. In case any class of employees engaged in hazardous work under this contract at the site of the project is not protected under Workmen's Compensation statute, the Contractor shall provide, and shall cause each Subcontractor to provide, adequate and suitable insurance for the protection of his employees not otherwise protected.

221-5 The Contractor shall secure, if applicable, "all risk" type builder's risk insurance for work to be performed. Unless specifically authorized by the Owner, the amount of such insurance shall not be less than the contract price totaled in the bid. The policy shall cover not less than the losses due to fire, explosion, hail, lightning, vandalism, malicious mischief, wind, collapse, riot, aircraft, and smoke during the contract time, and until the work is accepted by the Owner. The policy shall name as the insured, the Contractor, the Engineer, and the Owner.

221-6 Railroad Insurance Coverage The Contractor and his Subcontractors shall provide adequate insurance to cover limits set forth by the railroad company for working adjacent to crossing their tracks.

222 CONTRACT SECURITY

222-1 The Contractor shall within ten days after the receipt of the Notice of Award furnish the Owner with a Performance Bond and a Payment Bond in penal sums equal to the amount of the contract price, conditioned upon the performance by the Contractor of all undertakings, covenants, terms, conditions and agreements of the contract documents, and upon the prompt payment by the Contractor to all persons supplying labor and materials in the prosecution of the work provided by the contract documents. Such bonds shall be executed by the Contractor and a corporate bonding company licensed to transact such business in the state in which the work is to be performed and named on the current list of "Surety Companies Acceptable on Federal Bonds" as published in the Treasury Department Circular No. 570. The expense of these bonds shall be borne by the Contractor. If at any time a surety on any such bond is declared a bankrupt or loses its right to do business in the state in which the work is to be performed or is removed from the list of surety companies accepted on federal bonds, Contractor shall within ten days after notice from the Owner to do so, substitute an acceptable bond(s) in such form and sum and signed by such other surety or sureties as may be satisfactory to the Owner. The premiums on such bond shall be paid by the Contractor. No further payments shall be deemed due nor shall be made until the new surety or sureties shall have furnished an acceptable bond to the Owner.

223 ASSIGNMENTS

223-1 Neither the Contractor nor the Owner shall sell, transfer, assign or otherwise, dispose of the contract or any portion thereof, or of his right, title or interest therein, or his obligations thereunder, without written consent of the other party.

224 INDEMNIFICATION

224-1 The Contractor will indemnify and hold harmless the Owner and the Engineer and their agents and employees from and against all claims, damages, losses and expenses including attorney's fees arising out of or resulting from the performance of work, provided that any such claims, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property including the loss of use resulting therefrom; and is caused in whole or in part by any negligent or willful act or omission of the Contractor, and Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable.

224-2 In any and all claims against the Owner or the Engineer, or any of their agents or employees, by any employee of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, the indemnification or obligation shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any Subcontractor under

Workmen's Compensation Acts, disability benefit acts or other employee benefits acts.

224-3 The obligation of the Contractor under this paragraph shall not extend to the liability of the Engineer, his agents or employees arising out of the preparation or approval of maps, drawings, opinions, reports, surveys, change orders, designs or specifications.

225 SEPARATE CONTRACTS

225-1 The Owner reserves the right to let other contracts in connection with this project. The Contractor shall afford other Contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work, and shall properly connect and coordinate his work with theirs. If the proper execution of results of any part of the Contractor's work depends upon the work of any other Contractor, the Contractor shall inspect and promptly report to the Engineer and defects in such work that render it unsuitable for such proper execution and results.

225-2 The Owner may perform additional work related to the project by himself, or he may let other contracts containing provisions similar to these. The Contractor will afford the other Contractors who are parties to such contracts (or the Owner, if he is performing the additional work himself), reasonable opportunity for the introduction and storage of materials and equipment and the execution of work, and shall properly connect and coordinate his work with theirs.

225-3 If the performance of additional work by other Contractors or the Owner is not noted in the contract documents prior to the execution of the contract, written notice thereof shall be given to the Contractor prior to starting any such additional work. If the Contractor believes that the performance of such additional work by the Owner or others involves him in additional expense or entitles him to an extension of the contract time, he may make a claim therefore as provided in Sections 214 and 215.

226 SUBCONTRACTING

226-1 The Contractor may utilize the services of specialty Subcontractors on those parts of the work which, under normal contracting practices, are performed by specialty Subcontractors.

226-2 The Contractor shall not award work to Subcontractor(s), in excess of 50 percent of the contract price, without prior written approval of the Owner.

226-3 The Contractor shall be fully responsible to the Owner for the acts and omissions of his Subcontractors, and of persons either directly or indirectly employed by them, as he is for the acts and omissions of persons directly employed by him.

226-4 The Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the work to bind Subcontractors to the Contractor by the terms of the contract documents insofar as applicable to the work of Subcontractors and to give the Contractor the same power as regards terminating any subcontract that the Owner may exercise over the Contractor under any provision of the contract documents.

226-5 Nothing contained in this contract shall create any contractual relation between any Subcontractor and the Owner.

227 ENGINEER'S AUTHORITY

227-1 The Engineer shall act as the Owner's representative during the construction period. He shall decide questions which may rise as to quality and acceptability of materials furnished and work performed. He shall interpret the intent of the contract documents in a fair and unbiased manner. The Engineer will make visits to the site and determine if the work is proceeding in accordance with the contract documents.

227-2 The Contractor will be held strictly to the intent of the contract documents in regard to the quality of materials, workmanship and execution of the work. Inspections may be made at the factory or fabrication plant of the source of material supply.

227-3 The Engineer will not be responsible for the construction means, controls, techniques, sequences, procedures, or construction safety.

227-4 The Engineer shall promptly make decisions relative to interpretation of the contract documents.

228 LAND AND RIGHTS-OF-WAYS

228-1 Prior to issuance of Notice to Proceed, the Owner shall obtain all land and rights-of-way necessary for carrying out and for the completion of the work to be performed pursuant to the contract documents, unless otherwise mutually agreed.

228-2 The Owner shall provide to the Contractor information which delineates and describes the lands owned and rights-of-way acquired.

228-3 The Contractor shall provide at his own expense and without liability to the Owner any additional land and access thereto that the Contractor may desire for temporary construction facilities, or for storage of materials.

229 GUARANTEE

229-1 The Contractor shall guarantee all materials and equipment furnished and work performed for a period of one year from the date of acceptance by the Owner. The Contractor warrants and guarantees for a period of one year

from the date of acceptance by the Owner of the system that the completed system is free from all defects due to faulty materials or workmanship and the Contractor shall promptly make such corrections as may be necessary by reason of such defects including the repairs of any damage to other parts of the system resulting from such defects. The Owner will give notice of observed defects with reasonable promptness. In the event that the Contractor should fail to make such repairs, adjustments, or other work that may be made necessary by such defects, the Owner may do so and charge the Contractor the cost thereby incurred. The Performance Bond shall remain in full force and effect through the guarantee period.

230 TAXES

230-1 The Contractor will pay all sales, consumer, use and other similar taxes required by the law of the place where the work is performed.

SECTION 302

SPECIFICATIONS FOR THE REMOVAL OF STRUCTURES, OBSTRUCTIONS, SURFACING, AND MISCELLANEOUS ITEMS

302-1 DESCRIPTION This work shall include the removal, razing, demolition, and disposal of buildings, foundations, structures, fences, asphalt, and concrete pavement, sidewalks, driveways, curb and gutters, manholes, pipes, and other similar items shown on the plans or designated by the Engineer.

302-2 CONSTRUCTION REQUIREMENTS Unless otherwise specified, all salvageable material shall become the property of the Contractor.

All material removed from the site may be disposed of at the Municipal Landfill at no charge to the Contractor.

All building and basement foundations shall be completely removed. All building sewers shall be plugged with concrete. All building water and sewer services shall be located and left exposed until the Engineer has measured their locations.

All building and basement foundation excavations or any other cavity resulting from the removal work shall be backfilled with suitable material and compacted to 95% dry density as determined by the Standard Proctor Test Method. No separate payment shall be made for excavating, backfilling, or compacting these cavities.

Items designated for removal and salvage shall be removed and stored without breakage or damage. Items broken or damaged by the Contractor shall be replaced at the Contractor's expense.

Asphalt pavement to be removed shall be cut by the means of a saw, colter wheel, jack hammer, or similar means producing a reasonably straight and vertical cut.
Concrete pavement, driveways, sidewalks, and other surfaces to be removed shall be removed to an existing joint or saw cut.

Removal of asphalt and concrete surfaces shall be to the limits designated by the Engineer. Any surfaces damaged or destroyed by the Contractor's operations beyond these limits shall be removed and replaced at the Contractor's expense.

302-3 MEASUREMENT AND PAYMENT Items to be removed or removed and salvaged shall be listed in the Bidder's Proposal. The removal or removal and salvage of items shown on the plans, but not listed on the Bidder's Proposal, shall be considered incidental to the project. Items encountered during the work which are not shown on the plans and whose removal or removal and salvage are necessary to complete the work or are required by the Engineer, shall be considered extra work.

Removal or removal and salvage shall be measured on any of the following basis: Lump Sum (L SUM), Each (EA), Square Foot (SF), Square Yard (SY), Cubic Yard (CY), Ton (TON), or Linear Foot (LF) complete and accepted by the Engineer.

SECTION 303

SPECIFICATIONS FOR EXCAVATION AND EMBANKMENT

303-1 DESCRIPTION This item shall consist of excavating, removing and satisfactorily disposing of all materials within the limits of the work in accordance with these specifications and in conformity with the dimensions and typical sections shown on the plans and with the lines and grades established by the Engineer.

All suitable material taken from excavation shall be used in the formation of embankment, subgrade, and for backfilling as indicated on the plans or as directed by the Engineer.

When the volume of the excavation exceeds that required to construct the embankments to the grades indicated, the excess shall be used to grade the areas of ultimate development or wasted as directed. When the volume of excavation is not sufficient for constructing the fill to the grades indicated, the deficiency shall be supplied from borrow sources provided by the Contractor or at locations designated on the plans, the special provisions, or by the Engineer.

303-2 CLASSIFICATION All material excavated shall be defined as "Unclassified Excavation" unless, in the proposal form, prices are asked and bids are taken for "Rock Excavation", "Borrow Excavation", "Waste Excavation", and "Muck Excavation".

"Unclassified Excavation" shall include all excavation performed under this item regardless of the material encountered.

"Rock Excavation" shall include all solid rock in ledges, in bedded deposits, in unstratified masses, and conglomerate deposits which are so firmly cemented they present all the characteristics of solid rock and which cannot be removed without drilling and blasting. All boulders containing a volume of more than 2 cubic feet will be classified as "Rock Excavation".

"Borrow Excavation" shall consist of approved material required for the construction of embankments or for other portions of the work, and shall be obtained from approved sources. Unless otherwise designated in the contract, the Contractor shall make his own arrangements for obtaining borrow, and shall pay all costs involved.

The Contractor shall notify the Engineer sufficiently in advance of opening any borrow area so that the borrow material can be tested before being used. Sufficient time for testing the borrow shall be allowed.

"Waste Excavation" shall consist of excess excavated material not required to complete the embankment. Unless otherwise designated in the contract,

the Contractor shall make the necessary arrangements for obtaining waste excavation areas and pay all costs involved.

"Muck Excavation" shall consist of the excavation, removal, and disposal of deposits of saturated mixtures of soil and organic matter unsuitable for use as embankment material and which cannot be removed by conventional earth moving equipment such as scrapers, loaders, or dozers, but must be handled by drag lines, backhoes, or similar equipment.

303-3 CONSTRUCTION REQUIREMENTS

Excavations within City street and alley rights of way must be completed by Contractors who have posted a $10,000 Excavation Performance Bond with the City which warrantees their work for a period of two years. Details regarding the Excavation Performance Bond requirements may be obtained from the City Auditor's Office.

303-3.1 GENERAL The rough excavation shall be carried to the necessary depth to obtain the specified depth of subgrade compaction shown on the plans. Likewise, on embankments, the depth of subgrade compaction shall be as shown on the plans. Should the Contractor, through negligence or other fault, excavate below the designated lines, he shall replace the excavation with approved materials, in an approved manner and condition, at his own expense.

The Engineer shall have complete control over the excavation, moving, placing, and disposition of all material and shall determine the suitability of material to be placed in embankments. All material determined unsuitable shall be disposed of in waste areas or as directed. Topsoil shall not be used in fills or in subgrades but shall be handled and placed as directed.

The Contractor shall inform and satisfy himself as to the character, quantity, and distribution of all materials to be excavated. No payment will be made for any excavated material which is used for purposes other than those designated. All spoil areas shall be leveled to a uniform line and section and shall present a neat appearance before project acceptance. The surface elevation of spoil areas shall not extend above the surface elevation of adjacent or contiguous usable areas unless approved by the Engineer.

Those areas outside of the pavement areas in which the top layer of soil material becomes compacted, due to hauling or to any other activity of the Contractor, shall be scarified and disced to a depth of 4 inches, as directed, to loosen and pulverize the soil.

If it is necessary to interrupt existing surface drainage, sewers, or underdrainage, conduits, utilities, or similar underground structures, or parts thereof, the Contractor shall be responsible for and shall take all necessary precautions to protect and preserve or provide temporary services. When such facilities are encountered, the Contractor shall notify the Engineer, who shall arrange for their removal, if necessary. The Contractor shall, at his own expense, satisfactorily repair all damages to such facilities or structures which may result from any of his operations during the period of the contract.

303-3.2 EXCAVATION Excavation shall be performed as indicated on the contract plans to the lines, grades, and elevation shown, or as directed by the Engineer, and shall be made so that the requirements for formation of embankments can be followed. No excavation or stripping shall be started until the Engineer has taken cross-sectional elevations and measurements of the existing ground surface and has staked out the proposed work. All material encountered within the limits indicated shall be removed and disposed of as directed. During the process of excavation, the grade shall be maintained so that it will be well drained at all times. When directed, temporary drains and drainage ditches shall be installed to intercept or divert surface water which may affect the work.

If, at the time of excavation, it is not possible to place any excavated material in its proper section of the permanent construction, it shall be stockpiled in approved areas for later use.

Rock, shale, hardpan, loose rock, boulders, or other material unsatisfactory for subgrades, streets, roads, shoulders, intermediate areas, or any area intended for turfing shall be excavated to a minimum depth of 12 inches, or to the depth specified by the Engineer, below the contemplated surface of the subgrade or the designated grades. Muck, peat, matted roots, or other yielding material unsatisfactory for subgrade foundation shall be removed to the depth specified to provide a satisfactory foundation. Unsatisfactory materials shall be disposed of at locations designated by the Engineer. All material so excavated shall be paid for at the contract unit price per cubic yard for "Unclassified Excavation", "Rock Excavation", or "Muck Excavation", as the case may be, when the classification for these items are provided in the proposal. The portion so excavated shall be refilled with suitable selected material as specified, obtained from the grading operations or borrow area and thoroughly compacted by rolling. The necessary refilling will constitute a part of the embankment. Where rock cuts are made and refilled with selected material, or where trenching out is done to provide for a course of pavement, the depths thus created shall be ditched at frequent intervals to provide adequate drainage.

The Contractor shall make the distribution as indicated on the plans. Widening or narrowing of the section and raising or lowering of the grade to avoid haul will not be permitted. The right is reserved to make minor adjustments or revisions in lines or grades, if found necessary, as the work progresses due to discrepancies in the plans or to obtain satisfactory construction.

Overbreak, including slides, is that portion of any material displaced or loosened beyond the finished work as planned or authorized by the Engineer. The Engineer shall determine if the displacement of such material was unavoidable, and his decision shall be final. All overbreak shall be removed by the Contractor and disposed of as directed; however, payment will not be made for the removal and disposal of overbreak which the Engineer determines as avoidable. Unavoidable overbreak will be classified as "Unclassified Excavation".

The removal of existing structures and utilities required to permit the orderly progress of work will be accomplished by local agencies unless otherwise shown on the plans. All existing foundations shall be excavated for at least 2 feet below the top of the subgrade and the material disposed of as directed. All foundations thus excavated shall be backfilled with suitable material and compacted.

In cut areas, the subgrade under areas to be paved shall be compacted to the depths and to the densities at optimum moisture as shown on the plans or as specified in the specifications, or when not otherwise shown or specified, to a minimum depth of 6 inches and to a density of not less than 95% of the maximum dry density at optimum moisture as determined by the compaction control tests specified in A.S.T.M. D1557. Any unsuitable materials encountered shall be removed and paid for as specified.

No payment or measurement for payment will be made for suitable materials removed, manipulated, and replaced in order to obtain density. Any removal, manipulation, aeration, replacement, and recompaction of suitable materials necessary to obtain the required density shall be considered as incidental to the excavation and embankment operations, and shall be performed by the Contractor at no additional cost to the project.

Stones or rock fragments larger than 4 inches in their greatest dimension will not be permitted in the top 6 inches of the subgrade. The finished grading operations conforming to the typical cross section shall be completed and maintained at least one block ahead of the paving operations.

In cuts, all loose or protruding rocks on the back slopes shall be barred loose or otherwise removed to line or finished grade of slope. All slopes shall be uniformly dressed to the slope, cross section, and alignment shown on the plans or as directed by the Engineer.

Blasting, when necessary, will be permitted only when proper precautions are taken for the protection and safety of all persons, the work, and the surrounding property. All damage done to the work or property shall be repaired at the Contractor's expense. All operations of the Contractor in connection with the transportation, storage, and use of explosives shall be approved by the City of Williston Fire Department. Any approval given will not relieve the Contractor of his responsibility in blasting operations.

303-3.3 BORROW EXCAVATION When provided for in the proposal, borrow excavation shall consist of excavation made from borrow areas outside the normal grading limits. Borrow excavation shall be made only at the designated locations and within the horizontal and vertical limits as staked or as directed. On completion of borrow operations, the borrow area shall be finished to a neat and uniform grade acceptable to the Engineer.

The borrow excavation shall be handled and placed as specified in these specifications for excavation and embankment.

303-3.4 DITCH EXCAVATION Ditch excavation shall consist of excavating for drainage ditches such as intercepting, inlet or outlet, temporary levee construction, or any other type as designed or as shown on the plans. The work shall be performed in the proper sequence with the other construction. The location of all ditches or levees shall be established on the ground. All satisfactory material shall be placed in fills; unsatisfactory material shall be placed in spoil areas as shown on the plans, or as directed by the Engineer. Waste or surplus material shall be disposed of as shown on the plans or as directed by the Engineer. Intercepting ditches shall be constructed prior to the starting of adjacent excavation operations. All necessary handwork shall be performed to secure a finish true to line, elevation, and cross section, as designated.

Ditches constructed on the project shall be maintained to the required cross section and shall be kept free from debris or obstructions until the project is accepted. Where necessary, sufficient openings shall be provided through spoil banks to permit drainage from adjacent lands. Unless otherwise specified, no separate payment will be made for ditch excavation other than for the material removed which will be paid for at the unit price for "Unclassified Excavation", "Rock Excavation", or "Muck Excavation", as the case may be, if the proposal includes classification of these excavated materials.

Immediately prior to the placing of the fill materials, the entire area upon which the embankment is to be placed, except where limited by rock, shall be scarified and broken by means of a disc, harrow or plow, or other approved equipment to a depth of 6 inches. Scarifying shall be done approximately parallel to the axis of the fill. All roots, debris, large stones, or objectionable material that would cause interference with the compaction of the foundation or fill material shall be removed from the area and disposed of as directed by the Engineer. A thin layer (approximately 3 inches) of the fill material shall be spread over the scarified foundation and the whole area compacted as required in the specifications.

Where embankments are to be placed on natural slopes steeper than 3-to-1, horizontal benches shall be constructed as shown on the plans or as directed by the Engineer. Suitable excavated material shall be incorporated in embankments. Payment will be made for the material excavated at the unit price for grading.

303-3.5 STRIPPING All vegetation such as brush, heavy sods, heavy growth of grass, decayed vegetable matter, rubbish, and any other unsuitable material within the area upon which embankment is to be placed shall be stripped or otherwise removed before the embankment is started, and in no case shall such objectionable material be allowed in or under the embankment. Unless listed in the Bidder's Proposal, no direct payment will be made for stripping. The yardage removed and disposed of shall be paid for at the contract unit price per cubic yard for "Unclassified Excavation".

303-3.6 FORMATION OF EMBANKMENTS Embankments shall be formed of satisfactory materials placed in successive horizontal layers of not more than 8 inches in loose depth for the full width of the cross section.

The grading operations shall be conducted, and the various soil strata shall be placed, to produce a soil structure as shown on the typical cross section or as directed by the Engineer. All materials entering the embankment shall be reasonably free of organic matter such as leaves, grass, roots, and other objectionable material. Soil, granular material, shale, and any other material permitted for use in embankment shall be spread in successive layers as specified.

Operations on earth work shall be suspended at any time when satisfactory results cannot be obtained because of rain, freezing weather, or other unsatisfactory conditions of the field. The Contractor shall drag, blade, or slope the embankment to provide proper surface drainage.

The material in the layers shall be of the proper moisture content before rolling to obtain the prescribed compaction. Wetting or drying of the material and manipulation when necessary to secure a uniform moisture content throughout the layer shall be required. Should the material be too wet to permit proper compaction or rolling, all work on all portions of the embankment thus affected shall be delayed until the material has dried to the required moisture content. Sprinkling shall be done with approved equipment that will sufficiently distribute the water. Sufficient equipment to furnish the required water shall be available at all times. Samples of all embankment materials for testing, both before and after placement and compaction, will be taken at frequent intervals. From these tests, corrections, adjustments, and modifications of methods, materials, and moisture content will be made to construct the embankment.

Rolling operations shall be continued until the embankment is compacted to not less than 85% of the maximum dry density, at optimum moisture, as determined by A.S.T.M. Compaction Control Test Designation D1557. Under all areas to be paved, the embankment shall be compacted to the depths and to the densities at optimum moisture as shown on the plans or as specified in the specifications, or when not otherwise shown or specified to a minimum depth of 9 inches and to a density of not less than 95% of the maximum dry density at optimum moisture as determined by A.S.T.M. Compaction Control Test Designation D1557. On all areas outside of the pavement, curb and gutter, and sidewalk areas, no compaction will be required on the top 4 inches. Any areas inaccessible to a roller shall be consolidated and compacted by mechanical tampers.

During construction of the embankment, the Contractor shall route his equipment at all times, both when loaded and when empty, over the layers as they are placed and shall distribute the travel evenly over the entire width of the embankment. The equipment shall be operated in such a manner that hardpan, cemented gravel, clay, or other chunky soil material will be broken up into small particles and become incorporated with the other material in the layer.

In the construction of embankments, starting layers shall be placed in the deepest portion of the fill; as placement progresses, layers shall be constructed approximately parallel to the finished pavement grade line.

When rock and other embankment material are excavated at approximately the same time, the rock shall be incorporated into the outer portion of the embankment, and the other material shall be incorporated under the future paved areas. Stones or fragmentary rock larger than 2 inches in their greatest dimension will not be allowed in the top 6 inches of the subgrade. Rock fill shall be brought up in layers as specified or as directed, and every effort shall be exerted to fill the voids with the finer material to form a dense, compact mass. Rock or boulders shall not be disposed of outside of the excavation or embankment areas, except at places and in the manner designated by the Engineer.

Frozen material shall not be placed in the embankment, nor shall embankment be placed upon frozen material.

The Contractor shall be responsible for the stability of all embankments made under the contract and shall replace any portion which, in the opinion of the Engineer, has become displaced due to carelessness or negligence on the part of the Contractor.

There will be no separate measurement or payment for compacted embankment, and all costs incidental to placing in layers, compacting, discing, watering, mixing, sloping, and other necessary operations of the embankments will be included in the contract price for excavation, borrow, or other items.

When stockpiling of excavated material and later rehandling of such material is directed by the Engineer in order to produce the specified subgrade structure, the material shall be paid for at the contract unit price per cubic yard for "Unclassified Excavation".

303-3.7 EQUIPMENT The Contractor may use any type of earth moving, compaction, and watering equipment he may desire or has at his disposal, provided the equipment is in a satisfactory condition and is of such capacity that the construction schedule can be maintained as planned by the Contractor and as approved by the Engineer in accordance with the total calendar days or working days bid for the construction. The Contractor shall furnish, operate, and maintain such equipment as is necessary to control uniform density, layers, section, and smoothness of grade.

303.3.8 PREPARATION AND PROTECTION OF THE TOP OF THE SUBGRADE On areas to be paved, the specified depth in cut areas and the top of embankment shall be compacted to the density specified. When completed, the surface shall be true to the lines, grades, and cross section shown on the plans or as directed by the Engineer. After all drains, structures, ducts, and other underground appurtenances along the edges or under the pavement have been completed, the subgrade shall be compacted to the depth specified at not less than 95% of the maximum dry density, at optimum moisture, as determined by A.S.T.M. Compaction Control Test Designation D1557. Any irregularities or depressions that develop under rolling shall be corrected by loosening the material at these places and adding, removing, or replacing material until the surface is smooth and uniform. Any portion of the area which is not accessible to a roller shall be compacted in lifts not to exceed 6 inches to the required density by approved mechanical tampers. The material shall be sprinkled with water during rolling or tamping, when directed by the Engineer.

All soft and yielding material and material which will not compact readily when rolled or tamped shall be removed as directed by the Engineer and replaced with suitable material. After grading operations are complete, all loose stones larger than 2 inches in their greatest dimension shall be removed from the surface of all proposed graded paving areas and disposed of as directed by the Engineer.

At all times, the top of the subgrade shall be kept in such condition that it will drain readily and effectively. In handling materials, tools, and equipment, the Contractor shall protect the subgrade from damage by laying planks when directed and shall take other precautions as needed. In no case will vehicles be allowed to travel in a single track. If ruts are formed, the subgrade shall be reshaped and recompacted to required density. Storage or stockpiling of materials on the top of the subgrade will not be permitted. Until the subgrade has been checked and approved, no subbase, base, surface course, or pavement shall be laid thereon.

303-3.9 HAUL No payment will be made separately or directly for haul on any part of the work. All hauling will be considered a necessary and incidental part of the work and its cost shall be considered by the Contractor and included in the contract unit price for the pay items of work involved.

303-3.10 TOLERANCES In those areas upon which a subbase or base course is to be placed, the top of the subgrade shall be of such smoothness that, when tested with a 16 foot straightedge applied parallel and at right angles to the centerline, it shall not show any deviation in excess of 1/2 inch, or shall not be more than 0.05 of a foot from true grade as established by grade hubs or pins. Any deviation in excess of these amounts shall be corrected by loosening, adding, or removing materials, reshaping and recompacting to required density by sprinkling and rolling.

On areas to be turfed under the project or in the future outside the sidewalk, curb and gutter and pavement limits the surface shall be of such smoothness that it will not vary more than 0.10 of a foot from true grade as established by grade hubs. Any deviation in excess of this amount shall be corrected by loosening, adding or removing materials, and reshaping.

303-4 MEASUREMENT AND PAYMENT

303-4.1 UNCLASSIFIED EXCAVATION Unclassified Excavation shall be measured by the cubic yard (CY) in its original position by the method of average end areas of materials acceptably excavated and stripped as specified. Measurements shall not include the yardage of material excavated without authorization beyond normal slope lines, or the yardage of material used for purposes other than those directed. The plans shall state an assumed shrinkage factor to be used to compute embankment volume placed using the unclassified excavation material.

Payment shall be made at the unit price bid per cubic yard for "Unclassified Excavation".

303-4.2 ROCK EXCAVATION All rock found in the excavation of 2 cubic feet or more in size shall be classified as Rock Excavation and measured by the cubic yard (CY). Rock Excavation shall include boulders or solid ledge rocks, which in the opinion of the Engineer requires blasting for its removal or wedging, sledging or barring.

Payment shall be made at the unit price bid per cubic yard (CY) for "Rock Excavation".

303-4.3 BORROW EXCAVATION Borrow excavation shall be measured by the cubic yard (CY) in its final position with no allowance for shrinkage, and payment shall be made at the unit price bid per cubic yard (CY) for "Borrow Excavation".

303-4.4 WASTE EXCAVATION Waste excavation shall be measured by the cubic yard (CY) in its final position, and payment shall be made at the unit price bid for "Waste Excavation".

303-4.5 MUCK EXCAVATION Muck excavation shall be measured by the cubic yard (CY) at its disposal site, and payment shall be made at the unit price bid for "Muck Excavation".

303-4.6 WATER Unless listed in the Bidder's Proposal, water required to complete the excavation and embankment shall be considered incidental to the project.

303-4.7 SUBGRADE PREPARATION Subgrade preparation shall be measured by the square yard (SY) and paid for at the unit price bid for "Subgrade Preparation".

SECTION 305

SPECIFICATIONS FOR TOPSOIL

305-1 DESCRIPTION This item shall consist of preparing the ground surface for topsoil application, removing topsoil from designated stockpiles or areas to be stripped on the site or from approved sources off the site, and placing and spreading the topsoil on prepared areas in accordance with this specification at the locations shown on the plans or as directed by the Engineer.

305-2 MATERIALS

305-2.1 Topsoil Topsoil shall be the surface layer of soil with no admixture of refuse or any material toxic to plant growth, and it shall be reasonably free from subsoil and stumps, roots, brush, stones (2 inches or more in diameter), clay lumps or similar objects. Brush and other vegetation which will not be incorporated with the soil during handling operations shall be cut and removed. Ordinary sods and herbaceous growth such as grass and weeds are not to be removed but shall be thoroughly broken up and intermixed with the soil during handling operations. There shall be not less than 20% nor more than 80% of the material passing the 200 mesh sieve.

Topsoil to be provided by the Contractor shall be able to support vegetative growth. Topsoil sources shall be approved by the Engineer.

305-3 CONSTRUCTION REQUIREMENTS

305-3.1 General Areas to be topsoiled shall be shown on the plans. If topsoil is available on the site, the location of the stockpiles or areas to be stripped of topsoil shall be shown on the Plans. Unless otherwise specified, stripping depths shall be 6 inches.

Suitable equipment necessary for proper preparation and treatment of the ground surface, stripping of topsoil, and for the handling and placing of all required materials shall be on hand, in good condition, and approved by the Engineer before the various operations are started.

305-3.2 Preparing the Ground Surface Immediately prior to dumping and spreading the topsoil on any area, the surface shall be loosened by discs or spike-tooth harrows, or by other means approved by the Engineer, to a minimum depth of 2 inches to facilities bonding of the topsoil to the covered subgrade soil. The surface of the area to be topsoiled shall be cleared of all stones larger than 2 inches in any diameter and all litter or other material which may be detrimental to proper bonding, the rise of capillary moisture, or the proper growth of the desired planting. Limited areas, as shown on the plans, which are too compact to respond to these operations shall receive special scarification.

Grades on the area to be topsoiled, which have been previously established, shall be maintained in a true and even condition. Where grades have not been established, the areas shall be smooth-graded and the surface left at the prescribed grades in an even and properly compacted condition to prevent the formation of low places or pockets where water will stand.

305-3.3 Obtaining Topsoil Prior to the stripping of topsoil from designated areas, any vegetation, briers, stumps and large roots, rubbish or stones found on such areas, which may interfere with subsequent operations, shall be removed using methods approved by the Engineer. Heavy sod or other cover which cannot be incorporated into the topsoil by discing or other means shall be removed.

When suitable topsoil is available on the site, the Contractor shall remove this material from the designated areas and to the depth as directed by the Engineer. The topsoil shall be spread on areas already tilled and smooth-graded, or stockpiled in areas approved by the Engineer. Any topsoil stockpiled by the Contractor shall be rehandled and placed without additional compensation. Any topsoil that has been stockpiled on the site by others, and is required for topsoiling purposes, shall be removed and placed by the Contractor. The sites of all stockpiles and areas adjacent thereto, which have been disturbed by the Contractor shall be graded if required and put into a condition acceptable for seeding.

When suitable topsoil is secured off the project site, the Contractor shall locate and obtain the supply, subject to the approval of the Engineer. The Contractor shall notify the Engineer sufficiently in advance of operations in order that necessary measurements and tests can be made. The Contractor shall remove the topsoil from approved areas and to the depth as directed. The topsoil shall be hauled to the site of the work and placed for spreading, or spread as required. Any topsoil hauled to the site of the work and stockpiled shall be rehandled and placed without additional compensation.

305-3.4 Placing Topsoil The topsoil shall be evenly spread on the prepared areas to a uniform depth of 6 inches after compaction, unless otherwise shown on the plans or stated in the special provisions. Spreading shall not be done when the ground or topsoil is frozen, excessively wet, or otherwise in a condition detrimental to the work. Spreading shall be carried on so that seeding operations can proceed with a minimum of soil preparation or tilling.

After spreading, any large, stiff clods and hard lumps shall be broken with a pulverizer or by other effective means, and all stones or rocks (2 inches or more in diameter), roots, litter, or any foreign matter shall be raked up and disposed of by the Contractor. After spreading is completed, the topsoil shall be satisfactorily compacted by rolling with a cultipacker or by other means approved by the Engineer. The compacted topsoil surface shall conform to the required lines, grades, and cross sections. Any topsoil or other dirt falling upon pavements as a result of hauling or handling of topsoil shall be promptly removed.

305-4 MEASUREMENT AND PAYMENT

305-4.1 Stripping, Stockpiling, and Respreading Topsoil Stripping, stockpiling, and respreading topsoil shall be measured by the square yard (SY) basis and paid for at the unit price bid for "(Depth) Topsoil".

305-4.2 Spreading of Topsoil Provided by Owner The loading, hauling, and spreading of topsoil provided by the Owner shall be measured by the square yard (SY) basis and paid for at the unit price bid for "(Depth) Topsoil Spreading".

305-4.3 Topsoil Provided by Contractor The provision and placement of topsoil provided by the Contractor shall be measured by the square yard (SY) basis and paid for at the unit price bid for "(Depth) Borrow Topsoil".

SECTION 304

SPECIFICATIONS FOR PIPELINE TRENCH EXCAVATION

304-1 DESCRIPTION This item shall consist of the trench excavation, pipe laying and backfill required for laying water and sewer mains, water and sewer services, storm sewers, culverts and their appurtenances required on the plans at the places designated on the plans and profiles, or by the Engineer, in accordance with these specifications and with the lines and grades given.

304-2 MATERIALS

304-2.1 Bedding Gravel The bedding gravel shall be a granular pit run material with 100% passing a 1 inch sieve, 60% to 100% passing 3/4 inch sieve and 40% to 80% passing a ¼ inch sieve.

304-2.2 Subcut Gravel The subcut gravel shall be a granular material with 100% passing 2 inch sieve and 0% to 10% passing a No. 4 sieve.

304-3 CONSTRUCTION REQUIREMENTS Excavations within city street and alley rights-of-way must be completed by Contractors who have posted a $10,000 Excavation Performance Bond with the City which warrantees their work for a period of two years. Details regarding the Excavation Performance Bond requirements may be obtained from the City Auditor's office.

304-3.1 Equipment All equipment necessary and required for the proper construction of water mains shall be on the project, in first class working condition and approved by the Engineer before construction is permitted to start.

The Contractor shall provide appropriate hoisting equipment to handle the pipe while unloading and placing it in its final position without damage to the pipe.

The Contractor shall provide hand tampers and pneumatic tampers to obtain the required compaction of the pipe bed and the backfill, as specified.

304-3.2 Excavation and Preparation of Trench The trench shall be dug to the alignment and depth required and only so far in advance of pipe laying as the Engineer will permit. The trench shall be so braced and drained so that workmen may work there safely and efficiently. It is essential that the discharge from pumps be led to natural drainage channels, drains or storm sewer.

The trench width may vary depending upon the depth of the trench and the nature of the excavated material, but in any case, shall be of ample width to permit the pipe to be laid and joined properly and the backfill to be placed

and compacted to the required density. The minimum width of trench shall be 30 inches and for pipe 18 inches or larger, at least 12 inches greater than the outside diameter of the pipe barrel. The maximum width of trench shall not be more than 24 inches greater than the outside diameter of the pipe barrel.

The trench shall be excavated below the required grade so that the pipe may be laid on 4 inches of bedding gravel. Where the bottom of the trench uncovered at subgrade is soft and in the opinion of the Engineer, cannot support the pipe, further depth and/or width shall be excavated and refilled to the pipe foundation grade with subcut gravel thoroughly compacted.

If other approved means shall be adopted to assure a firm foundation for the pipe, the Contractor will be allowed extra compensation. Extra compensation shall not be allowed for extra excavation and gravel used for seepage and ground water control.

Whenever necessary, to prevent caving, excavations shall be adequately sheathed and braced. Where sheathing and bracing are used, the trench width shall be increased accordingly. Trench sheathing will be required on all excavations where necessary to prevent damage to utilities above or below ground. Trench sheathing shall remain in place until the pipe has been laid and the joint properly constructed and the backfill material thoroughly compacted to a depth over the pipe sufficient to protect any utility, structures, or adjacent paving, curb and gutter, sidewalks, or trees which might be damaged by caving of the excavation in order to protect the existing utilities. When approved by the Engineer, sheathing may be left in the excavation.

The Contractor may use trench boxes in lieu of sheathing.

Bell holes of ample dimension shall be dug in earth trenches at each joint to permit the joints to be made properly.

All excavated material shall be piled in a manner that will not endanger the work and that will avoid obstructing sidewalks and driveways. Gutters shall be kept clean or otherwise satisfactory provisions made for street drainage.

The use of excavation equipment will be permitted except in places where operation of same will cause damage to trees, buildings, or existing structures above or below ground, in which case, hand methods shall be employed.

The Contractor is assumed to be familiar with all Federal, State and local Laws, Codes, Ordinances and Regulations which, in any manner affect the safety of those engaged or employed in the work, the material or equipment used in or upon the site, or in any way affect the conduct of the work. No pleas of misunderstanding or ignorance on the part of the Contractor will, in any way, serve to modify the provisions of the contract. The Contractor shall provide and maintain on a 24 hour basis, all necessary safeguards such as

watchmen, warning signs, barricades and night lights at his own expense in accordance with the latest addition of the Manual of Uniform Traffic Control Devises.

Excavation for pipe laying operations shall be conducted in a manner to cause the least interruption to traffic. Where traffic must cross open trenches, the Contractor shall provide suitable bridges at street intersections and driveways. Hydrants under pressure, valve boxes, curb stop boxes and other utility controls shall be left unobstructed and accessible during the construction period.

Adequate provisions shall be made for the flow of sewers, drains and water courses encountered during construction and the structures which may have been disturbed shall be satisfactorily restored upon completion of the work.

Trees, fences, poles and all other property shall be protected, unless their removal is authorized by the Engineer and any property damages shall be satisfactorily restored by the Contractor. The cost of removal shall be included in the Price Bid per linear foot of water main in place unless listed separately in the Proposal.

304-3.3 Rock Excavation All rock found in the trench area shall be classified as solid rock and measured for payment if of 2 cubic feet in contents or more per each individual rock, boulder or continuous slab of ledge rock. Solid rock shall be measured for payment on the basis of and limited to the maximum trench width allowed under Sub-section 304-3.2, "Excavation and Preparation of Trench". If solid rock extends below the necessary depth of excavation it shall be measured for payment to a horizontal plane 6 inches below the bottom of the pipe. All rocks smaller in volume than 2 cubic feet, shall not be classified as solid rock, but shall be termed excavation and the cost for the removal thereof included in the Unit Price Bid for the item for which the excavation is made.

Blasting for excavation will be permitted only after securing the approval of the Engineer and only when proper precautions are taken for the protection of person and property. The hours of blasting will be fixed by the Engineer and any damage caused by blasting shall be repaired by the Contractor at this own expense. The Contractor's methods of procedure relative to blasting, shall conform to Local and State Laws and Municipal Ordinances.

Whenever ledge rock is encountered, the Contractor shall strip from the same all overlying earth and he shall then notify the Engineer that rock is ready for measurement. The Engineer may then take levels upon the surface of the rock or he may at his discretion defer measurement until after the excavation is completed. In any event, the Contractor shall not refill any trench where rock is encountered until he is notified by the Engineer that measurement has been made. No payment will be allowed for any rock claimed unless the same shall have been measured as herein provided. The rock shall be excavated to a depth of 6 inches below the bottom of the pipe and the trench shall be refilled to the proper grade with bedding gravel.

All rock found in the trench having greater diameter than 8 inches, shall not be used as backfill material but shall be disposed of as directed by the Engineer.

304-3.4 Pipe Laying Proper implements, tools and facilities satisfactory to the Engineer shall be provided and used by the Contractor for the safe and convenient prosecution of the work. All pipe, fittings, valves and hydrants shall be carefully lowered into the trench piece by piece by means of derrick, ropes, or other suitable tools or equipment in such a manner as to prevent damage to pipe or pipe coating. Under no circumstances shall pipe or accessories be dropped into the trench. Before lowering and while suspended, ductile iron pipe shall be inspected for defects and rung with a light hammer to detect cracks. Any defective, damaged or unsound pipe shall be rejected. All foreign matter or dirt shall be removed from the inside of the pipe before it is lowered into its position in the trench and it shall be kept clean by approved means during and after laying. Care shall be taken to prevent dirt from entering the joint space. At times when pipe laying is not in progress, the open ends of the pipe shall be closed by approved means and no trench water shall be permitted to enter the pipe.

Cutting pipe for inserting valve, fittings, or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe. Unless otherwise directed, pipe shall be laid with the bell ends facing the direction of laying. Where pipe deflections are necessary, the degree of pipe deflection at each joint shall be approved by the Engineer. All deflections shall be made at the joints and not made by bending the pipe. When any railroad is crossed, all precautionary construction measures required by the railroad officials shall be followed. No pipe shall be laid in water or when the trench condition for the weather is unsuitable for such work except by permission of the Engineer.

During the pipe laying operation, the Contractor shall have a watertight plug available to install in the last pipe laid at the end of each work day or to install during the work day, to prevent water or other foreign material from entering the newly installed pipe.

The Contractor shall furnish and install temporary watertight plugs in any opening left in the main line or lead off the main line, during construction, that would allow water or other debris to enter the newly constructed pipe.

304-3.5 Tests Inspection and tests must be made by the manufacturer on all pipe and component parts before shipment. Such tests shall be made by some testing laboratory satisfactory to the Engineer and such tests shall be made in a accordance with the requirements of the American Society for Testing Materials. Documentary evidence that the materials have been passed by such inspection and tests must be furnished the Engineer before the delivery of the materials on the job. Any materials which do not prove satisfactory after being placed in the work must be removed from the premises and replaced with satisfactory material. The cost of foundry inspection shall be paid by the Contractor.

304-3.6 Backfilling of Pipe Trench After the pipe has been laid to line and grade, the trench shall be backfilled under and along the sides of the pipe up to 2 inches above the top of the pipe by thoroughly compacting bedding gravel into place so as to form a uniform bed for the pipe. This compaction may be obtained by any approved method or equipment which produces a uniform density meeting the requirement of not less than 85% maximum dry density at optimum moisture made in accordance with A.S.T.M. D-1557. Care shall be exercised to not displace the pipe or injure the pipe during the compaction operations. If the material in the trench is sand or gravel and acceptable to the Engineer, it will not be necessary to furnish any other material than that found within the trench to backfill up to 2 inches above the top of the pipe. If sand or gravel is not found within the trench, The Contractor will be required to furnish bedding gravel.

After the pressure test has been made and the joints have been inspected, the trench shall be backfilled to a point 2 feet above the top of the pipe by any approved method or equipment which will produce a uniform density meeting the requirement of not less than 95% of the maximum dry density at optimum moisture as determined by A.S.T.M. Compaction Control Test Designation D-1557. The use of drop pile hammers, loaded or unloaded clam shells or backhoe buckets, or other similar equipment will not be permitted to obtain the required density below a point 2 feet above the top of the pipe. The remaining trench shall be backfilled to meet the requirement of not less than 95% of the maximum dry density at optimum moisture as determined by ASTM Compaction Control Test Designation D-1557. Any deficiency in the quantity of material or amount of moisture necessary for backfilling the trenches shall be supplied by the Contractor.

The Contractor shall restore all shrubbery, fences, sod or other surfaces disturbed to a condition equal to that before the work began, furnishing all labor and material incidental thereto.

304-3.7 Protecting Underground & Surface Structures Temporary support, adequate protection and maintenance of all underground and surface structures, drains, sewers, water mains, home service connections for both sewer and water and other obstructions encountered in the progress of the work shall be furnished by the Contractor all at his own expense under the direction of the Engineer.

a) Deviations Occasioned by Other Utility Structures Wherever existing utility structures or branch connections leading to main sewer or water mains or other conduits, ducts, pipes or structures form obstructions to the grade and alignment of the water main to be laid, they shall be permanently supported, removed, relocated or reconstructed by the Contractor through cooperation with the Owner of the utility, structure or obstruction involved. In those instances where their relocation or reconstruction is impracticable, a deviation from the line and grade will be ordered by the Engineer and the change shall be made in the manner directed by the Engineer.

Wherever possible, all existing utility structures or branch connections leading therefrom will be located in advance of the excavation of the trench and properly marked. The Contractor shall not cut any existing utility lines unless it is determined by the Engineer that it is necessary in order to install the new water mains. All utility lines that are cut or broken by the Contractor shall be repaired at his own expense. Wherever the Engineer shall determine it is necessary to remove or relocate any existing utility in order to properly install the new water main, the change shall be made in a manner directed by the Engineer and for which extra compensation will be allowed the Contractor.

b) Deviation Without Engineer's Consent No deviation shall be made from the required line and grade established by the Engineer without the consent of the Engineer.

c) Sub-surface Explorations Whenever necessary to determine the location of existing pipes, valves, or other underground structures, the Contractor, after an examination of available records and upon written order from the Engineer, shall make all exploration and excavations for such purpose for which the Engineer may allow extra compensation.

304-4 MEASUREMENT AND PAYMENT The costs of excavation, pipe laying and backfilling shall be considered incidental to the bid price of the item requesting the work.

304-4.1 Bedding Gravel Bedding gravel shall be measured by the ton and paid for at the unit price bid for "Bedding Gravel" complete in place and accepted by the Engineer.

304-4.2 Subcut Gravel Subcut gravel shall be measured by the ton and paid for at the unit price bid for "Subcut Gravel" complete in place and accepted by the Engineer.

304-4.3 Rock Excavation Rock excavation shall be measured by the cubic yard (CY) and paid for at the unit price bid for "Rock Excavation" completed and approved by the Engineer.

SECTION 306

SEEDING, SODDING, AND MULCHING

306-1 DESCRIPTION This item shall consist of seeding, sodding, and mulching the areas shown on the plans or as directed by the Engineer.

306-2 MATERIALS

306-2.1 Seed Seed and seeding mixtures shall be free of all prohibited noxious weed seed and shall not contain more than 0.5% by weight of restricted noxious weed seeds. Prohibited and restricted noxious weeds shall be those as classified by the State Seed Department.

All seed containers must be sealed and labeled to comply with existing North Dakota Seed Laws and Regulations or in accordance with U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act if shipped in Interstate Commerce.

Seed which has become wet, moldy, or otherwise damaged in transit or in storage will not be acceptable.

Seed mixture shall contain not less than the specified percent of Pure Live Seed and shall be uniformly mixed by weight to one of the following formulas:

Class I (40 Lbs./Acre) (Pasture and Hay Land Areas)

Percent by Weight	Kind of Grass (Rate of Application)	Percent Pure Live Seed
40	Brome Grass	80
40	Crested Wheat Grass	80
20	Slender or Intermediate Wheat Grass	75
Plus Cover Crop		

Class II (5 Lbs./100 S.Y.) (Lawn Areas)

Percent by Weight	Kind of Grass (Rate of Application)	Percent Pure Live Seed
80	Kentucky Blue Grass	80
10	Perennial Rye	80
10	White Clover	80

Class III (40 Lbs./Acre) (Level Areas)

Percent by Weight	Kind of Grass (Rate of Application)	Percent Pure Live Seed
100	Brome Grass	80
Plus Cover Crop		

Class IV (40 Lbs./Acre) (For slopes 3:1 or more)

Percent by Weight	Kind of Grass (Rate of Application)	Percent Pure Live Seed
50	Brome Grass	80
50	Crested Wheat Grass	80
Plus Cover Crop		

Class V (20 Lbs./Acre) (Saline Areas)

Percent by Weight	Kind of Grass (Rate of Application)	Percent Pure Live Seed
40	Fairway Crested Wheat Grass	80
20	Slender Wheat Grass	75
40	Western Wheat Grass	75
Plus Cover Crop		

Class VI (10 Lbs./Acre) (Dense Nesting Cover)

Percent by Weight	Kind of Grass (Rate of Application)	Percent Pure Live Seed
35	Intermediate Wheat Grass	75
20	Slender Wheat Grass	75
35	Alfalfa	85
10	Mixed Sweet Clover	85
Plus Cover Crop		

When Class V seed mixture is specified, 60 pounds of ammonium nitrate (33.5% Nitrogen) per acre shall be spread on the soil prior to seeding or by means of fertilizer attachment on the drill. Ammonium nitrate shall not be mixed with the seed.

When Class I, III, IV, V, or VI seed mixture is specified, 20 pounds of oats seed per acre shall be added to the mixture if seeding is performed before July 15th, and if seeding is performed after July 15th, 30 pounds of rye seed per acre shall be added to the mixture.

If seed with the specified percentage of pure live seed cannot be obtained, additional seed may be used to bring the amount of live seed up to the amount specified.

Seed shall be furnished separately or in mixtures in standard containers with the seed name, lot number, net weight, percentages of purity and of germination and hard seed and percentage of maximum weed seed content clearly marked for duplicate signed copies of a statement by the vendor certifying that each lot of seed has been tested by a recognized laboratory for seed testing within 6 months of date of delivery. This statement shall include: name and address of laboratory, date of test, lot number for each kind of seed and the results of tests as to name, percentages of purity and of germination, and percentage of weed content for each kind of seed furnished and, in case of a mixture, the proportions of each kind of seed.

306-2.2 Topsoil Topsoil shall consist of loose, friable, loamy topsoil that is free of excess acid and alkali. It shall be free from objectionable amounts of sod, hard lumps, gravel, subsoil or other undesirable material which will prevent the formation of a suitable seedbed. Topsoil shall, prior to being stripped, have demonstrated by the occurrence upon it of healthy crops, grass or other vegetable growth that is of good quality, and that is reasonably well drained.

306-2.3 Soil For Repairs The soil for fill and topsoiling of areas to be repaired shall be at least of equal quality to that which exists in areas adjacent to the area to be repaired. The soil shall be relatively free from large stones, roots, stumps, or other materials that will interfere with subsequent sowing of seed, sodding, or mulching, and shall be approved by the Engineer before being placed.

306-2.4 Sod Sod furnished by the Contractor shall have a good cover of living or growing grass. This shall be interpreted to include grass that is seasonally dormant during the cold or dry seasons and capable of renewing growth after the dormant period. All sod shall be obtained from areas where the soil is reasonably fertile and contains a high percentage of loamy topsoil. Sod shall be cut or stripped from living, thickly matted turf relatively free of weeds or other undesirable foreign plants, large stones, roots, or other materials which might be detrimental to the development of the sod or to future maintenance. Any vegetation more than 6 inches in height shall be mowed to a height of 3 inches or less before sod is lifted. Sod shall have a uniform thickness of at least 2 inches.

Sod provided by the Contractor shall be approved by the Engineer.

306-2.5 Mulch Material Acceptable mulch shall be the materials listed below or any approved locally available material that is similar to those specified. Low

grade, musty, spoiled, partially rotted hay, straw, or other materials unfit for animal consumption will be acceptable. Mulch materials which contain matured seed of species which would volunteer and be detrimental to the proposed overseeding, or to surrounding land, will not be acceptable. Straw or other mulch material which is fresh and/or excessively brittle, or which is in such an advanced stage of decomposition as to smother or retard the planted grass, will not be acceptable.

(a) Hay Hay shall be native hay, sudan grass hay, broomsedge hay, legume hay, or similar hay or grass clippings.

(b) Straw Straw shall be the threshed plant residue of oats, wheat, barley, or rye from which the grain has been removed.

(c) Stalks Stalks shall be the whole or shredded stems of corn, cane, sorghum, flax, sunflowers, potato vines, or other coarse stemmy material.

(d) Manure Manure shall be fresh or partially decomposed strawy stable manure containing not over 25% of solid material by volume.

(e) Manufactured Mulch Cellulose fiber or wood pulp mulch shall be products commercially available for use in spray applications.

(f) Asphalt Binder Asphalt Binder material shall conform to the requirements of A.S.T.M. D977, Type SS-1H or RS-1H, as appropriate.

306-3 CONSTRUCTION REQUIREMENTS

306-3.1 Seeding Seeding shall be done at such times of the year when the climatic conditions of temperature and moisture are most adaptable for growth and work of this nature. It is preferred that seeding shall be accomplished before July 1st and after September 1st of each year.

The areas to be seeded shall be cleared of all debris, rank vegetation, and other material that is detrimental to the preparation of a seedbed. The areas thus cleared shall be shaped or bladed by approved equipment to the plan cross section, or to such cross section that best fits the existing conditions. The areas thus prepared shall be disced, harrowed, raked, or worked by some other approved method, into a reasonably smooth even seedbed. The surface of the prepared seedbed shall be firm enough to take and hold the seed without undue loss from high winds or ordinary rainfall. If rolling is necessary to secure this, it shall be done prior to the seeding and with an approved roller, the weight of which shall be dependent upon the particular soil conditions.

Seed shall be sown by means of a force feed drill with a grass seed attachment, except that on slopes steeper than 3:1 or on areas too small to

be seeded with a force feed drill, seed may be sown by power sprayers, blowers, or other approved methods. All equipment shall be in good working order and shall be approved by the Engineer.

No seed shall be sown during winds strong enough to prevent it from being properly embedded into the surface.

Seed shall not be sown into frozen ground or standing water.

306-3.2 Sodding The sod shall be cut with approved sod cutters to such a thickness that after it has been transported and placed on the prepared bed, but before it has been compacted, it shall have a uniform thickness of not less than 2 inches. Sod sections or strips shall be cut in uniform widths, not less than 10 inches, and in lengths of not less than 18 inches, but of such length as may be readily lifted without breaking, tearing, or loss of soil. Where strips are required, the sod must be rolled without damage with the grass folded inside. The Contractor may be required to mow high grass before cutting sod.

The sod shall be transplanted within 24 hours from the time it is stripped, unless circumstances beyond the Contractor's control make storing necessary. In such cases, sod shall be stacked, kept moist, and protected from exposure to the air and sun and shall be kept from freezing. Sod shall be cut and moved only when the soil moisture conditions are such that favorable results can be expected. Where the soil is too dry, permission to cut sod may be granted only after it has been watered sufficiently to moisten the soil to the depth the sod is to be cut.

Sodding shall be performed only during the seasons when satisfactory results can be expected. Frozen sod shall not be used and sod shall not be placed upon frozen soil. Sod may be transplanted during periods of drought with the approval of the Engineer, provided the sod bed is watered to moisten the soil to a depth of at least 4 inches immediately prior to laying the sod.

The sod shall be moist and shall be placed on a moist earth bed. Pitchforks shall not be used to handle sod, and dumping from vehicles shall not be permitted. The sod shall be carefully placed by hand, edge-to-edge and with staggered joints, in rows at right angles to the slopes, commencing at the base of the area to be sodded and working upward. The sod shall immediately be pressed firmly into contact with the sod bed by tamping or rolling with approved equipment to provide a true and even surface, and insure knitting without displacement of the sod or deformation of the surfaces of sodded areas. Where the sod may be displaced during sodding operations, the workmen when replacing it shall work from ladders or treated planks to prevent further displacement. Screened soil of good quality shall be used to fill all cracks between sods. The quantity of the fill soil shall not cause smothering of the grass. Where the grades are such that the flow of water will be from paved surfaces across sodded areas, the surface of the soil in the sod after compaction shall be set approximately 1 inch below the pavement edge. Where the flow will be over the sodded areas and onto the

paved surfaces around manholes and inlets, the surface of the soil in the sod after compaction shall be placed flush with the pavement edges.

On slopes steeper than 3:1 and in V-Shaped or flat bottom ditches or gutters, the sod shall be pegged with wooden pegs not less than 12 inches in length and have a cross sectional area of not less than 3/4 square inch. The pegs shall be driven flush with the surface of the sod.

Adequate water and watering equipment must be on hand before sodding begins, and sod shall be kept moist until it has become established and it's continued growth assured. In all cases, watering shall be done in a manner which will avoid erosion from the application of excessive quantities and will avoid damage to the furnished surface.

The newly placed sod shall be kept in good condition during the care period following placement. The care period after placement of the sod shall be 14 days duration for sod placed during the growing season before July 15th, and after September 15th; and shall be 21 days duration for sod placed between July 15th and September 15th.

The time between October 15th of any year and April 15th of the following year shall not be considered to be a part of the required care period for sod. Sod placed after October 15th of any year, or sod placed at a time when the care period for that sod extends past October 15th shall show evidence of established growth after April 15th of the following year before its care period will be considered concluded.

Water shall be applied to the sod during the care period according to the following schedule:

Immediately after sod placement	5 gals./sq. yd.
7 days after sod placement	5 gals./sq. yd.
14 days after sod placement	5 gals./sq. yd.

For sod placed between July 15th and September 15th, an additional 5 gallons per square yard shall be applied 21 days after sod placement.

Water shall be applied by sprinkling or any method approved by the Engineer that prevents wasting the water by runoff from the sod area. If necessary to prevent runoff several hours of applications of the water may be required. The amount of water to be applied may be reduced by the Engineer if in his opinion there has been enough rainfall to warrant a reduction.

The Contractor shall furnish and replace without any compensation any sod that dies or is damaged to the extent replacement is required during the care period. Replacement sod shall be installed under the same specification requirements as those for the original sod being replaced, including the care period.

Water will be considered incidental to the items "Sodding".

All sodded areas shall be protected against traffic or other use by warning signs or barricades approved by the Engineer.

The Contractor shall mow the sodded areas with approved mowing equipment, depending upon climatic and growth conditions and the needs for mowing specific areas. In the event that weeds or other undesirable vegetation are permitted to grow to such an extent that, either cut or uncut, they threatened to smother the sodded species, they shall be mowed and the clippings raked and removed from the area.

When the surface has become gullied or otherwise damaged during the period covered by this contract, the affected areas shall be repaired to re-establish the grade and the condition of the soil, as directed by the Engineer, and shall then be resodded.

306-3.3 Mulching Before spreading mulch, all large clods, stumps, stones, brush, roots, and other foreign material shall be removed from the area to be mulched. Mulch shall be applied immediately after seeding. The spreading of the mulch may be by hand methods, blower, or other mechanical methods, provided a uniform covering is obtained.

Mulch materials shall be furnished, hauled, and evenly applied on the area shown on the plans or designated by the Engineer. Straw or hay shall be spread over the surface to form a uniform thickness at the rate of 2 to 3 tons per acre to provide a loose depth of not less than 1-1/2 inches nor more than 3 inches. Other organic material shall be spread at the rate directed by the Engineer. Mulch may be blown on the slopes and the use of cutters in the equipment for this purpose will be permitted to the extent that at least 95% of the mulch in place on the slope shall be 6 inches or more in length. When mulches applied by the blowing method are cut, the loose depth in place shall not be less than 1 inch nor more than 2 inches.

The mulch shall be held in place by light discing, a very thin covering of topsoil, small brush, pins, stakes, wire mesh, asphalt binder, or other adhesive material approved by the Engineer. Where mulches have been secured by either of the asphalt binder methods, it will not be permissible to walk on the slopes after the binder has been applied. The Contractor is warned that in the application of asphalt binder material he must take every precaution to guard against damaging or disfiguring structures or property on or adjacent to the areas worked and that he will be held responsible for any such damage resulting from his operations.

If the "Peg and String" method is used, the mulch shall be secured by the use of stakes or wire pins driven into the ground on 5 foot centers or less. Binder twine shall be strung between adjacent stakes in straight lines and crisscrossed diagonally over the mulch, after which the stakes shall be firmly

driven nearly flush to the ground to draw the twine down tight onto the mulch.

The Contractor shall care for the mulched areas until final acceptance of the project. Such care shall consist of providing protection against traffic or other use by placing warning signs as approved by the Engineer, and erecting and barricades that may be necessary. The Contractor shall be required to repair or replace any mulching that is defective or becomes damaged until the project is finally accepted. When in the judgement of the Engineer, such defects or damages are the result of poor workmanship or failure to meet the requirements of the specifications, the cost of the necessary repairs or replacement shall be borne by the Contractor. However, once the Contractor has completed the mulching of any area in accordance with the provisions of the specifications and to the satisfaction of the Engineer, no additional work at his expense will be required, but subsequent repairs and replacements deemed necessary by the Engineer shall be made by the Contractor and will be paid for as additional or extra work.

If the "Asphalt Spray" method is used, all mulched surfaces shall be sprayed with asphalt binder material so that the surface has a uniform appearance. The binder shall be uniformly applied to the mulch at the rate of approximately 8.0 gallons per 1,000 square feet, or as directed by the Engineer, with a minimum of 6.0 gallons and a maximum of 10 gallons per 1,000 square feet depending on the type of mulch and the effectiveness of the binder securing it. Bituminous binder material may be sprayed on the mulched slope areas from either the top or the bottom of the slope. An approved spray nozzle shall be used. The nozzle shall be operated at a distance of not less than 4 feet from the surface of the mulch and uniform distribution of the bituminous material shall be required. A pump or an air compressor of adequate capacity shall be used to insure uniform distribution of the bituminous material.

If the "Asphalt Mix" method is used, the mulch shall be applied by blowing, and the asphalt binder material shall be sprayed into the mulch as it leaves the blower. The binder shall be uniformly applied to the mulch at the rate of approximately 8.0 gallons per 1,000 square feet or as directed by the Engineer, with a minimum of 6.0 gallons and a maximum of 10 gallons per 1,000 square feet depending on the type of mulch and effectiveness of the binder securing it.

306-4 MEASUREMENT AND PAYMENT

306-4.1 Seeding Seeding shall be measured by the square yard (SY) basis or acre basis and paid for at the unit price bid for "(Class) Seeding".

306-4.2 Sodding Sodding shall be measured by the square yard (SY) basis and paid for at the unit price bid for "Sodding".

306-4.3 Mulching Mulching shall be measured to the square yard (SY) basis or acre basis and paid for at the unit price bid for "Mulching".

306-4.4 Asphalt Mulching Asphalt mixed on sprayed mulch will be measured by the square yard (SY) basis or acre basis and paid for at the unit price bid for "Asphalt Mulching".

SECTION 307

SPECIFICATIONS FOR CONSTRUCTION FABRIC

307-1 DESCRIPTION This work consists of the furnishing and installation of Geotextile separation fabric, filter wrap fabrics, Riprap fabrics, paving fabrics, and erosion control fabrics according to the locations shown on the Plans or as directed by the Engineer.

307-2 MATERIALS

307-2.1 Geotextile Separation Fabric Geotextile fabric shall be a non-woven fabric equal to Amoco 4551.

307-2.2 Filter Wrap Fabric Filter fabric shall be a non-woven fabric equal to Amoco 4545.

307-2.3 Riprap Fabric Riprap fabric shall be a non-woven fabric equal to Amoco 4553.

307-2.4 Paving Fabric Paving fabric shall be a non-woven fabric equal to Amoco 4599.

307-2.4 Erosion Control Fabric Erosion control fabric shall be a straw mat fabric equal to Excelsior regular or superior grade.

307-3 CONSTRUCTION REQUIREMENTS The surface receiving the fabric shall be smooth and free of stones, sticks, and other debris or irregularities which could puncture the fabric. The fabric shall be placed free of tension and wrinkles. Construction equipment shall not operate directly upon the fabric.

An 18 inch overlap shall be required at all joints and seams. Seams shall not fall beneath the line of a wheel path.

Fabrics shall be covered with aggregates the same day they are placed. The first layer of aggregate covering the fabric shall be a minimum of 6 inches thick and spread with a small dozer or loader. Dumping the aggregate directly on the fabric from trucks or buckets will not be allowed.

The size of equipment used to spread the aggregate shall limit rutting of aggregate to a maximum of 3 inches. Ruts shall be filled with additional aggregate. Ruts shall not be bladed out. The turning of construction equipment shall not be allowed on the initial aggregate layer.

307-3.2 Filter Wrap Fabric The surfaces and trenches receiving the filter fabric shall be smooth and free from stones, sticks, roots, and other debris and irregularities which might puncture the fabric. The fabric shall be placed free of tension and wrinkles.

An 18 inch overlap shall be required at all joints and seams. The overlaps shall be made in the downstream direction.

Filter aggregate shall not be dropped on the aggregate from heights greater than 3 feet. Fabrics placed shall be filled with aggregate the same day they are placed.

Aggregate backfill for the filters shall meet the following gradation:

Sieve Size	Sand	Chips	Rock
3/4 Inch			100
½ Inch		100	90-100
3/8 Inch	100	95-100	40-70
No. 4	95-100	20-85	0-15
No. 8		0-17	0-5
No. 16	45-80		
No. 50	10-30		
No. 100	0-10		
No. 200	0-3	0-3	

307-3.3 Riprap Fabric The surface receiving the riprap fabric shall be smooth and free from stones, sticks, roots, or other debris which may puncture the fabric. The fabric shall be placed free from tension and wrinkles.

An 18 inch overlap shall be required at all joints and seams. The overlaps shall be placed in the downstream direction.

When required, the fabric shall be covered with a 6 inch rock cushion. The rock cushion shall have the gradation shown in Section 307-3.2 rock above. The rock cushion shall be spread by a small dozer or loader. The rock cushion shall not be dumped directly on the fabric. The turning of construction equipment on the rock cushion shall not be allowed.

Dropping of riprap rock less than 18 inches in diameter on the fabric from heights in excess of three 3 feet shall not be allowed. Riprap rock in excess of 18 inches in diameter shall be placed with no free fall. Contouring of the riprap shall be accomplished during its initial placement. Riprap rock shall not be rolled across the fabric.

Placement of the riprap shall begin at the downstream center of the fabric and proceed upwards and outwards.

307-3.4 Pavement Fabrics The surface to receive the fabric shall be smooth and free of debris or irregularities.

Immediately prior to placing the fabric, a coat of PG 58-28 asphalt cement shall be placed upon the surface at a rate of 0.3 gallons per square yard.

The fabric shall be placed free of tension and wrinkles.

A 6 inch overlap will be required at all joints and seams. Seams shall not be placed beneath wheel paths. Fabric shall be placed no less than 18 inches from the edge of the asphalt overlay.

The fabric shall be overlaid the same day it was placed.

307-3.5 Erosion Control Fabric The surface to receive the fabric shall be smooth and free of stones, sticks, roots, or other debris. The fabric shall be placed free of tension and wrinkles.

The fabric shall be installed in the upstream direction. The fabric shall be installed in firm contact with the ground. Sprinkling dirt over the fabric to achieve firm contact may be necessary.

The fabric shall be stapled to the ground at 2 foot intervals. Staples shall be placed no less than 6 inches from the fabric's edge.

Longitudinal joints shall be staggered and overlapped by 18 inches. Seams shall be overlapped 6 inches. Upstream ends shall be keyed into the ground by 6 inch trenches.

307-4 MEASUREMENT AND PAYMENT

307-4.1 Geotextile Separation Fabric Geotextile fabric shall be measured by the square yard (SY) of fabric installed and paid for at the unit price bid for "Geotextile Separation Fabric".

307-4.2 Filter Wrap Fabric Filter wrap fabric shall be measured by the square yard (SY) of fabric installed and paid for at the unit price bid for "Filter Wrap Fabric".

307-4.3 Filter Aggregate Filter aggregate shall be measured by the ton and paid for at the unit price bid for "(Type) Filter Aggregate".

307-4.4 Riprap Fabric Riprap fabric shall be measured by the square yard (SY) of fabric installed and paid for at the unit price bid for "Riprap Fabric".

307-4.5 Riprap Rock Cushion Riprap rock cushion shall be measured by the square yard (SY) and paid for at the unit price bid for "Riprap Rock Cushion".

307-4.6 Paving Fabric Paving fabric shall be measured by the square yard (SY) of fabric installed and paid for at the unit price bid for Paving Fabric".

The unit price bid for Paving Fabric shall include the cost of the Asphalt Cement used for tack.

307-4.7 Erosion Control Fabric Erosion control fabric shall be measured by the square yard (SY) of fabric installed and paid for at the unit price bid for "(Type) Grade Erosion Control Fabric".

SECTION 309

SPECIFICATIONS FOR FENCING

309-1 DESCRIPTION This work consists of the installation, the removal and resetting and the removal and salvage of barbed wire, barbless wire, woven wire, welded wire and chain link fence.

309-2 MATERIALS

309-2.1 Barbed and Barbless Wire Fence

309-2.1.1 Barbed and Barbless Wire Fence wire shall be 2 strand twisted 12½ ASW gauge galvanized steel wire.

When specified, barbs shall be 2 point barbs of 14 ASW gauge galvanized steel wire.

Brace wire and loops shall be 9 ASW gauge galvanized steel wire.

309-2.1.2 Wood Posts Wood posts shall be pressure treated naturally round posts of the diameter and length required. Posts shall be free of decay, kinks, unsound knots, or reverse bends. One-way sweeps in excess of 1½ inches will not be allowed. Posts shall be pointed for driving.

Wood posts shall be complete with 1½ inch long 9 ASW gauge galvanized steel staples.

309-2.1.3 Steel Posts Steel posts shall be studded "T" Posts with steel anchor plates.

Steel posts shall be complete with 10 ASW gauge galvanized steel wire ties.

309-2.2 Woven Wire Fence

309-2.2.1 Woven Wire Woven wire shall be of the width specified with top and bottom wires of 10 ASW gauge wire and with filler and stay wires of 12½ ASW gauge wire. Stays shall be 6 inches apart. All wire shall be galvanized steel wire.

309-2.2.2 Wood Posts Wood posts shall be as specified in 309-2.1.2.

309-2.2.3 Steel Posts Steel posts shall be as specified in 309-2.1.3.

309-2.3 Welded Wire Fence

309-2.3.1 Welded Wire Welded wire shall be of the width specified with 14 ASW gauge galvanized steel wire spaced at 2 inch by 4 inch intervals.

309-2.3.2 Wood Posts Wood posts shall be as specified in 309-2.1.2.

309-2.3.3 Steel Posts Steel Posts shall be as specified in 309-2.1.3.

309-2.4 Chain Link Fence

309-2.4.1 Chain Link Fence Fabric Chain link fence fabric shall be of the width specified with 9 ASW gauge galvanized steel wire and mesh size of 2 inches. Top selvage shall be knuckled, and the bottom selvage shall be twisted and barbed.

309-2.4.2 Wire Ties No. 9 ASW gauge galvanized steel wire ties shall be spaced 12 inches on center on all posts and 24 inches on center on all rails.

309-2.4.3 Posts, Braces, and Rails All posts, braces, and rails shall be hot dip galvanized steel with the following diameters and weights:

	Diameter	Weight
Line and Brace Posts	2 Inch	2.75 #/ft
Corner and Ends Posts	2½ Inch	3.65 #/ft
Rails and Braces	1 5/8 Inch	2.27 #/ft

Each brace shall be diagonally trussed with a 3/8 inch hot dip galvanized steel rod with truss tightener and fittings.

All posts shall be equipped with tops and fittings for attaching fabric and rails. Fittings shall be of malleable iron or pressed steel.

All posts shall be set in concrete.

309-2.5 Gates

309-2.5.1 Tubular Steel Gates Tubular steel gates shall be constructed of 2 inch galvanized steel tubing with welded joints. Gates shall be 50 inches high and the length as specified.

Gates shall be equipped with hinges, hatches, and wheels.

309-2.5.2 Chain Link Fence Gates Chain link fence gates shall be hung on ball and socket hinges. Latches shall be of the "Pig Ear" or spring type. Gates shall be equipped with wheels.

309-3 CONSTRUCTION REQUIREMENTS

309-3.1 General The fence shall be constructed in accordance with the details on the Plans and as specified herein using new materials, and all work shall be performed in a workmanlike manner satisfactory to the Engineer. Prior to the beginning of the work or upon the request of the Contractor, the Engineer shall locate the position of the work by establishing and marking the property line or fence line. When directed, the Contractor shall span the opening below the fence with barbed wire fastened to stakes of the required length at locations of small natural or drainage ditches where it is not practical to conform the fence to the general contour of the ground surface. The new fence shall be permanently tied to the terminals of existing fences whenever required by the Engineer. The finished fence shall be plumb, taut, true to line and ground contour, and complete in every detail.

309-3.2 Clearing Fence Line The site of the fence shall be sufficiently cleared of obstructions, and surface irregularities shall be graded so that the fence will conform to the general contour of the ground. The fence line shall be cleared to a minimum width of 2 feet on each side of the centerline of the fence. This clearing shall consist of the removal of all stumps, brush, rocks, trees, or other obstructions which will interfere with proper construction of the fence. When shown on the Plans or as directed by the Engineer, the existing fences which coincide with, or are in a position to interfere with, the new fence location shall be removed by the Contractor as a part of the construction work unless such removal is listed as a separate item in the bid schedule. All holes remaining after post and stump removal shall be refilled with suitable soil, gravel, or other material acceptable to the Engineer and shall be compacted properly with tampers.

The work shall include the handling and disposal of all material cleared, excavated or removed, regardless of the type, character, composition, or condition of such material encountered.

309-3.3 Wire Fence Construction

309-3.3.1 General This section describes the work required for barbed, barbless, woven, and welded wire fence.

309-3.3.2 Installing Posts All posts shall be spaced as shown on the Plans. Posts may either be driven or set in dug holes to a penetration of 3 feet. All post setting shall be done carefully and to true alignment. Dirt removed for placing posts, anchor bars, flanges, etc., shall be replaced, tamped, and leveled. When posts are driven, care shall be exercised to prevent marring or buckling of the posts. Damaged posts shall be replaced at the Contractor's expense. No extra compensation will be made for rock excavation. Rock excavation shall not be grounds for extension of time.

309-3.3.3 Bracing All corner, anchor, end, and gate posts shall be braced as shown on the Plans. Anchor posts shall be set at approximately 500 foot intervals and braced to the adjacent posts.

309-3.3.4 Installing Wire The wire shall be placed on the side of the posts away from the property, or as directed, at the height indicated on the Plans. The wire shall be carefully stretched and hung without sag and with true alignment. Care shall be taken not to stretch the wire so tightly that it will break in cold weather or pull up corner and brace posts. All horizontal wires shall be fastened securely to each post by fasteners or clips designed for use with the posts furnished. The wire shall be wrapped around end, corner, and gate posts, and the ends of all horizontal wires shall be tied with snug, tight twists. The wire shall be secured to prevent slipping up and down the posts. However, on spans of less than 100 feet, both ends of the span need not be wrapped around the posts.

The bottom wire of the woven and welded wire fencing shall clear the ground by not more than 4 inches or less than 1 inch at any place. When directed by the Engineer, the Contractor shall stake down the woven or welded wire at several points between posts.

309-3.3.5 Splicing Wire Splices in the wire will be permitted if made with an approved galvanized bolt/clamp splice or a wire splice made as follows: The ends of each wire shall be carried 3 inches past the splice tool and wrapped around the other wire for at least six turns in opposite directions. After the tool is removed, the space occupied by it shall be closed by pulling the ends together. The unused ends of the wire shall be cut close to make a neat, workmanlike job.

309-3.3.6 Existing Fence Connections Wherever the new fence joins an existing wire fence, either at a corner or at the intersection of straight fence lines, a corner or anchor post shall be set at the junction and braced and anchored the same as herein described for corner posts.
If the connection is made at other than the corner of the new fence, the last span of the old fence shall contain a brace span.

309-3.4 Chain Link Fence Construction

309-3.4.1 Installing Posts All posts shall be spaced not more than 10 feet apart as shown on the Plans. Terminal (end, corner, pull, and brace) and gate posts shall be set 36 inches in concrete bases as shown on the Plans. All line posts shall be set 30 inches in concrete bases as shown on the Plans. The top of the concrete bases shall be slightly above the ground, trowel finished, and sloped to drain away from the posts. Holes of full depth and size for the concrete bases for posts shall be dug to the size and depth as shown on the Plans. Blasting of rock or other obstructions shall be done if necessary. No extra compensation shall be made for rock excavation. Rock excavation shall not be grounds for extension of time. All post settings shall be done carefully so that all posts shall be vertical and in true alignment and rigidly secured in position.

On terminal (end, corner, pull, and brace) and gate posts, the post tops and brace rail clamps around the posts shall be placed before setting the posts in concrete bases. In setting the gate posts, great care must be taken to make sure that gate posts are set the exact distance apart as shown on the Plans. For example, posts for a 6 foot gate must be set so as to leave an opening exactly 6 feet wide. A line drawn across from the top of one gate post to the other must be level, regardless of the grade at the ground line. If the ground is not level, the upgrade gate post shall be set first to get the proper height for the downgrade gate post.

The concrete bases for end, corner, pull, brace, and gate posts shall be placed first and allowed to cure for 14 days. The concrete bases for line posts shall be allowed to cure for 7 days. Stretcher bar bands and truss bands as specified on the Plans shall be spread and slipped on end, corner, pull, brace, and gate posts as the next operation. Post tops are then inserted on all other posts.

309-3.4.2 Installing Top Rails To start the installation, a length of top rail shall be run through the first couple of post tops; a rail clamp shall be assembled on the end, corner or gate post, as the case may be. The end of the rail already placed shall be butted into the clamp and fastened. The top rail shall be installed along the run of the fence and the various sections joined with sleeve couplings. At not more than every 100 feet, and expansion coupling shall be placed to take care of expansion and contraction of the rail. The rail shall be clamped in the end, corner, or gate post at the end of the run of the installation of top rail.

309-3.4.3 Installing Braces All horizontal braces shall be attached together with truss rods at all terminal (end, corner, and pull) and gate posts to the brace posts as shown on the Plans.

309-3.4.4 Installing Fabric The fabric shall be unrolled on the outside of the fence line with the bottom edge of the fabric against the posts. The various rolls shall be spiced by bringing the ends close together and weaving in a picket in such a way that it will engage both of the roll ends and catch with each twist each separate mesh of the end pickets of both rolls of fabric. The fabric shall be raised and tied loosely to the top rail with a temporary tie wire at intervals of about 20 feet. The fabric shall be installed by a method approved by the Engineer.

Standard chain-line fence stretching equipment shall be provided for stretching the fabric before tying it to the rails and posts. The stretching and tying operations shall be repeated about every 100 feet until the run of fence is completed.

Before making a closure, the other end of the run shall be fastened to the end, corner, or gate post. The operation of making a closure of a run shall be as follows: The stretching equipment shall be clamped on the ends of the fabric parallel to each other and about 5 feet apart when the tension is

first applied. The stretching shall continue until the slack has been removed from both sections of the fabric. If the ends overlap, the fabric shall be cut to match. The ends shall be joined by the insertion of a picket similar to the method of connecting two rolls of fabric.

309-3.4.5 Existing Fence Connections Wherever the new fence joins an exiting chain link fence, either at a corner or at the intersection of straight fence lines, a corner post with a brace post shall be set at the junction and braced the same as herein described for corner posts or as shown on the Plans.

If the connection is made at other than the corner of the new fence, the last span of the old fence shall contain a brace span.

309-3.5 Removal and Resetting of Fence Where called for on the Plans, the Contractor shall carefully disassemble, remove, and stockpile the existing fence.

Existing concrete shall be removed from existing posts.
Any materials damaged by the Contractor during the disassembly, removal, and stockpiling process shall be replaced at the Contractor's expense.

Prior to disassembly, the Contractor shall point out any material which cannot be salvaged. If the Engineer determines that this material cannot be salvaged, it shall be replaced by the Contractor. The Contractor shall be reimbursed at the replacement materials' invoiced cost plus 25%.

The resetting of salvaged fence materials shall conform to the specifications of new fence construction above.

309-3.6 Salvage of Existing Fence Where called for on the Plans, the Contractor shall carefully disassemble, remove, and deliver to the Public Works storage yard, the existing fence.

Existing concrete shall be removed from existing posts.
All post holes shall be backfilled and compacted with a material approved by the Engineer.

Unsalvageable material shall be disposed of by the Contractor.

309-4 MEASUREMENT AND PAYMENT

309-4.1 Fencing The construction of new fencing shall be measured by the linear foot (LF) basis and paid for at the unit price bid for "(Height) (Type) Fence".

309-4.2 Gates The construction of gates shall be measured by the individual (EA) basis and paid for at the unit price bid for "(Length) (Type) Gate".

309-4.3 Removal and Resetting Fence The removal and resetting of fences shall be measured by the linear foot (LF) basis and paid for at the unit price bid for "Removal and Replacement of (Type) Fence".

309-4.4 Fence Salvage The salvaging of a fence shall be measured by the linear foot (LF) basis and paid for at the unit price bid for "(Type) Fence Salvage".

SECTION 401

SPECIFICATIONS FOR WATER MAIN CONSTRUCTION

401-1 DESCRIPTION This item shall consist of pipe of the types, classes, sizes, and dimensions required on the plans, furnished and installed at the places designated on the plans and profiles, or by the Engineer, in accordance with these specifications and with the lines and grades given.

The bid price per linear foot of pipe in place, shall include the cost of excavation and backfill, the cost of furnishing and installing all trench bracing, concrete bases and concrete thrust blocking, and the material for the making of all joints, including all connections to existing water mains, unless otherwise specified.

401-2 MATERIALS

401-2.1 General Materials shall be of the type called for on the plans or in the proposal and shall be in accordance with the following appropriate requirements. All materials shall meet the applicable ANSI/NSF Standards 60 or 61 and be so certified by NSF, UL or other organizations accredited by ANSI to test and certify such materials.

401-2.2 Polyvinyl Chloride Pipe Polyvinyl Chloride Pipe, when specified, shall be of quality conforming to requirements of ASTM D-2241 in accordance with ASTM D-1784 and the requirements of NSF Standards 14 and 16.

401-2.2.1 Class 200 SDR-21 Pressure Pipe When specified, pressure pipe shall meet the requirements of Class 200 SDR-21 pressure pipe.

401-2.2.2 C900 Pressure Pipe When specified, pressure pipe shall meet the requirements of AWWA C-900 SDR 14 Class 200.

401-2.2.3 Ductile Iron Pipe Ductile iron pipe, when specified, shall meet the requirements of AWWA C151, American National Standard for Ductile Iron Pipe. Wall thickness shall be Class 51 unless specified otherwise.

The interior of the pipe shall have a 1/16th inch cement mortar lining conforming to the requirements of AWWA C104. The outside surface of underground pipe shall receive a bituminous coal tar base coating approximately 1 mil thick.

Ductile iron pipe shall be provided with a polyethylene pipe jacket conforming to the requirements of AWWA C105.

401-2.2.4 HDPE PIPE High density polyethylene pipe when specified shall be a minimum SDR 11 Ductile Iron pipe size.

401-2.3 Ductile Iron Fittings Fittings shall be Class 250 fittings conforming to AWWA C110. Joints shall be mechanical joint or push-on joint conforming to AWWA C111. Fittings shall be coated with Fusion Bonded Epoxy. Mechanical joint bolts and nuts shall be stainless steel. Fittings shall be wrapped with polyethylene in accordance with AWWA C105.

Unless otherwise specified, PVC fittings will not be accepted.

401-2.4 Gate Valves Gate valves shall be resilient seat gate valves with non-rising stems with the design, construction and materials conforming to the latest standards of AWWA C509. Gate valves shall be Waterous or Mueller or approved equal.

Gate valves shall have doubles "0" ring stem seals and 2 inch square operating nuts for key operation. All valves shall open counterclockwise.

Gate valves shall be epoxy coated.

Gate valves shall be furnished with push-on or mechanical joints. Bonnet and mechanical joint bolts and nuts shall be stainless steel.

401-2.5 Butterfly Valves Butterfly valves shall be Class 150, rubber seated, tight closing butterfly valves with the design, construction and materials conforming to the latest standards of AWWA C504.

Butterfly valves shall have self adjusting, permanent type shaft packing; totally enclosed permanently lubricated, watertight screw type operator for underground service and a 2 inch square operating nut for key operation. All valves shall open counterclockwise. Butterfly valves shall be epoxy coated.

Butterfly valves shall be furnished with mechanical joints. Bonnet and mechanical joint bolts and nuts shall be stainless steel.

401-2.6 Pipe Couplings Pipe couplings shall be ductile iron sleeves with ductile iron flanges, ductile iron mechanical joint solid sleeves with a minimum length of 12 inches, or Romac 501 cast couplings or equal. Bolts and nuts shall be stainless steel.

401-2.7 Valve Boxes The valve boxes furnished shall be of a quality equal to that manufactured by Mueller Company No. H-10357 with bases and dimensions of each section to be as follows:

No. 6 round base for 8 inch and smaller gate valves.

No. 160 oval base for 10 inch through 16 inch gate valves.

No. 162 oval base for 18 inch through 20 inch gate valves.

No. 6 round base for all butterfly valves.

Covers marked "Water".

Top Section 25.5 inches long.

Center Section 60 inches long.

Extension pieces as required, Mueller No. H-10363 or equal.

All valve boxes shall be capable of a minimum 6 inch top adjustment in either direction, up or down, to or from, the finished curb grades shown on the plans.

If any valve box extension pieces are required to make the above mentioned adjustment, they shall be considered incidental to the price bid for either Butterfly Valve and Box and/or Gate Valve and Box.

401-2.8 Hydrants Hydrants shall be Waterous Pacer WB67-250 with extended head and 22 inch break off. Hydrants shall be provided with two 2½ inch ID hose connections with 7352 Threads and one 4 inch ID pumper connection with 40500 Threads. Hydrants shall have mechanical joint connections with stainless steel nuts and bolts. All hydrants with 6 inch pipe connections shall have 5 inch valves, hydrants with 8 inch connections shall have 6 inch valves. The minimum bury depth shall be 7 1/2 feet. The traffic flange bolts shall be located above the final grade. The traffic flange shall be no more than 6 inches above the final grade. The nozzle elevation shall be a minimum of 30 inches above final grade. The hydrants shall be surrounded by 2 cubic yards of subcut gravel so placed that it will readily take up all water from the drip valves. They hydrants shall be set on a concrete pad 6 inches thick and 18 inches square.

401-2.9 Insulation Insulation shall consist of a double 2 inch layer (4 inches total) of extruded polystyrene insulation meeting the requirements of AASHTO M-230.

401-3 CONSTRUCTION REQUIREMENTS

Water and Sewer work must be completed by Contractors holding a valid Sewer and Water Excavators License issued by the North Dakota State Plumbing Board. Contractors shall submit copies of their Sewer and Water Excavators License with the Construction Agreement.

Excavations within City street and alley rights of way must be completed by Contractors who have posted a $10,000 Excavation Performance Bond with the City which warrantees their work for a period of two years. Details regarding the Excavation Performance Bond requirements may be obtained from the City Auditor’s Office.

401-3.1 Equipment All equipment necessary and required for the proper construction of water mains shall be on the project, in first class working condition and approved by the Engineer before construction is permitted to start.

The Contractor shall provide appropriate hoisting equipment to handle the pipe while unloading and placing it in its final position without damage to the pipe.

The Contractor shall provide hand tampers and pneumatic tampers to obtain the required compaction of the pipe bed and the backfill, as specified.

401-3.2 Tests The test section shall be filled with water and subjected to examination. After the examination, the pressure shall be gradually increased. If defects are found, the Contractor shall immediately make the necessary repairs at his own expense. The final pressure test shall be 150 PSI and shall be held at least two hours and not vary by ∀ 5 psi. The Contractor shall furnish all tools, equipment and material necessary to make the pressure test.

401-3.3 Chlorination After the new water mains and valved extensions have been tested, they shall be flushed until all foreign material has been removed. Chlorination applications shall be made under the supervision of the Engineer. Water shall be fed into the new line with chlorine applied in amounts to produce at least 100 PPM and retained for three hours with the free chlorine not dropping below 50 ppm. The chlorine shall be flushed from the main through hydrants until all excess chlorine has been removed. No chlorination water will be permitted in the water main trench. The Contractor shall furnish all tools, equipment and material to chlorinate the water main.

401-3.4 Handling Pipe and Accessories Pipe, fittings, valves, hydrants and other accessories shall, unless otherwise directed, be unloaded at the point of delivery, hauled to and distributed at the site of the project by the contractor. They shall at all times be handled with care to avoid damage. In loading and unloading, they shall be lifted by hoists or slid or rolled on skidways in such a manner as to avoid shock. Under no circumstances shall they be dropped. Pipe handled on skidways must not be skidded or rolled against pipe already on the ground. In distributing the material at the site of work, each piece shall be unloaded opposite or near the place where it is to be laid in the trench. Pipe shall be handled in such a manner that a minimum of damage to the coating will result. Damaged coating shall be repaired in a manner satisfactory to the engineer. Pipe shall be placed on the site of the work parallel with the trench alignment and with bell ends facing the direction in which the work will proceed unless otherwise directed. The interior of all pipe, fittings and other accessories shall be kept free from dirt and foreign matter at all times. Valves and hydrants before installation shall be drained and stored in a manner that will protect them from damage by freezing.

401-3.5 Sanitary Sewer Crossings Water mains installed above and within 5 feet of a sanitary sewer main and all water mains installed below a sanitary sewer

main shall have a full 20 foot length of water main pipe centered on the sanitary sewer main.

When water mains are installed beneath an existing sewer main, the sewer main shall be replaced by a full 20 foot length of sewer main pipe centered over the water main unless otherwise directed by the Engineer.

401-3.6 Blocking Hydrants and Fittings All hydrants and tees and bends 22-2 degrees and more, shall be provided with suitable reaction blocking of concrete blocks of adequate size to prevent movement of fittings and hydrants when the pipe is under pressure, the blocks shall be placed in a manner acceptable to the Engineer and shall allow pipe and fitting joints to be accessible for repair. The concrete blocks may be poured in place if sufficient time is allowed for curing.

401-3.7 Anchor for Valves Wherever a slip-on type joint water main is used, all gate valves shall be anchored and tied down with steel and concrete. The anchors and tie downs shall be placed in a manner and of a size according to the manufacturer's recommendations. The size, location and procedure shall be acceptable to the Engineer. The concrete shall be 6 bag concrete, poured in place with sufficient time allowed for curing. The concrete, steel and labor for anchoring purpose shall be considered incidental to the Price Bid for water main pipe.

401-3.8 Marking Valve Box Locations The Contractor will be required to furnish and install a steel fence post by each valve box. Steel fence posts to be used for valve locations shall be a "Tee" or "U" post having a minimum length of 52 feet. The post shall be located 2 feet from the valve box in a direction toward the street.

The cost of the steel fence post and the installations shall be considered incidental to other bid items.

401-3.9 Insulation Insulation shall be installed whenever the water main (sewer main, water or sewer service or force main) passes within 2 feet beneath a storm sewer. The insulation shall extend a minimum of 4 feet beyond the outer walls of the storm sewer.

Insulation shall be on a firm compacted and smooth base. Sand may be used to provide the base. Insulation shall be covered with 12 inches of sand or other suitable granular base prior to any compaction or additional backfill is placed.

The insulation boards shall be placed in a stepped pattern so that joints are not continuous. Each layer shall be placed to cover the joints of the proceeding layer. The upper joint shall be no closer than 6 inches from the lower joint.

401-4 MEASUREMENT AND PAYMENT

401-4.1 Water Main Water Main shall be measured by the linear foot (LF) through fittings and from centerline of pipe to centerline of pipe (See Standard Detail Number 1325) and shall be paid for at the Unit Price Bid for (Size) Inch (Material) Water Main complete in place and accepted by the Engineer.

401-4.2 Gate Valve and Box Gate Valves and Boxes shall be measured on an individual unit basis (EA) and shall be paid for at the Unit Price Bid for (Size) Inch Gate Valve and Box, complete in place and accepted by the Engineer.

401-4.3 Butterfly Valve and Box Butterfly valves and boxes shall be measured on an individual unit basis (EA) and shall be paid for at the Unit Price bid for (Size) Inch Butterfly Valve and Box, complete in place and accepted by the Engineer.

401-4.4 Hydrants Hydrants shall be measured on an individual unit basis (EA) and shall be paid for at the Unit Price bid for (Size) Inch Hydrants, complete in place and accepted by the Engineer.

401-4.5 Ductile Iron Fittings Ductile Iron Fittings shall be measured on an individual basis (EA) and paid for at the Unit Price Bid for (Size, Type) Ductile Iron Fittings, complete in place and accepted by the Engineer.

401-4.6 Water Main Connections Connections to existing water mains shall be measured on an individual basis (EA) and paid for at the Unit Price bid for (Size) Water Main Connection, complete in place and accepted by the Engineer.

401-4.7 Insulation Insulation shall be measured on the square foot (SF) basis and paid for at the unit price bid for "Insulation".

SECTION 401A

SPECIFICATIONS FOR PIPE BURSTING FOR WATER MAIN CONSTRUCTION

401A-1 GENERAL

401A-1.1 Description This item shall consist of the replacement of existing water mains by using a static pipe bursting system in which a static pipe bursting unit is pulled through the existing pipe. Simultaneously the new high density polyethylene pipe of equal or larger diameter directly attached to the static pipe bursting unit is pulled through the fragmented existing pipe.

401A-1.2 Contractor Qualifications Prior to the award of the contract, the Contractor shall provide the Engineer with the following:

Demonstrate the successful completion of one or more static pipe bursting projects. These projects shall have a combined total of at least 3,000 feet of pipe installed by the static pipe bursting method.

Certificates for the project personnel certified as fusion technicians trained by a manufacturer of polyethylene pipe and/or fusing equipment.

Certificate from the pipe bursting system manufacturer that the Contractor's project personnel have been fully trained as a user of the pipe bursting system.

401A-1.3 Submittals Prior to the award of the contract, the Contractor shall provide the Engineer with the following:

Items required in Section 401A-1.2.

Shop drawings, catalog data and manufacturer's technical data showing complete information on material composition, physical properties and dimensions of new pipe and fittings. Include manufacturer's recommendations for handling, storage and repair of pipe and fittings damaged.

Method of construction with descriptions of the entire construction procedure to insert the pipe, pipe fusion techniques, non-fusion pipe joining techniques and connections to water services, intersecting water mains and existing water mains.

Submit details of connections to existing water mains that allow for restraint or pipe expansion/contraction to avoid leaks.

The number and location of insertion and receiving pits and any other excavations planned by the Contractor.

401A-2 MATERIALS

401A-2.1 General Materials shall be of the type called for on the plans or in the proposal and shall be in accordance with the following appropriate requirements. All materials shall meet the applicable ANSI/NSF Standards 60 or 61 and be so certified by NSF, UL or other organizations accredited by ANSI to test and certify such materials.

401A-2.2 Polyvinyl Chloride Pipe Polyvinyl chloride pipe, when specified, shall be of quality conforming to requirements of ASTM D-2241 in accordance with ASTM D-1784 and the requirements of NSF Standards 14 and 16.

401A-2.2.1 Class 200 SDR-21 Pressure Pipe When specified, pressure pipe shall meet the requirements of Class 200 SDR-21 pressure pipe.

401A-2.2.2 C900 Pressure Pipe When specified, pressure pipe shall meet the requirements of AWWA C-900-07 SDR 14.

401A-2.2.3 Ductile Iron Pipe Ductile iron pipe, when specified, shall meet the requirements of AWWA C151, American National Standard for Ductile Iron Pipe. Wall thickness shall be Class 51 unless specified otherwise.

Underground pipe and fitting joints shall be mechanical joint or push-on joint conforming to AWWA C111 unless designated otherwise. Mechanical joint bolts and nuts shall be stainless steel.

The interior of the pipe shall have a 1/16th inch cement mortar lining conforming to the requirements of AWWA C104. The outside surface of underground pipe shall receive a bituminous coal tar base coating approximately 1 mil thick.

Ductile iron pipe shall be provided with a polyethylene pipe jacket conforming to the requirements of AWWA C105.

401A-2.2.4 HDPE Pipe High density polyethylene pipe when specified shall be a minimum SDR 11 ductile iron pipe size.

401A-2.3.1 Fittings High density polyethylene pipe fittings shall be SDR11 iron pipe size with electrofusion connections.

Ductile iron fittings may be used in lieu of HDPE fittings. Ductile iron fittings shall be epoxy coated Class 250 ductile iron with mechanical joint polyethylene SDR-11 ductile iron pipe size adapters. Nuts and bolts shall be stainless steel.

401A-2.3.2 HDPE Fittings HDPE fittings shall be SDR-11 ductile iron pipe size with electrofusion connections.

401A-2.4 Gate Valves Gate valves shall be resilient seat gate valves with non-rising stems with the design, construction and materials conforming to the latest standards of AWWA C509. Gate valves shall be Waterous or Mueller or approved equal.

Gate valves shall have doubles "0" ring stem seals and 2 inch square operating nuts for key operation. All valves shall open counterclockwise.

Gate valves shall be epoxy coated.

Gate valves shall be connected to the HDPE pipe using mechanical joint polyethylene SDR11 ductile iron pipe size adapters.

Bonnet and mechanical joint nuts and bolts shall be stainless steel.

401A-2.5 Butterfly Valves Butterfly valves shall be Class 150, rubber seated, tight closing butterfly valves with the design, construction and materials conforming to the latest standards of AWWA C504.

Butterfly valves shall have self adjusting, permanent type shaft packing; totally enclosed permanently lubricated, watertight screw type operator for underground service and a 2 inch square operating nut for key operation. All valves shall open counterclockwise. Butterfly valves shall be epoxy coated.

Butterfly valves shall be connected to the HDPE pipe using mechanical joint polyethylene SDR11 ductile iron pipe size adapters.

Bonnet and mechanical joint nuts and bolts shall be stainless steel.

401A-2.6 Couplings HDPE pipe shall be joined to HDPE pipe using SDR11 iron pipe size high density polyethylene electrofusion couplings.

HDPE pipe shall be joined to other pipes using restrained mechanical joint polyethylene SDR11 iron pipe size adapters. Electrofusion flex restraints shall be provided for main line couplings. Mechanical joint nuts and bolts shall be stainless steel.

Other pipe couplings shall be ductile iron sleeves with ductile iron flanges, mechanical joint solid sleeves with a minimum length of 12 inches or Romac 501 cast couplings or approved equal. Nuts and bolts shall be stainless steel.

401A-2.7 Valve Boxes The valve boxes furnished shall be of a quality equal to that manufactured by Mueller Company No. H-10357 with bases and dimensions of each section to be as follows:

No. 6 round base for 8 inch and smaller gate valves.
No. 160 oval base for 10 inch through 16 inch gate valves.

No. 162 oval base for 18 inch through 20 inch gate valves.

No. 6 round base for all butterfly valves.

Covers marked "Water".

Top Section 25.5 inches long.

Center Section 60 inches long.

Extension pieces as required, Mueller No. H-10363 or equal.

All valve boxes shall be capable of a minimum 6 inch top adjustment in either direction, up or down, to or from, the finished curb grades shown on the plans.

If any valve box extension pieces are required to make the above mentioned adjustment, they shall be considered incidental to the price bid for either Butterfly Valve and Box and/or Gate Valve and Box.

401A-2.8 Hydrants Hydrants shall be Waterous Pacer WB67-250 with extended head and 22 inch break off. Hydrants shall be provided with two 2½ inch ID hose connections with 7352 Threads and one 4 inch ID pumper connection with 40500 Threads. Hydrants shall have mechanical joint connections with stainless steel nuts and bolts. All hydrants with 6 inch pipe connections shall have 5 inch valves, hydrants with 8 inch connections shall have 6 inch valves. The minimum bury depth shall be 7 1/2 feet. The traffic flange bolts shall be located above the final grade. The traffic flange shall be no more than 6 inches above the final grade. The nozzle elevation shall be a minimum of 30 inches above final grade. The hydrants shall be surrounded by 2 cubic yards of subcut gravel so placed that it will readily take up all water from the drip valves. They hydrants shall be set on a concrete pad 6 inches thick and 18 inches square.

401A-2.9 Insulation Insulation shall consist of a double 2 inch layer (4 inches total) of extruded polystyrene insulation meeting the requirements of AASHTO M-230.

401A-3 CONSTRUCTION REQUIREMENTS

401A-3.1 Equipment All equipment necessary and required for the proper construction of the proposed water main by means of pipe bursting shall be on the project, in first class working condition and approved by the Engineer before construction is permitted to start.

The Contractor shall use static bursting equipment. Hydraulic or pneumatic bursting equipment will not be allowed. The Contractor shall hold the Owner harmless in any legal action resulting from patent infringements.

401A-3.2 Handling Pipe and Accessories Pipe, fittings, valves, hydrants and other accessories shall, unless otherwise directed, be unloaded at the point of delivery, hauled to and distributed at the site of the project by the Contractor. They shall at all times be handled with care to avoid damage. In loading and unloading, they shall be lifted by hoists or slid or rolled on skidways in such a manner as to avoid shock. Under no circumstances shall they be dropped. The interior of all pipe, fittings and other accessories shall be kept free from dirt and foreign matter at all times. Valves and hydrants before installation shall be drained and stored in a manner that will protect them from damage by freezing.

Pipe shall not be stored uncovered in direct sunlight.

401A-3.3 Pipe Joining The high density polyethylene pipe shall be assembled and joined at the site using the butt-fusion method to provide a leak proof joint. Threaded or solvent-cement joints and connections are not permitted. All equipment and procedures used shall be used in strict compliance with the manufacturer's recommendations. Fusing shall be accomplished by personnel certified as fusion technicians by a manufacturer of the high density polyethylene pipe and/or fusing equipment.

The butt-fused joint shall be true alignment and shall have uniform rollback beads resulting from the use of proper temperature and pressure. The joint shall be allowed adequate cooling time before removal of pressure. The fused joint shall be water tight and shall have tensile strength equal to that of the pipe. All joints shall be subject to acceptance by the Engineer prior to insertion. All defective joints shall be cut out and replaced at no cost to the Owner. Any section of the pipe with a gash, blister, abrasion, nick, scar or other deleterious fault greater in depth than 10% of the wall thickness shall not be used and must be removed for the site. However, a defective area of the pipe may be cut out and the joint fused in accordance with the procedures stated above. In addition, any section of pipe having other defects such as concentrated ridges, discoloration, excessive spot roughness, pitting, variable wall thickness or any other defect of manufacturing transportation or handling as determined by the Engineer shall be discarded and not used.

Where the high density polyethylene pipe is connected with ductile iron fittings or valves, an HDPE flange adapter shall be fused to the end of the pipe and connection made with bolted flanged components with stainless steel nuts and bolts.

Terminal sections of high density polyethylene pipe that are joined to existing pipes shall be connected with restrained mechanical joint polyethylene adapters. Couplings on main line runs shall also be restrained using electrofusion flex restraints.

Runs of high density polyethylene pipe shall be joined with electrofusion couplings.

Service connections shall be made using electrofusion corp saddles.

401A-3.4 Protection of Existing Structures and Utilities The Contractor shall be responsible for the protection of all existing structures and/or utilities from damage resulting from the work required. The Contractor shall repair, replace or restore any damage to existing structures and/or utilities resulting from the work required at the Contractor's expense.

401A-3.5 Excavations Prior to the award of the contract, the Contractor shall submit to the Engineer the size and locations of all insertion pits, receiving pits and any other excavations necessary to complete the work.

These excavations shall be backfilled and the surface restored to its original condition in accordance with these specifications.

401A-3.6 Unknown Obstructions The location of all known fittings, pipe deflections, structures and utilities are shown on the plans. Any excavation necessary to remove or avoid damage to these items shall be included in the list of excavations to be submitted to the Engineer prior to award of the contract. No additional compensation shall be made for any excavation not listed in this submittal that during construction is found necessary to remove, repair, replace or avoid damage to any fitting, pipe deflection, structure or utility shown on the plans.

With the approval of the Engineer, the Contractor may make additional excavations to protect, relocate, repair or restore unknown utilities or structures or to remove unknown fittings, pipe deflections or other pipe obstructions that prevents the progress of the pipe bursting equipment.

401A-4 MEASUREMENT AND PAYMENT

401A-4.1 Water Main Water main pipe burst shall be measured by the linear foot (LF) through fittings and from centerline of pipe to centerline of pipe (See Standard Detail Number 1325) and shall be paid for at the unit price bid for (Size) Inch, HDPE Water Main - Pipe Burst complete in place and accepted by the Engineer.

401A-4.2 Gate Valve and Box Gate Valves and Boxes shall be measured on an individual unit basis (EA) and shall be paid for at the unit price bid for (Size) Inch Gate Valve and Box, complete in place and accepted by the Engineer.

401A-4.3 Butterfly Valve and Box Butterfly valves and boxes shall be measured on an individual unit basis (EA) and shall be paid for at the unit price bid for (Size) Inch Butterfly Valve and Box, complete in place and accepted by the Engineer.

401A-4.4 Hydrants Hydrants shall be measured on an individual unit basis (EA) and shall be paid for at the unit price bid for (Size) Inch Hydrants, complete in place and accepted by the Engineer.

401A-4.5 Fittings Fittings shall be measured on an individual basis (EA) and paid for at the unit price bid for (Size, Type) Fittings, complete in place and accepted by the Engineer.

401A-4.6 Water Main Connections Connections to existing water mains shall be measured on an individual basis (EA) and paid for at the unit price bid for (Size) Water Main Connection, complete in place and accepted by the Engineer.

401A-4.7 Surface Restoration The restoration of the surface of all planned excavations shall be measured on the Lump Sum basis and paid for at the unit price bid for "(Type) Surface Restoration".

SECTION 402

SPECIFICATIONS FOR WATER SERVICE CONNECTIONS

402-1 DESCRIPTION This item shall consist of furnishing and installing water service connections from the main lines located in public right-of-way, such as streets and alleys to the right-of-way property line. The materials, equipment and construction methods shall be in full compliance with the ordinances of the City of Williston, the State Plumbing Code, regulations set forth by the State Health Department and in accordance with these specifications and standard details.

402-2 MATERIALS

402-2.1 General The materials shall be of the type called for on the plans or in the proposal and shall be in acceptance with the following appropriate requirements. All materials shall meet the applicable ANSI/NSF Standards 60 or 61 and shall be so certified by NSF, UL or other organizations accredited by ANSI to test and certify such materials.

402-2.2 Water Service Pipe

A. Copper water pipe shall conform to A.S.T.M. B88, Type K.

B. Polyethylene water pipe shall conform to PE3408, ASTM D-2239, SDR7, 200 psi, NSF approved high density polyethylene pipe.

402-2.3 Corporation Stop Corporation stops shall be:

A. For flared copper Ford No. FB-600 or approved equal.

B. For PE pipe Ford No. FB-1001 or approved equal.

402-2.4 Curb Stop Curb stops shall be:

A. For flared copper Ford No. B22-444M or approved equal.

B. For PE pipe Ford No. B66-444M or approved equal.

402-2.5 Curb Box Curb boxes shall be Ford EM2-80-67 or approved equal. The upper section shall be 1 ½ inch diameter. The lower section shall have a 2 inch FPIT on the bottom. The extended length of the curb boxes shall be 8 feet. Curb stop boxes shall not be furnished with standard lids (see below).

402-2.6 Curb Stop Box Lids Curb stop boxes shall be furnished with a 2 inch cast iron curb stop box lid with an integrally cast brass bushing and cast iron pentagon plug. The lid shall be threaded on a 2" x 18" Schedule 40 iron pipe. This lid assembly is slipped over the top of the curb stop box.

402-2.7 Tapping Saddles Tapping saddles shall be Smith-Blair No. 323 double strap bronze saddle for asbestos cement pipe and Romac 306 two bolt stainless steel saddle for PVC pipe or approved equal.

402-2.8 Pipe Couplings Couplings shall be of the compression, flared copper or stab in type sized and configured for the material of the pipes being joined. Stainless steel pipe inserts will be required when coupling to polyethylene pipe.

402-2.9 Insulation Insulation shall consist of a double 2 inch layer (4 inches total) of extruded polystyrene insulation meeting the requirements of AASHTO M-230.

402-3 CONSTRUCTION REQUIREMENTS

Water and Sewer work must be completed by Contractors holding a valid Sewer and Water Excavators License issued by the North Dakota State Plumbing Board. Contractors shall submit copies of their Sewer and Water Excavators License with the Construction Agreement.

Excavations within City street and alley rights of way must be completed by Contractors who have posted a $10,000 Excavation Performance Bond with the City which warrantees their work for a period of two years. Details regarding the Excavation Performance Bond requirements may be obtained from the City Auditor's Office.

402-3.1 General Water service connections shall be constructed in accordance to the specifications regarding water main construction contained in Section 401-3.

Curb stops and boxes shall be placed on a brick or concrete block. Use of wood planks or rocks will not be allowed.

Unless otherwise directed, curb stop locations shall be marked with a 4 foot 2 x 4 extended 2 feet above the surface elevation.

402-3.2 Insulation Insulation shall be installed whenever the water main (sewer main, water or sewer service or force main) passes within 2 feet beneath a storm sewer. The insulation shall extend a minimum of 4 feet beyond the outer walls of the storm sewer.

Insulation shall be on a firm compacted and smooth base. Sand may be used to provide the base. Insulation shall be covered with 12 inches of sand or other suitable granular base prior to any compaction or additional backfill is placed.

The insulation boards shall be placed in a stepped pattern so that joints are not continuous. Each layer shall be placed to cover the joints of the proceeding layer. The upper joint shall be no closer than 6 inches from the lower joint.

402-4 MEASUREMENT AND PAYMENT

402-4.1 (Size) Inch Copper Water Service Pipe Copper water service pipe shall be measured by the linear foot (LF) from the centerline of the water main at the water service connection to the end of the water service pipe and shall be paid for at the unit price bid for "(Size) Inch Copper Water Service Pipe" complete in place and accepted by the Engineer.

402-4.2 Taps, Saddles, and Corporation Stops Water main taps, tapping saddles, and corporation stops shall be considered one item and shall be measured on the individual (EA) basis and paid for at the unit price bid for "(Size of Main)" x (Size of Service Line)" Service Tap complete in place and accepted by the Engineer.

402-4.3 Curb Stops, Boxes and Lids Curb stops, curb stop boxes and lids shall be considered one item and shall be measured on the individual (EA) basis and paid for at the unit price bid for "(Size)" Curb Stop W/Box" complete in place and accepted by the Engineer.

402-4.4 Curb Stop Replacement The excavation for and the replacement of existing curb stops and boxes including the connections to the existing service line shall be measured on the individual (EA) basis and paid for at the unit price bid for "(Size) Curb Stop Replacement" complete in place and accepted by the Engineer.

402-4.5 Water Service Connection Connections of new water service lines to existing water service lines shall be measured on an individual unit basis (EA) and paid for at the unit price bid for "(Size) Inch Water Service Connection" complete in place and accepted by the Engineer.

402-4.6 Insulation Insulation shall consist of a double 2 inch layer (4 inches total) of extruded polystyrene insulation meeting the requirements of AASHTO M-230.

SECTION 403

SPECIFICATIONS FOR CLEANING & DISINFECTION OF WATER MAINS

403-1 SCOPE This section covers cleaning and disinfection of water mains and associated appurtenances.

Pipeline pressure and leakage testing are covered in the pipeline pressure and leakage testing section.

403-2 GENERAL Unless otherwise specified, hydrostatic testing of the pipeline shall be completed prior to final cleaning and disinfection.

The Engineer shall be present during the performance of all cleaning and disinfection work and shall be notified of the time and place of cleaning and disinfection at least 3 days prior to commencement of the work. All work shall be performed to the satisfaction of the Owner and Engineer.

403-2.1 Governing Standard All disinfection work shall conform to the requirements of ANSI/AWWA C651 and the requirements of the North Dakota Department of Health. If any State requirements conflict with the provisions of this section, the State requirements shall govern.

403-2.2 Experience All work shall be done under the direct superintendence and authority of a competent and experienced specialist in such work.

403-2.3 Disinfection Plan Unless otherwise specified, not less than 14 days prior to starting any disinfection work, the Contractor shall submit to the Engineer a detailed cleaning and disinfection plan. The plan shall cover the method and procedure proposed, including coordination, the time and sequence of operations, the limits of the pipeline to be cleaned and disinfected, the location of temporary bullkheads, equipment to be used, the manner of filling and flushing of lines, the neutralization and disposal of wasted water, and all other methods and procedures to be followed in performing the required cleaning and disinfection work.

403-2.4 Special Cleaning and Disinfection Requirements Unless otherwise permitted by the Owner, cleaning and disinfection of water mains shall comply with the following special requirements:

a. Temporary bulkheads shall be provided during cleaning and disinfection so that the flushing and disinfection work is not applied to existing water lines or to any portion that has been put into service of new lines installed under this contract.

b. The cleaning and disinfection work shall be conducted prior to connection to the existing water lines or to any portion that has been put into service of new lines installed under this contract.

403-2.5 Equipment and Facilities The Contractor shall provide all necessary piping, connections, temporary valves, sampling taps, pumps, disinfectant, neutralization agents, chlorine residual test apparatus, and all other items of equipment or facilities required to complete the disinfection work.

403-2.6 Water Water required for flushing and disinfection work will be provided by the Owner.

403-2.7 Chlorine Residual Tests The Contractor shall provide the necessary apparatus for the making of chlorine residual tests by the drop dilution method as set forth in Appendix A of ANSI/AWWA C651. Tests will be made by the Owner.

403-2.8 Interruption of Service In all cases where it is necessary to interrupt service to water customers, permission of the Owner shall be obtained and each customer affected thereby shall be notified of the proposed service interruption and its probable duration.

403-3 CLEANING The line shall be cleaned by flushing the line at the maximum velocity which can be developed until the line is free of dirt, debris, and other foreign materials. Cleaning of the line shall be completed prior to disinfection.

403-4 DISINFECTION PROCEDURE The line shall be disinfected by the slug method.

Unless otherwise permitted, the chlorination agent shall be injected into the line at the supply end of each new line or valve section thereof through a corporation cock installed in the top of the pipe.

Admission of disinfection solution into or the flushing thereof through existing mains shall be held to the minimum possible, and then only after proper and adequate measures have been taken to effectively prevent any such solution of waste water from entering branch service connections to water customers.

During disinfection, all valves and hydrants shall be operated to ensure that all appurtenances are disinfected. Valves shall be manipulated in such a manner that the strong chlorine solution in the line being chlorinated will not flow back into the supply line. Check valves shall be used if required.

Existing mains or any portion that has been put into service of new mains installed under this contract, which would have been contaminated during work requiring connections to the new water line, involving either tapping or cutting into operations, shall be flushed and disinfected in accordance with Section 10 of ANSW/AWWA C651.

403-5 FINAL FLUSHING AND NEUTRALIZATION PROCEDURE All chlorinated water discharged shall be neutralized by dilution or chemical treatment and suitably disposed of in accordance with Section 6 and Appendix B of ANSI/AWWA C651.

The Contractor shall notify federal, state, and local regulatory agencies in accordance with the governing standard to determine if any special procedures or permits are required for disposal of neutralized or diluted chlorinated water. All requirements and costs associated with obtaining any discharge permit shall be the responsibility of the Contractor.

Upon completion of chlorination, but before sampling and bacteriological testing, all heavily chlorinated water shall be removed from the line by flushing with potable water until the chlorine residual in the line is not higher than that generally prevailing in the remainder of the system or as acceptable to the Owner. No chlorinated water will be permitted in the water main trench.

Effective measures shall be initiated prior to the commencement of discharge of heavy chlorinated water to prevent pollution of drainage ditches, watercourses, water basins, sanitary sewer systems, and other applicable systems.

The Contractor shall sample, test, and record the chlorine residual and time of test at several locations downstream of the discharge. Should the chlorine test indicate that the heavy chlorinated water is not neutralized, the Contractor shall take appropriate corrective measures to neutralize the discharge.

403-6 BACTERIOLOGICAL TESTS Sampling and testing of water in the line shall be performed after final flushing in accordance with Section 7 of the governing standard. A standard plate count shall be made for each sample. Samples shall be taken as directed by the Owner.

403-7 REDISINFECTION Should the bacteriological tests indicate the presence of coliform organisms at any sampling point, the line shall be reflushed, resampled, and retested. If check samples show the presence of coliform organisms, the line shall be rechlorinated until results acceptable to the Owner are obtained.

CITY OF WILLISTON
DISINFECTION OF MAINS

Project: _____ Date: _____

Contractor: _____

Line	Pipe Diameter Inch	Stationing or Location of Main	Length of Main (ft)	Radius^2 x π x Length x Gal/Ft ^{3} = Gallons (3.1416) (ft) (7.48)
1				
2				
3				
4				

Total Gallons (Gals) to be Disinfected = _____ = (_____ mg)

Disinfection Method _____

Type of Chlorine Disinfection _____

1. (% Chemical Solution) x (_____Tablets/20 ft Pipe) x (1 oz/_____Tablets) x (1 ft Pipe/_____Gal x (7489.2 mg/l / 1 oz/gal = _____mg/l)

2. _____ x _____ x _____ x _____ x _____ = _____

3. Slug Concentration Required = 100 mg/l Free Chlorine

4. Fill Velocity Must Be Less Than 1 ft/sec

5. Water to Remain in Pipe for 3 Hours

Disposal Neutralizing Chemical _____ LBS Chemical Used _____

Accepted by: _____ _____
Engineer Contractor

Comments:

SECTION 404

SPECIFICATIONS FOR PIPELINE PRESSURE & LEAKAGE TESTING

404-1 SCOPE This section covers field hydrostatic pressure and leakage testing of water mains and associated appurtenances.

Cleaning and disinfection of the pipeline is covered in the cleaning and disinfection of water mains section.

402-2 GENERAL Unless otherwise specified, hydrostatic testing of the pipeline shall be completed prior to final cleaning and disinfection.

The Engineer shall be present during the performance of all testing work and shall be notified of the time and place of testing at least 3 days prior to commencement of the work. The Engineer shall witness the opening and closing of all valves and shall be notified prior to the changing of the position of any valves during testing of the water line. All work shall be performed to the satisfaction of the Engineer.

404-2.1 Testing Schedule and Procedure A testing schedule and test procedure shall be submitted to the Engineer for review and acceptance not less than 21 days prior to commencement of testing work. The schedule shall indicate the proposed time and sequence of testing of the pipeline. The testing procedure shall establish limits of the pipeline to be tested, the position of all valves during testing, the location of temporary bulkheads and test equipment, disposal of test water, and all other methods and procedures to be followed in performing the required testing work.

404-2.2 Special Testing Requirements Unless otherwise permitted by the Owner, pressure and leakage testing shall comply with the following special requirements:

a. During testing of the water line, all valves, except for the auxiliary hydrant valve, shall be in the open position.

b. Temporary bulkheads shall be provided during testing so that the test pressures are not applied to existing or new valves and hydrants, or to existing water lines or to any portion that has been put into service of new water lines installed under this contract.

c. A temporary pressure gauge shall be installed at each end of the limits of the pipeline to be tested.

d. The tests shall be conducted before connections are made to existing water lines or to any portion that has been put into service of new water lines installed under this contract.

e. The auxiliary hydrant valve shall be closed during pressure testing so that the test pressure is not applied to the hydrant valve.

f. Unless otherwise acceptable, upon completion of testing, connections made to existing water lines or to any portion that has been put into service of new water lines installed under this contract shall be visually inspected for leakage after placing the water line into service and before backfilling the connection.

404-2.3 Water Water for testing shall be furnished by the Owner. Water shall be conserved through collection and reused in subsequent tests. Following completion of testing work, the water shall be wasted or disposed of in a manner acceptable to the Engineer. Unless otherwise permitted, the water will not be allowed to enter other parts of the system.

404-2.4 Filling and Venting Before filling the line with water, care shall be taken to ensure that all temporary venting devices are properly installed in the open position. Hand operated vent valves shall not be closed until water flows in an uninterrupted stream from each valve. Care shall be taken to ensure that the rate at which the line is filled with water does not exceed the venting capacity of the permanently installed air vent valves and devices.

404-2.5 Blocking and Backfilling Piping shall be adequately blocked, anchored, and supported before the test pressure is applied.

404-2.6 Test Equipment All necessary piping connections between the line to be tested and the water source, together with pumping equipment, water meter, pressure gauges, backflow protection, and other equipment, materials, and facilities required to perform the specified tests, shall be provided. All flanges, valves, bulkheads, bracing, blocking, and other sectionalizing devices required shall also be provided. All temporary sectionalizing devices shall be removed upon completion of testing. Vents shall be provided in test bulkheads where necessary to expel air from the line to be tested.

Test pressures shall be applied by means of a force pump sized to provide and maintain the required pressure without interruption during the test.

Water meters and pressure gauges shall be accurately calibrated and shall be subject to review and acceptance by the Engineer.

Unless otherwise acceptable to the Engineer, drilling and tapping of permanently installed pipe walls will not be permitted.

404-3 PRESSURE TESTING After the pipeline to be tested has been filled with water, the test pressure shall be applied and maintained within ∀ 5% without the interruption for 2 hours plus the additional time required by the Engineer to examine all piping undergoing the test for the Contractor to locate all defective joints and pipe materials.

404-3.1 Test Pressure The pipeline shall be subject to a hydrostatic test pressure equivalent to 150 psi.

404-4 LEAKAGE TESTING Following completion of pressure testing and acceptance by the Engineer, the pipeline shall be subjected to a leakage test. The duration of the leakage test shall be 2 hours plus the additional time required by the Engineer for an accurate determination of line leakage.

404-4.1 Leakage Test Pressure The hydrostatic pressure maintained during leakage test shall be at least 75% but not more than 100% of the pressure specified for pressure testing of the pipeline and shall be maintained within ± 5% during the entire time that leakage measurements are being performed.

404-4.2 Leakage Measurements Measurements of leakage shall not be attempted until all trapped air has been vented and a constant test pressure has been established. After the pressure has stabilized, line leakage shall be measured by means of a suitable water meter installed in the pressure supply piping on the pipeline side of the force pump.

404-4.3 Allowable Leakage The term Aleakage@, as used herein, shall be the total amount of water which must be introduced into the line during the leakage test to maintain the leakage test pressure. At the end of the test duration, if pressure is below the initial leakage test pressure, the pressure shall be increased to the initial leakage test pressure to determine total actual leakage.

No pipeline will be accepted if and while it exhibits a leakage rate in excess of that determined by the following formula:

$$Q = 0.0075\ DLN$$

where

Q = Allowable leakage rate in gallons per hour

D = Nominal diameter of pipe in inches

L = Length of section tested in thousand feet

N = Square root of weighted average test pressure in psi

Whenever the pipeline to be tested contains pipe of different diameters, the allowable leakage rate shall be calculated separately for each diameter and corresponding length of line. Each separate leakage rate shall be added to obtain the total allowable leakage rate for the entire pipeline.

All joints in piping shall be water tight and free from visible leaks during the leakage test. Each leak which is discovered within the 1 year correction

period shall be repaired by and at the expense of the Contractor regardless of any amount that the total line leakage rate, during the leakage test, may have been below the specified allowable leakage rate.

If the leakage test indicates a line leakage rate exceeding the allowable, the Contractor shall locate and repair leaking joints and other defective items to the extent required to reduce the line leakage rate to an acceptable amount.

CITY OF WILLISTON
PIPELINE PRESSURE & LEAKAGE TEST

Project: _____ Date: _____

Contractor: _____

Pipeline: _____

Station: _____ to Station: _____

Length: _____

Test Equipment: _____

PRESSURE TEST

Test Plane Elevation _____ ft

Pressure Gauge Elevation _____ ft

Difference _____ ft x 0.433

Test Pressure Required _____ psi

Start Time _____ Pressure Reading _____ psi

Stop Time _____ Pressure Reading _____ psi

Duration _____ Pressure Loss _____ psi

LEAKAGE TEST

Leakage Test Pressure Required _____ psf (75% - 100% Test Pressure Above)

D = Dia. _____ inch L = Length _____ feet x 0.001 = _____ 1000 feet

N = π Avg Leakage Test Pressure _____ psi Q = 0.0075

DLN = _____ Gal/Hr Allowable Leakage

Start Time _____ Pressure Reading _____ psi

Stop Time _____ Pressure Reading _____ psi

Q = _____ Gal/Hr. Actual Leakage

Accepted by: _____ _____

Engineer Contractor

Comments (including position of all valves, locations of temporary bulkheads and special testing requirements):

SECTION 501

SPECIFICATIONS FOR SANITARY SEWERS

501-1 DESCRIPTION This item shall consist of pipe of the types, classes, sizes, and dimensions required on the plans, furnished and installed at the places designated on the plans and profiles, or by the Engineer, in accordance with these specifications and with the lines and grades given.

The bid price per linear foot of pipe in place, shall include the cost of excavation and backfill, the cost of furnishing and installing all trench bracing, All fittings required to complete the sewer pipe, as shown on the plans, and the material for and the making of all joints, including all connections to existing sewer pipe and manholes.

501-2 MATERIALS

501-2.1 General The pipe shall be of the type called for on the plans or in the Proposal and shall be in accordance with the following appropriate requirements.

When harmful concentrations of petroleum fuels are wasted to the piping, pipe containing bituminous products in its coating and/or paving, or pipe jointing made with material, such as rubber, that would also be adversely affected shall not be used.

501-2.2 Concrete Sewer Pipe Concrete sewer pipe, when specified, standard nonreinforced, shall conform to the requirements of ASTM C-14. Concrete sewer pipe, reinforced, shall conform to the requirements of ASTM C-76.

501-2.3 Polyvinyl Chloride Sewer Pipe Polyvinyl Chloride Sewer Pipe, when specified, shall conform to the requirements of ASTM D-3034 for Type PSM, PVC Sewer Pipe and Fittings and shall have an SDR of 35. PVC sewer pipe and PVC sewer service pipe shall have the elastomeric gasket type joint providing a watertight seal. A solvent cement type joint will not be allowed. PVC wye branches shall be of the "Factory Assembled Type".

501-2.4 Rubber Gasket Joints Rubber type gaskets for concrete nonpressure pipe shall conform to the requirements of ASTM C-443.

501-2.5 Mortar Mortar for connections to manholes and sewers shall be composed of one part, by volume, of Portland Cement and two parts of mortar sand.

501-2.6 O-Ring Rubber Gasket Joint for PVC Sewer Pipe O-Ring Rubber Gaskets for PVC Sewer Pipe Joints shall be of the Elastomeric type providing a watertight seal.

501-2.7 Sewer Connections Connections to pipes of differing materials shall be made with FERNCO couplings equipped with stainless steel straps or approved equal.

501-2.8 Insulation Insulation shall consist of a double 2 inch layer (4 inches total) of extruded polystyrene insulation meeting the requirements of AASHTO M-230.

501-3 CONSTRUCTION REQUIREMENTS

Water and Sewer work must be completed by Contractors holding a valid Sewer and Water Excavators License issued by the North Dakota State Plumbing Board. Contractors shall submit copies of their Sewer and Water Excavators License with the Construction Agreement.

Excavations within City street and alley rights of way must be completed by Contractors who have posted a $10,000 Excavation Performance Bond with the City which warrantees their work for a period of two years. Details regarding the Excavation Performance Bond requirements may be obtained from the City Auditor's Office.

501-3.1 Equipment All equipment necessary and required for the proper construction of sewer mains shall be on the project, in first class working condition and approved by the Engineer before construction is permitted to start.

The Contractor shall provide appropriate hoisting equipment to handle the pipe while unloading and placing it in its final position without damage to the pipe.

The Contractor shall provide hand tampers and pneumatic tampers to obtain the required compaction of the pipe bed and the backfill, as specified.

501-3.2 Connections to Existing Sewers The Contractor shall connect the new sewer to an existing sewer of differing material by means of a FERNCO Coupling.

Where FERNCO Couplings are not practical, the Contractor shall remove the existing pipe to its nearest joint. This type of joint shall be sealed with gaskets, Oakum packing or similar material to produce a water tight joint.

501-3.3 Connections to Existing Manholes The Contractor shall carefully and in a workmanlike manner cut and remove the concrete or brick manhole to produce a hole no larger than necessary to accommodate the new pipe.

This manhole pipe joint shall utilize a GPK gasketed manhole adaptor, or equal and shall be firmly grouted shut to produce a water tight joint.

The Contractor shall repair any damage to the existing manhole caused by the connection of the new sewer pipe.

It will generally be necessary to remove and reconstruct the manhole's concrete shelves and inverts to accommodate the new sewer. Reconstruction of the shelves and inverts shall be with concrete mortar. The Contractor shall remove all construction debris from the manhole and prevent any debris from entering the existing sewer system.

501-3.4 Handling Pipe and Accessories Pipe, fittings, manholes and other accessories shall, unless otherwise directed, be unloaded at the point of delivery, hauled to and distributed at the site of the project by the contractor. They shall at all times be handled with care to avoid damage. In loading and unloading, they shall be lifted by hoists or slid or rolled on skidways in such a manner as to avoid shock. Under no circumstances shall they be dropped. Pipe handled on skidways must not be skidded or rolled against pipe already on the ground. In distributing the material at the site of work, each piece shall be unloaded opposite or near the place where it is to be laid in the trench. Pipe shall be placed on the site of the work parallel with the trench alignment and with bell ends facing the direction in which the work will proceed unless otherwise directed. The interior of all pipe, fittings and other accessories shall be kept free from dirt and foreign matter at all times.

501-3.5 Water Main Crossings Sewer mains crossing a water main shall have a full 20 foot length of sewer main pipe centered on the water line.

501-3.6 Insulation Insulation shall be installed whenever the water main (sewer main, water or sewer service or force main) passes within 2 feet beneath a storm sewer. The insulation shall extend a minimum of 4 feet beyond the outer walls of the storm sewer.

Insulation shall be on a firm compacted and smooth base. Sand may be used to provide the base. Insulation shall be covered with 12 inches of sand or other suitable granular base prior to any compaction or additional backfill is placed.

The insulation boards shall be placed in a stepped pattern so that joints are not continuous. Each layer shall be placed to cover the joints of the proceeding layer. The upper joint shall be no closer than 6 inches from the lower joint.

501-4 MEASUREMENT AND PAYMENT

501-4.1 PVC Sewer Main PVC Sewer Main shall be measured by the linear foot (LF) basis from centerline of manhole to centerline of manhole and by depth of cut in 3 foot increments measured from the existing surface grade to the sewer invert as determined by field surveys conducted by the Engineer and paid for at the unit price bid for "(Size) Inch PVC Sewer Main (Depth of Cut to Depth of Cut) complete in place and accepted by the Engineer.

501-4.2 Concrete Sewer Main Concrete sewer main shall be measured by the Linear Foot (LF) basis from centerline of manhole to centerline of manhole and by

depth of cut in 3 foot increments measured from the existing surface grade to the sewer invert as determined by field surveys conducted by the Engineer and paid for at the unit price bid for "(Size) Inch Concrete Sewer Main (Depth of Cut to Depth of Cut) complete, in place and accepted by the Engineer.

501-4.3 Sewer Wyes Wye branches shall be measured on an individual (EA) basis and paid for at the unit price bid for "(Size) x (Size) Wye." complete in place and accepted by the Engineer.

501-4.4 Connections to Existing Sewer Mains Connections to existing sewer mains shall be measured on an individual (EA) basis and paid for at the unit price bid for "(Size) (Type) to (Type) Sewer Main Connection" complete in place and accepted by the Engineer.

501-4.5 Connections to Existing Manholes Connections to existing manholes shall be measured on an individual (EA) basis and paid for at the unit price bid for "(Size) (Type) Sewer Connection to (Type) Manhole" complete in place and accepted by the Engineer.

501-4.6 Insulation Insulation shall be measured on the square foot (SF) basis and paid for at the unit price bid for "Insulation".

SECTION 502

SPECIFICATIONS FOR SANITARY SEWER SERVICES

502-1 DESCRIPTION

This item shall consist of furnishing and installing sewer service connections from the main lines located in public right-of-way, such as streets and alleys to the right-of-way property line. The materials, equipment and construction methods shall be in full compliance with the ordinances of the City of Williston, the State Plumbing Code, regulations set forth by the State Health Department and in accordance with these specifications and standard details.

The bid price per linear foot of pipe in place, shall include the cost of excavation and backfill, the cost of furnishing and installing all trench bracing, All fittings required to complete the sewer pipe, as shown on the plans, and the material for and the making of all joints, including all connections to existing sewer pipe and manholes.

502-2 MATERIALS

502-2.1 Polyvinyl Chloride Sewer Pipe Polyvinyl Chloride Sewer Pipe, when specified, shall conform to the requirements of A.S.T.M. D-3034 for Type PSM, PVC Sewer Pipe and Fittings and shall have an SDR of 35. PVC sewer service pipe may have the elastomeric gasket type joint or a solvent cement type joint. PVC wye branches shall be of the "Factory Assembled Type".

502-2.2 PVC Sewer Pipe Joint Cement The Polyvinyl Chloride Sewer Pipe Joint Cement shall consist of a viscous brushable solution of polyvinyl chloride in suitable active solvents. The cement shall be purchased from the pipe manufacturer and used in accordance with the manufacturer's instructions. It shall produce a joint of sufficient strength to permit normal installation handling within five minutes after jointing when exercising reasonable care.

502-2.3 Sewer Connections Connections to pipes of differing materials shall be made with polyvinyl chloride couplings equipped with stainless steel straps as manufactured by FERNCO or approved equal.

502-2.4 Insulation Insulation shall consist of a double 2 inch layer (4 inches total) of extruded polystyrene insulation meeting the requirements of AASHTO M-230.

502-3 CONSTRUCTION REQUIREMENTS

Water and Sewer work must be completed by Contractors holding a valid Sewer and Water Excavators License issued by the North Dakota State Plumbing Board. Contractors shall submit copies of their Sewer and Water Excavators License with the Construction Agreement.

Excavations within City street and alley rights of way must be completed by Contractors who have posted a $10,000 Excavation Performance Bond with the City which warrantees their work for a period of two years. Details regarding the Excavation Performance Bond requirements may be obtained from the City Auditor's Office.

502-3.1 General Sanitary sewer service connections shall be constructed in accordance to the specifications regarding sewer main construction contained in Section 501-2.

Unless otherwise directed by the engineer, sanitary sewer service shall be capped at the property line.

The end of the sewer service shall be marked with a 4 foot 2 x 4 extended 2 feet above the surface elevation.

502-3.2 Insulation Insulation shall be installed whenever the water main (sewer main, water or sewer service or force main) passes within 2 feet beneath a storm sewer. The insulation shall extend a minimum of 4 feet beyond the outer walls of the storm sewer.

Insulation shall be on a firm compacted and smooth base. Sand may be used to provide the base. Insulation shall be covered with 12 inches of sand or other suitable granular base prior to any compaction or additional backfill is placed.

The insulation boards shall be placed in a stepped pattern so that joints are not continuous. Each layer shall be placed to cover the joints of the proceeding layer. The upper joint shall be no closer than 6 inches from the lower joint.

502-4 MEASUREMENT AND PAYMENT

502-4.1 Sanitary Sewer Service Pipe Sanitary sewer service pipe shall be measured by the linear foot (LF) basis and paid for at the unit price for "(Size) PVC Sewer Service".

502-4.2 Sanitary Sewer Service Wyes Wyes shall be measured on the individual (each) basis and paid for at the unit price bid for "(Size) x (Size) Sewer Wye". All other fittings shall be considered incidental to the project.

502-4.3 Sewer Service Risers Risers shall be measured by the vertical foot (VF) basis as measured from the center line of the main to the center line of the service and paid for at the unit price bid for "(Size) Sewer Service Riser".

502-4.4 Sewer Service Connections Connections of new sewer service lines to existing service lines shall be measured on an individual (each) basis and paid for at the unit price bid for "(Size) Sewer Service Connection".

502-4.5 Insulation Insulation shall be measured on the square foot (SF) basis and paid for at the unit price bid for "Insulation".

SECTION 503

SPECIFICATIONS FOR STORM SEWERS & CULVERTS

503-1 DESCRIPTION This item shall consist of pipe of the types, classes, sizes, and dimensions required on the plans, furnished and installed at the places designated on the plans and profiles, or by the Engineer, in accordance with these specifications and with the lines and grades given.

The bid price per linear foot of pipe in place, shall include the cost of excavation and backfill, the cost of furnishing and installing all trench bracing, all fittings required to complete the storm sewer pipe or culvert, as shown on the plans, and the material for and the making of all joints, including all connections to existing pipes, manholes and inlets.

503-2 MATERIALS

503-2.1 General The pipe shall be of the type called for on the plans or in the Proposal and shall be in accordance with the following appropriate requirements.

503-2.2 Concrete Pipe Concrete pipe, when specified, standard nonreinforced, shall conform to the requirements of A.S.T.M. C-14. Concrete pipe, reinforced, shall conform to the requirements of A.S.T.M. C-76.

503-2.3 Polyvinyl Chloride Pipe Polyvinyl Chloride Pipe, when specified, shall conform to the requirements of A.S.T.M. D-3034 for Type PSM, PVC Sewer Pipe and Fittings and shall have an SDR of 35. PVC pipe shall have the elastomeric gasket type joint providing a watertight seal. A solvent cement type joint will not be allowed.

503-2.4 Corrugated Steel Pipe Metallic, zinc, or aluminum coated corrugated steel pipe shall conform to the requirements A.A.S.H.T.0. M-196.

503-2.5 Rubber Gasket Joints Rubber type gaskets for concrete nonpressure pipe shall conform to the requirements of A.S.T.M. C-443.

503-2.6 Mortar Mortar for connections to manholes and sewers shall be composed of one part, by volume, of Portland Cement and two parts of mortar sand.

503-2.7 O-Ring Rubber Gasket Joint for PVC Sewer Pipe O-Ring rubber gaskets for PVC sewer pipe joints shall be of the elastomeric type providing a watertight seal.

503-2.8 Sewer Connections Connections to pipes of differing materials shall be made with polyvinyl chloride couplings equipped with stainless steel straps as manufactured by FERNCO or approved equal.

503-2.9 Insulation Insulation shall consist of a double 2 inch layer (4 inches total) of extruded polystyrene insulation meeting the requirements of AASHTO M-230.

503-3 CONSTRUCTION REQUIREMENTS

503-3.1 Equipment All equipment necessary and required for the proper construction of storm sewers and culverts shall be on the project, in first class working condition and approved by the Engineer before construction is permitted to start.

The Contractor shall provide appropriate hoisting equipment to handle the pipe while unloading and placing it in its final position without damage to the pipe.

The Contractor shall provide hand tampers and pneumatic tampers to obtain the required compaction of the pipe bed and the backfill, as specified.

503-3.2 Connections to Existing Sewers and Culverts The Contractor shall connect the new sewer to an existing sewer of differing material by means of a FERNCO Coupling.

Where FERNCO Couplings are not practical, the Contractor shall remove the existing pipe to its nearest joint. This type of joint shall be sealed with gaskets, Oakum packing or similar material to produce a watertight joint.

503-3.3 Connections to Existing Manholes The Contractor shall carefully and in a workmanlike manner cut and remove the concrete or brick manhole to produce a hole no larger than necessary to accommodate the new pipe.

This manhole pipe joint shall be firmly grouted shut to produce a watertight joint.

The Contractor shall repair any damage to the existing manhole caused by the connection of the new storm sewer pipe.

It will generally be necessary to remove and reconstruct the manhole's concrete shelves and inverts to accommodate the new storm sewer. Reconstruction of the shelves and inverts shall be with concrete mortar. The Contractor shall remove all construction debris from the manhole and prevent any debris from entering the existing storm sewer system.

503-3.4 Handling Pipe and Accessories Pipe, fittings, manholes and other accessories shall, unless otherwise directed, be unloaded at the point of delivery, hauled to and distributed at the site of the project by the contractor. They shall at all times be handled with care to avoid damage. In loading and unloading, they shall be lifted by hoists or slid or rolled on skidways in such a manner as to avoid shock. Under no circumstances shall they be dropped. Pipe handled on skidways must not be skidded or rolled against

pipe already on the ground. In distributing the material at the site of work, each piece shall be unloaded opposite or near the place where it is to be laid in the trench. Pipe shall be placed on the site of the work parallel with the trench alignment and with bell ends facing the direction in which the work will proceed unless otherwise directed. The interior of all pipe, fittings and other accessories shall be kept free from dirt and foreign matter at all times.

503-3.5 Insulation Insulation shall be installed whenever a storm sewer passes within 2 feet of a water or sewer main, water or sewer service or a force main. Insulation shall extend a minimum of 4 feet beyond the outer walls of the storm sewer.

Insulation shall be on a firm compacted and smooth base. Sand may be used to provide the base. Insulation shall be covered with 12 inches of sand or other suitable granular base prior to any compaction or additional backfill is placed.

The insulation boards shall be placed in a stepped pattern so that joints are not continuous. Each layer shall be placed to cover the joints of the proceeding layer. The upper joint shall be no closer than 6 inches from the lower joint.

503-4 MEASUREMENT AND PAYMENT

503-4.1 PVC Storm Sewer PVC storm sewer shall be measured by the linear foot (LF) basis from centerline of manhole to centerline of manhole and by depth of cut in 3 foot increments measured from the existing surface grade to the sewer invert as determined by field surveys conducted by the Engineer and paid for at the unit price bid for "(Size) Inch PVC Storm Sewer (Depth of Cut to Depth of Cut) complete in place and accepted by the Engineer.

503-4.2 Concrete Storm Sewer Concrete storm sewer shall be measured by the Linear Foot (LF) basis from centerline of manhole to centerline of manhole and by depth of cut in 3 foot increments measured from the existing surface grade to the sewer invert as determined by field surveys conducted by the Engineer and paid for at the unit price bid for "(Size) Inch Concrete Storm Sewer (Depth of Cut to Depth of Cut) complete, in place and accepted by the Engineer.

503-4.3 Connections to Existing Storm Sewer Connections to existing storm sewers shall be measured on an individual (EA) basis and paid for at the unit price bid for "(Size) Connection" complete in place and accepted by the Engineer.

503-4.4 Connections to Existing Manholes or Inlets Connections to existing manholes or inlets shall be measured on an individual (EA) basis and paid for at the unit price bid for "(Size) (Type) Sewer Connection to (Type) Manhole (or Inlet)" complete in place and accepted by the Engineer.

503-4.5 Reinforced Concrete Pipe Culvert Reinforced concrete pipe culverts shall be measured by the linear foot (LF) basis and paid for at the unit price bid for "(Size) Inch of Reinforced Concrete Pipe Culvert" complete in place and accepted by the Engineer.

503-4.6 Corrugated Steel Culvert Corrugated steel culvert shall be measured by the linear foot (LF) basis and paid for at the unit price bid for "(Size) Inch Corrugated Steel Pipe Culvert" complete in place and accepted by the Engineer.

503-4.7 Reinforced Concrete Pipe End Sections Reinforced concrete pipe end sections shall be measured on an individual (EA) basis and paid for at the unit price bid for "(Size) Inch Reinforced Concrete Pipe End Sections" complete in place and accepted by the Engineer.

503-4.8 Corrugated Steel Pipe End Sections Corrugated steel pipe end sections shall be measured on an individual (EA) basis and paid for at the unit price bid for "(Size) Inch Corrugated Steel Pipe End Sections" complete in place and accepted by the Engineer.

503-4.9 Insulation Insulation shall be measured on the square foot (SF) basis and paid for at the unit price bid for "Insulation".

SECTION 504

SPECIFICATIONS FOR MANHOLES AND INLETS

504-1 DESCRIPTION This item shall consist of manholes and inlets, in accordance with these specifications, at the specified locations and conforming to the lines, grades, and dimensions shown on the plans or required by the Engineer.

504-2 MATERIALS

504-2.1 Mortar Mortar shall be a compound of one part Portland Cement to two parts of sand by volume to which lime may be added not to exceed 10% of the cement by weight.

504-2.2 Precast Reinforced Concrete Pipe Manholes Precast reinforced concrete manhole risers and top sections inlets and catch basin shall conform to A.S.T.M. C478, Wall B. The dimensions of the manholes shall be as shown on the Standard Details of Plans. Snap-in boots or cast-in place gaskets may be provided in lieu of knockouts. Unless otherwise called for, manhole top sections shall be eccentric.

504-2.3 Manhole Steps Manhole steps shall be cast iron or steel reinforced polyurethane. Cast iron steps shall be Clow F-3650, Vestal Model No. 920-V or approved equal. Steel reinforced polyurethane steps shall be certified to exceed OSHA standards and shall be subject to approval by the Engineer. If, during construction, the polyurethane is damaged to expose the reinforcing steel, the entire step shall be replaced at the Contractor's expense.

504-2.4 Manhole Castings and Covers Manhole frames shall be equal to Neenah Foundry No. R1733. All horizontal bearing surfaces shall be machined.

Manhole covers shall be equal to Neenah Foundry Type 'C' lids with two open pick holes.

504-2.5 Frost Proof Manhole Castings and Covers Frost proof manhole frames shall be equal to Neenah Foundry No. R1758-F. All horizontal bearing surfaces shall be machined.

Frost proof covers shall be equal to Neenah Foundry Type 'C' lid with two concealed pick holes.

The dust pan shall be filled with blanket insulation for a frost proof installation.

504-2.6 Inlet Castings and Grates Inlet castings and grates shall be as follows:

A. Type I inlets shall be Neenah Foundry R-3030 or East Jordan Iron Works 7010. Type I inlets shall be provided with diagonal grates.

B. Type II inlets shall be Neenah Foundry R-3030 or East Jordan Iron Works 7030. Type II Inlets shall be provided with diagonal grates.

504-2.7 Precast Reinforced Concrete Bases Precast reinforced bases shall conform to the requirements of ASTM C478. Bases may be integrally cast with the bottom section of the riser.

504-2.8 Precast Reinforced Concrete Covers Precast reinforced concrete covers shall conform to the requirements of ASTM C478. Covers shall be designed to withstand AASHTO HS-20 highway loads. Covers will be cast to provide an access hole providing a minimum of 24 inch clear opening. Where necessary, the access hole shall be offset to provide direct access to the manhole steps.

504-2.9 Joint Seal Precast manhole joints shall be sealed with material equal to Kent Seal # 2.

504-3 CONSTRUCTION REQUIREMENTS

504-3.1 Excavation Excavation for catch basins, manholes, inlets and pipe junctions shall be done in a manner to provide adequate room for the construction of the item according to details shown on the plans. When necessary the excavation shall be adequately shored or sheeted to insure safe and satisfactory construction and backfilling. The bottom of the excavation shall be leveled, prepared, and compacted in such a manner as to provide a firm foundation for the base.

504-3.2 Precast Reinforced Concrete Pipe Manholes and Inlets Unless otherwise specified, standard reinforced concrete sewer pipe shall be used for this purpose. When this type of construction is used, the bottom precast section shall be set in a full mortar bed and the joints between sections and around pipes shall be filled with mortar.

504-3.3 Concrete Base The bottoms of all manholes and inlets shall be of concrete. The thickness and other dimensions of the base shall be as specified on the plans. The invert channel shall be the true shape of the lower half of the pipe or sewer. Pipe placed in concrete for inlet or outlet connections shall extend through the walls a sufficient distance to allow for connections and the concrete shall be carefully constructed around them so as to prevent leakage along their outer surface. The inside ends shall be flush with the inside walls, and the pipe shall be of the same size and kinds as those with which they connect on the outside.

504-3.4 Placing Castings Castings shall be set in full mortar beds. Castings shall be set accurately to correct elevation so that no subsequent adjustment will be needed. The maximum distance from the top of the precast reinforced concrete pipe manhole to the top of the casting shall be 12 feet. Building up shall be done with precast manhole rings.

504-3.5 Backfill Backfill shall be deposited in horizontal layers not over 12 inches in depth (loose) and each layer compacted, this process being repeated to the elevation of the finished grade as designated on the plans. Compaction shall be secured by watering each layer if dry (the water content of the material used shall not exceed the optimum moisture content) and tamping with approved mechanical rammers. The backfill shall be compacted to a density equal to the requirements specified for the pipe trench common to the manhole, catch basin, or inlet.

504-3.6 Cleaning All manholes, catch basins, or inlets shall be thoroughly cleaned of any accumulations of silt, debris, or foreign matter of any kind, and shall be free from such accumulations at the time of the final inspection.

504-4 MEASUREMENT AND PAYMENT

504-4.1 Concrete Manhole Precast concrete manholes shall be measured on the Vertical Foot (VF) basis as determined by the difference between the rim elevation and invert elevation and paid for at the unit price bid for "(Diameter) Concrete Manhole" complete in place and accepted by the Engineer.

504-4.2 Concrete Drop Manhole The manhole structure shall be paid for as specified in Section 504-4.1

The drop structure shall be measured on the Vertical Foot (VF) basis as determined by the difference between the dropped sewer invert elevation and the manhole invert elevation and paid for at the unit price bid for "(Size) Drop Structure" complete in place and accepted by the Engineer.

504-4.3 Manhole Bases Precast concrete manhole bases shall be measured on the individual (EA) basis and paid for at the unit price bid for "(Diameter) Manhole Base" complete in place and accepted by the Engineer. This item is to include the construction of the concrete invert and shelves.

504-4.4 Manhole Covers Precast concrete manhole covers shall be measured on the individual (EA) basis and paid for at the unit price bid for "(Diameter) Concrete Manhole Cover" complete in place and accepted by the Engineer.

504-4.5 Manhole Castings and Covers Manhole castings and covers shall be measured on the individual (EA) basis and paid for at the unit price bid for "Manhole Casting and Cover" complete in place and accepted by the Engineer. This item is to include adjusting the castings to grade.

504-4.6 Inlet and Catch Basin Barrels Precast concrete inlet and catch basin barrels shall be measured on the Vertical Foot (VF) basis as determined by the

difference between the flow line elevation and invert elevation and paid for at the unit price bid for "(Size) (Type) Inlet (or Catch Basin)" complete in place and accepted by the Engineer.

504-4.7 Inlet and Catch Basin Bases Precast concrete inlet and catch basin bases shall be measured on an individual (EA) basis and paid for at the unit price bid for "(Size) (Type) Inlet (or Catch Basin) Base" complete in place and accepted by the Engineer. This item is to include the construction of the concrete shelves and inverts.

504-4.8 Inlet Covers Precast concrete inlet covers shall be measured on an individual (EA) basis and paid for at the unit price bid for "(Type) Inlet Cover" complete in place and accepted by the Engineer.

504-4.9 Inlet and Catch Basin Castings and Grates Inlet and catch basin castings and grates shall be measured on an individual (EA) basis and paid for at the unit price bid for "(Type) Casting and Grate" complete in place and accepted by the Engineer. This item is to include adjusting the castings to grade.

SECTION 505

SPECIFICATIONS FOR FORCE MAIN CONSTRUCTION

505-1 DESCRIPTION This item shall consist of pipe of the types, classes, sizes, and dimensions required on the plans, furnished and installed at the places designated on the plans and profiles, or by the Engineer, in accordance with these specifications and with the lines and grades given.

The bid price per linear foot of pipe in place, shall include the cost of excavation and backfill, the cost of furnishing and installing all trench bracing, concrete bases and concrete thrust blocking, and the material for the making of all joints, including all connections to existing force mains.

505-2 MATERIALS

505-2.1 General The pipe shall be of the type called for on the plans or in the Proposal and shall be in accordance with the following appropriate requirements.

505-2.2 Polyvinyl Chloride Pipe Polyvinyl Chloride Pipe, when specified, shall meet the requirements of Class 200 IPS, SDR-21 pressure rate pipe. The pipe material shall be of quality conforming to requirements of ASTMD-2241 in accordance with ASTMD-1784 and the requirements of NSF Standards 14 and 16.

505-2.3 High Density Polyethylene Pipe High density polyethylene pipe shall be a PE3408 High Density, High Extra Molecular Weight Polyethylene Pipe conforming to the requirements of ASTM D3350 having a cell classification of PE345434C. Dimensions and workmanship shall conform to the requirements of ASTM F714.

HDPE Pipe shall have a minimum of 160 PSI pressure rating and SDR ratio of 7.

Unless otherwise specified, HDPE pipe joints shall be butt fused.

505-2.4 Ductile Iron Fittings Fittings shall be Class 250 fittings conforming to AWWA C110. Joints shall be mechanical joint or push on joint conforming to AWWA C111. Fittings shall be epoxy coated in accordance with AWWA C550 and/or AWWA C213. Mechanical joint bolts and nuts shall be stainless steel. Fittings shall be wrapped with polyethylene in accordance with AWWA C105.

Unless otherwise specified, PVC fittings will not be accepted.

505-2.5 HDPE Flanged Coupling Adapters HDPE flanged coupling adapters shall consist of the following: HDPE molded flange connector meeting the HDPE

pipe material specifications, Style "FCA 501" Flanged Coupling Adapter as manufactured by ROMAC or approved equal, complete with stainless steel nuts and bolts, and Ductile iron backup ring.

The flanged coupling adapter shall be wrapped in a polyethylene jacket.

505-2.6 Gate Valves Gate valves shall be resilient seat gate valves with nonrising stems with the design, construction and materials conforming to the latest standards of AWWA C509. Gate valves shall be waterous or Mueller or approved equal.

Gate valves shall have doubles "0" ring stem seals and 2 inch square operating nuts for key operation. All valves shall open counterclockwise.

Gate valves shall be furnished with push on or mechanical joints. Mechanical joint bolts and nuts shall be stainless steel.

505-2.7 Valve Boxes The valve boxes furnished shall be of a quality equal to Mueller Company No. H-10357 with a No. 6 round base, center section 60 inches long, top section 25.5 inches long with unmarked covers. Extension pieces shall be of a quality equal to Mueller No. H-10363.

All valve boxes shall be capable of a minimum 6 inch top adjustment in either direction, up or down, to or from, the finished curb grades shown on the plans.

If any valve box extension pieces are required to make the above mentioned adjustment, they shall be considered incidental to the price bid for either Butterfly Valve and Box and/or Gate Valve and Box.

505-2.8 Air Release Valves The air release valves shall be equal to CRISPIN SL-20 air release valves with a 1/4 inch release orifice. The Valve shall be complete with all fittings required to connect it to the force main and supports necessary to support the valve's weight.

505-2.9 Air and Vacuum Release Valves The air and vacuum release valve shall be equal to CRISPIN SL-20A1. The valve shall be complete with all fittings required to connect it to the force main and supports necessary to support the valve's weight.

505-2.10 Insulation Insulation shall consist of a double 2 inch layer (4 inches total) of extruded polystyrene insulation meeting the requirements of AASHTO M-230.

505-3 CONSTRUCTION REQUIREMENTS

Water and Sewer work must be completed by Contractors holding a valid Sewer and Water Excavators License issued by the North Dakota State Plumbing Board. Contractors shall submit copies of their Sewer and Water Excavators License with the Construction Agreement.

Excavations within City street and alley rights of way must be completed by Contractors who have posted a $10,000 Excavation Performance Bond with the City which warrantees their work for a period of two years. Details regarding the Excavation Performance Bond requirements may be obtained from the City Auditor's Office.

505-3.1 Equipment All equipment necessary and required for the proper construction of water mains shall be on the project, in first class working condition and approved by the Engineer before construction is permitted to start.

The Contractor shall provide appropriate hoisting equipment to handle the pipe while unloading and placing it in its final position without damage to the pipe.

The Contractor shall provide hand tampers and pneumatic tampers to obtain the required compaction of the pipe bed and the backfill, as specified.

505-3.2 Tests The test section shall be filled with water and subjected to examination. After the examination, the pressure shall be gradually increased. If defects are found, the Contractor shall immediately make the necessary repairs at his own expense. The final pressure test shall be 150 PSI and shall be held at least 1 hour. The Contractor shall furnish all tools, equipment and material necessary to make the pressure test.

505-3.3 Handling Pipe and Accessories Pipe, fittings, valves, hydrants and other accessories shall, unless otherwise directed, be unloaded at the point of delivery, hauled to and distributed at the site of the project by the contractor. They shall at all times be handled with care to avoid damage. In loading and unloading, they shall be lifted by hoists or slid or rolled on skidways in such a manner as to avoid shock. Under no circumstances shall they be dropped. Pipe handled on skidways must not be skidded or rolled against pipe already on the ground. In distributing the material at the site of work, each piece shall be unloaded opposite or near the place where it is to be laid in the trench. Pipe shall be handled in such a manner that a minimum of damage to the coating will result. Damaged coating shall be repaired in a manner satisfactory to the engineer. Pipe shall be placed on the site of the work parallel with the trench alignment and with bell ends facing the direction in which the work will proceed unless otherwise directed. The interior of all pipe, fittings and other accessories shall be kept free from dirt and foreign matter at all times. Valves and hydrants before installation shall be drained and stored in a manner that will protect them from damage by freezing.

505-3.4 Blocking Fittings All fittings, tees, and bends 22-1/2° and more shall be provided with suitable reaction blocking of concrete blocks of adequate size to prevent movement of fittings when the pipe is under pressure. The blocks shall be placed in a manner acceptable to the Engineer and shall allow pipe and fitting joints to be accessible for repair. The concrete blocks may be poured in place if sufficient time is allowed for curing.

505-3.5 Anchor for Valves Wherever a slip on type joint force main is used, all gate valves shall be anchored and tied down with steel and concrete. The anchors and tie downs shall be placed in a manner and of a size according to the manufacturer's recommendations. The size, location and procedure shall be acceptable to the Engineer. The concrete shall be six bag concrete, poured in place with sufficient time allowed for curing. The concrete, steel and labor for anchoring purpose shall be considered incidental to the Price Bid for water main pipe.

505-3.6 Marking Valve Box Locations The Contractor will be required to furnish and install a steel fence post by each valve box. Steel fence posts to be used for valve locations shall be a "Tee" or "U" post having a minimum length of 5-1/2 feet. The post shall be located 2 feet from the valve box in a direction toward the street.

The cost of the steel fence post and the installations shall be considered incidental to other bid items.

505-3.7 Insulation Insulation shall be installed whenever the water main (sewer main, water or sewer service or force main) passes within 2 feet beneath a storm sewer. The insulation shall extend a minimum of 4 feet beyond the outer walls of the storm sewer.

Insulation shall be on a firm compacted and smooth base. Sand may be used to provide the base. Insulation shall be covered with 12 inches of sand or other suitable granular base prior to any compaction or additional backfill is placed.

The insulation boards shall be placed in a stepped pattern so that joints are not continuous. Each layer shall be placed to cover the joints of the proceeding layer. The upper joint shall be no closer than 6 inches from the lower joint.

505-4 MEASUREMENT AND PAYMENT

505-4.1 Force Main Force Main shall be measured by the linear foot (LF) through fittings and from centerline of pipe to centerline of pipe and shall be paid for at the Unit Price Bid for "(Size) Inch (Material) Force Main", complete in place and accepted by the Engineer.

505-4.2 Gate Valve and Box Gate Valves and Boxes shall be measured on an individual unit basis (EA) and shall be paid for at the Unit Price Bid for "(Size) Inch Gate Valve and Box", complete in place and accepted by the Engineer.

505-4.3 Ductile Iron Fittings. Ductile Iron Fittings shall be measured on an individual basis (EA) and paid for at the Unit Price Bid for "(Size, Type) Ductile Iron Fittings", complete in place and accepted by the Engineer.

505-4.4 HDPE Flange Adapter Couplings HDPE Flange adaptor couplings shall be measured on an individual basis (EA) and paid for at the Unit Price bid for "(Size,Type) Force Main Connection", complete in place and accepted by the Engineer.

505-4.5 Insulation Insulation shall be measured on the square foot (SF) basis and paid for at the unit price bid for "Insulation".

SECTION 508

SPECIFICATIONS FOR CASTINGS AND ADJUSTMENT

508-1 GENERAL Existing manholes, inlets and valve boxes shall be adjusted to the elevation, grade or dimensions as indicated on the plans or as ordered by the Engineer. Castings shall be carefully removed and reinstalled by the Contractor as indicated. If the height of a rectangular casting is to be increased, the addition may be of brick, solid concrete block or concrete. Brick or solid concrete block shall not be used to increase the height of circular casting. In the event that the top part of the existing structure is weak and faulty, it shall be replaced as directed by the Engineer and the extension completed. Where the casting, grating, or cover is to be lowered, the masonry or concrete shall be removed to sufficient depth so that a seat of proper dimensions may be reconstructed to receive the casting, grating, or cover at the new grade.

Upon completion of the adjustment, all surplus material shall be removed and the structure and the site of the work shall be left in a neat and clean condition. The entire structure shall be thoroughly cleaned of any accumulation of silt, debris, or foreign matter of any kind and shall be free from such accumulations at the time of final inspection.

508-2 WATER STOP BOX EXTENSION Water service stop boxes are found within the area of construction very frequently. Adjustments in elevation that can be accomplished with the range of the adjustment sleeve of the stop box shall be considered incidental to the contract bid items. The Contractor is required to use due care in making these adjustments.

If the stop box cannot be extended to the proper grade within the above limits, it shall be adjusted by removing the lid and adding the required length and diameter of standard weight pipe with a standard pipe coupling and replacing the lid. The maximum adjustment shall be 2 feet. Adjustments over 2 feet will be paid for under a separate item as approved by the Engineer.

508-3 MEASUREMENT AND PAYMENT

508-3.1 Adjust Manhole Casting This item shall be measured on an individual unit basis (EACH) and paid for at the unit price bid for “Manhole Adjustment” complete as detailed and accepted by the Engineer.

508-3.2 Adjust Valve Box This item shall be measured on an individual unit basis (EACH) and paid for at the unit price bid for “Gate Valve Adjustment” complete ad detailed and accepted by the Engineer.

SECTION 601

PORTLAND CEMENT CONCRETE MATERIALS

601-1 DESCRIPTION This section is intended to provide the specifications for the materials to be used by the Contractor in the construction of work requiring Portland cement concrete.

601-2 SPECIFICATIONS

601-2.1 General When called for on the plans or the special provisions, the Contractor shall, prior to construction, submit for approval to the Engineer a Certified Analysis of the following materials:

Portland Cement	Water
Fly Ash	Admixtures
Coarse Aggregate	Expansion Joint Material
Fine Aggregate	Reinforced Steel

601-2.2 Portland Cement The cement used in the work shall be Air-Entrained Portland Cement, Type 1A, meeting the requirements of A.S.T.M. C175 or Portland Cement, Type 1, meeting the requirements of A.S.T.M C150 with admixtures for producing air-entrainment meeting the requirements of A.S.T.M. C260.

601-2.3 Fly Ash The Fly Ash used in the work shall meet the requirements of A.S.T.M. C-618-84.

601-2.4 Aggregate During the construction period the Contractor shall, at all times, make available to the Engineer sampling of aggregate. All aggregate shall meet the requirements of these specifications.

601-2.5 Coarse Aggregate Except as noted herein, the coarse aggregate used shall conform to the requirements of A.S.T.M. C33. Coarse aggregate shall consist of gravel or broken stone, composed of strong, hard, durable, uncoated pebbles or rock fragments, washed clean, and free from injurious amounts of shale, coal, clay, lumps, soft fragments, dirt, glass, organic or any other deleterious substances.

Coarse aggregate shall be graded from coarse to fine within one of the following limits when tested in conformity with A.S.T.M. C136. Any of these gradations may be used, but once adopted, no change in gradation will be made during the course of the work.

CLASS	3	4	5

Sieve Size	Percent Passing by Weight		
12 inch	100		
1 inch	95-100	100	
3/4 inch		90-100	100
2 inch	25-65		90-100
3/8 inch	15-55	20-55	40-70
No. 4	0-10	0-10	0-15
No. 8	0-5	0-5	0-5
No. 200 Max	1.0	1.0	1.0

601-2.6 Fine Aggregate Except as noted herein, the fine aggregate shall conform to the requirements of A.S.T.M. C-33. Fine aggregate shall be natural sand, washed clean, consisting of hard, strong, sharp uncoated grains, free of dust, lumps, mica, shale, organic matter or other deleterious substances.

Fine aggregate shall be graded within the following limits when tested in conformity with A.S.T.M. C136.

Sieve Size	Percent Passing by Weight
3/8 inch	100
No. 4	95-100
No. 16	45-80
No. 50	10-30
No. 100	0-10
No. 200	0-3

601-2.7 Water Water used in mixing concrete shall be clean and shall not contain deleterious amounts of acids, alkalies, or organic materials. Water shall be subject to test and approval by the Engineer.

601-2.8 Admixtures Substances other than cement, Fly Ash, water, aggregates, and air-entraining agents shall not be used in the concrete except as otherwise required or when permitted in writing by the Engineer. Unless otherwise provided in the Plans or Special Provisions, no reduction will be made in the specified cement and fly ash content of the concrete mixture by reason of using any admixtures. No admixture shall be used which interferes with proper control of the entrained air content of concrete. Permission to use

any admixtures may be withdrawn at any time if the properties of the admixture are not uniform or if satisfactory results are not being obtained.

Should the Contractor request and obtain permission to use admixtures for his own benefit, no additional compensation will be allowed for the cost of furnishing the admixtures and incorporating them into the concrete mixture.

Should the Engineer direct the Contractor to use admixtures when their use is not required by these Specifications or by the Plans or Special Provisions, furnishing the admixtures and incorporating them into the concrete mixture will be considered extra work.

601-2.9 Expansion Joint Material Premolded Bituminous Fiber Expansion Joint Material shall be used in expansion joints and shall consist of preformed strips of one continuous piece per joint which have been formed from cane or other suitable fibers of cellular nature securely bound together and uniformly impregnated with a suitable asphaltic binder.

601-2.10 Hot Applied Joint Sealant Hot applied joint sealant used in the work shall meet the requirements of A.S.T.M. D-3405.

601-2.11 Cold Applied Joint Sealant Cold applied joint sealant used in the work shall consist of a low modulus silicone sealant of one part silicone formulation meeting the following requirements:

Test Method	Limit
A.S.T.M. C-639	0.3 Inch Maximum
A.S.T.M. C-603	75-250 Grams/Minimum
A.S.T.M. C-679	20-75 Minutes
A.S.T.M. D-792, Method A	1.010-1.515
A.S.T.M. D-2240	10-25 (0E F)
A.S.T.M. D-412(DIE C)	45 PSI Maximum 1200% Minimum
A.S.T.M. C-719	No Adhesive or Cohesive Failure after 10 Cycles (0E F)
AASHTO T-132	50 PSI Minimum

The silicone sealant material shall have a movement capability of +100% and -50% of joint width.

Backer rod shall be of a non-absorbing, resilient material compatible with the sealant. No bond of reaction shall occur between the rod and sealant.

601-2.12 Reinforcing Steel Reinforcing steel except as otherwise specified, shall be grade 60 deformed bars rolled from billet stock and shall conform to the requirements of A.S.T.M. A615.

Dowel bars shall be intermediate grade plain bars rolled from billet stock and shall conform to the requirements of A.S.T.M. A663 or A675.

Wire mesh reinforcement shall comply with the requirements of A.S.T.M. A185.

Bar supports and spacers shall be of steel and of suitable design and strength to hold reinforcement accurately in place before and during the placing of concrete. Hy-chairs shall be of welded steel construction and all spacers, bar supports and chairs shall be approved by the Engineer.

The wire shall be No. 16 gauge annealed wire.

601-2.13 Concrete Curing Agent Chemical concrete curing agents shall meet the requirements of A.S.T.M. C309, Type 2 (white pigmented).

601-2.14 Select Backfill Select Backfill shall consist of pit run gravel meeting the following gradation.

Sieve Size	Percent Passing by Weight
1 inch	100
3/4 inch	60-100
1/4 inch	40-80

SECTION 602

PORTLAND CEMENT CONCRETE CONSTRUCTION REQUIREMENTS

602-1 DESCRIPTION The Contractor shall furnish all labor, materials and services necessary for, and incidental to, the completion of all work as shown on the drawings and specified herein. All machinery and equipment owned or controlled by the Contractor, which he proposed to use on the work, shall be of sufficient size to meet the requirements of the work and shall be such as to produce satisfactory work; all work shall be subject to the inspection and approval of the Engineer. The Contractor shall employ, at all times, a sufficient force of workmen of such experience and ability that the work can be prosecuted in a satisfactory and workmanlike manner.

The construction requirements of this section are intended to specify the general construction requirements for all Portland cement concrete construction. Construction requirements for specific work are specified in the following specifications.

602-2 CONSTRUCTION REQUIREMENTS

602-2.1 Materials Storage

(A) Cement Cement shall be stored as specified in A.S.T.M. C150. Storage shall be of such capacity to provide ample space for consignments of cement as may be required to carry on the work.

Cement shall be stored and protected against dampness and contamination. Cement which has become partially set or contains lumps or caked cement shall not be used.

(B) Fly Ash Fly ash shall be stored as specified in A.S.T.M. C618-84. Storage shall be of such capacity to provide ample space for consignments of fly ash as may be required to carry on the work.

Fly ash shall be stored and protected against dampness and contamination. Fly ash which has become partially set or contains lumps or caked cement shall not be used.

(C) Aggregates Aggregates shall be stored in such a manner as to afford good drainage, prevent the intrusion of foreign matter and preserve the gradation. Any material which has deteriorated or which has been damaged shall not be used for concrete.

To avoid changes in consistency, the aggregates shall be obtained from a source which will insure uniform quality and grading during any single day's operation, and they shall be delivered to the work and handled in such a manner that variations in moisture content will not

interfere with the steady production of concrete of uniform quality and consistency.

602-2.2 Standard Mix Design Unless otherwise called for on the plans or special provisions, the concrete mix shall meet the following requirements:

Cement Content	Minimum of 6 sacks per cu yd
Water Content	Maximum of 35 gallons per cu yd
Water Cement Ratio	0.5 Maximum
Air Content	3% - 8%
Coarse to Fine Aggregate Ration	1 to 2
28 Day Compressive Strength Slump	3500 PSI 4" maximum

Fly ash replacement shall be limited to 20% fly ash for 15% cement by weight. If lesser amounts of fly ash are used, the cement replacement ratios shall remain the same.

High Early Strength concrete shall have the cement content increased by 30% (8 sack). Fly ash shall not be used in High Early Strength concrete.

The Contractor shall submit a concrete mix design for the engineer's approval prior to commencing work. Standard mix designs from local ready mix suppliers maybe submitted for approval.

602-2.3 Advance Design of Concrete Mixes When called for on the plans or special provisions, each concrete mix to be used under this contract shall be designed and tested using aggregates which have been approved for this work shall be designed and tested.

Mixes shall be designed in accordance with ACI 613 to attain the required strengths using the various slumps (including the maximum allowable), the various sized aggregates expected to be used in the work and the admixtures as called for by the Engineer. The concrete mixes shall be designed by an independent testing laboratory and paid for by the Owner.

Advance tests of each of the proposed mixes shall be made in accordance with A.S.T.M. C192. Six standard 6 inch diameter compression test cylinders shall be made for each mix design, three shall be tested at 7 days and three at 28 days. Concrete tested shall contain all required and/or proposed admixtures and in addition to the testing required by A.S.T.M. C192 shall be tested for air content by A.S.T.M. C231.
The advance mix designs and the results of tests on cylinders made from advance mix designs is required before work of concrete placing is started.

Tests for aggregates may be made a part of these tests, if suitably referenced on the reports which shall be issued at 7 and 28 days.

The above tests shall be repeated if necessary because of changes in materials, or unsatisfactory results.

602-2.4 Concrete Testing During the progress of the work, and for each different mix of concrete, a set of two standard 6 inch diameter compression test cylinders shall be made in the field and tested for each day's operation where 15 cubic yards of concrete or more are placed. The cylinders, comprising one set, will be made from the same sample of concrete, and one cylinder tested at 7 days and one at 28 days. Unless otherwise called for on the plans or supplemental specifications, the required minimum strength of the concrete shall be 3500 lbs./sq. in. at 28 days.

Slump tests made in accordance with A.S.T.M. C143 shall be made as necessary to maintain desired concrete consistency. Slump tests shall also be made and recorded for each sample of concrete used in making test cylinders. The maximum allowable slump of the concrete mix shall be 4 inches. Air content, in accordance with A.S.T.M. C231 shall also be tested and recorded for each sample of concrete used in making test cylinders. The air content shall fall within the range of 3% to 8%.

If any test cylinder shows a strength at 28 days which fails to meet the specified strength for the class of concrete from which the sample was taken, then the concrete represented by such test cylinder shall be further tested by the Engineer. If such further tests indicate that concrete has been placed which does not meet the compressive strength requirements established by this specification, then the concrete shall be rejected and shall be removed and replaced with new work of the specified strength, all at the expense of the Contractor.

602-2.5 Proportioning Materials Concrete shall be composed of Portland Cement, fly ash, fine aggregate, coarse aggregate, water admixtures as specified. The mix shall be designed in accordance with Section 602-2.2 or 602-2.3 of these specifications.

The amount of water specified shall include the surface moisture carried by the aggregates at the time of mixing. This amount of water shall be determined by tests made by the Contractor and the quantity of mixing water to be added to the batch shall be added to that found to be carried by the aggregates, to total the rate specified. The number of tests required and the consequent changes in the amount of mixing water to be added will depend on the control exercised in the gradation and moisture contents of the aggregate.

The amount of water shall also include that liquid added to the batch in the form of admixtures.

The amounts and proportions of fine and coarse aggregates to be used in each mix shall be such as to produce a plastic, workable mix, free from harshness, which can be readily placed into the corners and angles of the forms and around reinforcement and other embedded work without undue accumulation of water or laitance on the surface, and such that there will be no honeycombing in the structure.

602-2.6 Batching and Mixing Concrete Mixing of concrete shall be done in a rotary batch mixer of a type acceptable to the Engineer. The volume of the mixed material for each batch shall not exceed the manufacturer's rated capacity of the mixer.

The batch materials shall be delivered to the mixer measured accurately to the required proportions and shall be mixed continuously for not less than 12 minutes after all the materials including water are in the mixer, during which time the mixer shall rotate at the speed recommended by its manufacturer. The entire batch shall be discharged before recharging the mixer. The mixer shall be cleaned as required to insure adequate and complete mixing.

In lieu of job site mixing, ready mixed concrete, meeting the requirements specified herein and all applicable requirements of A.S.T.M. C94 may be approved, provided the quantity and rate of delivery of materials will be such as to permit unrestricted progress of the work in accordance with the placing schedule. When air temperatures are above 90E F., the concrete shall be discharged within 1 hour. When air temperatures are below 90E F., a maximum of 12 hours or 300 revolutions of the drum whichever comes first after the introduction of mixing water to the cement and aggregates.

Truck mixers shall be equipped with a means by which the number of revolutions of the drum, blades or paddles may be readily verified.
Two copies of complete data concerning mixing and transportation methods, if required, shall be submitted to the Engineer for approval.

602-2.7 Cold Weather When the temperature is below 40E F., or when there is a probability that such temperature will occur during the 24 hour period after placing, special provisions shall be taken. Except as otherwise specified, mixing, placing, and protection shall be in accordance with the latest edition of the Portland Cement Association manual entitled "Design and Control of Concrete Mixtures". Curing shall be as specified in Section 602-2.13.

Frozen concrete shall be immediately removed upon direction of the Engineer, and replaced with new work at no expense to the Owners.

In order to maintain the temperature specified, the work shall be entirely enclosed with tarpaulins, polyethylene plastic sheets, commercial insulating blanket or bat insulation, and all fuel and suitable heating equipment and the necessary labor and supervision shall be furnished. Unvented heaters shall not be used. Only commercial insulating blanket or bat insulation will be permitted as a covering without addition of heat. Full responsibility for the protection of the work shall be under this section.

During freezing weather, temperature records shall be kept by the Contractor and furnished to the Engineer daily, showing the temperature at four hour intervals of the outside air, of the air in the coldest part of the enclosure near the concrete, of the concrete as it is placed, and of the concrete in place at such points as the Engineer may direct. A 2% or less solution of calcium chloride may be added to the concrete mix.

602-2.8 Hot Weather Concrete materials shall be placed at the lowest practicable temperature except as specified in Section 602-2.7 for cold weather. When hot weather conditions exist that would seriously impair the quality and strength of the concrete, the concrete as it is placed in accordance with the latest edition of the Portland Cement Association Manual entitled "Design and Control of Concrete Mixtures" except as otherwise specified herein. During hot weather conditions, the temperatures of the concrete immediately before it is placed in the forms shall be between 50E F., and 90E F.

Shaved ice may be used in the mixing water to reduce the temperature of the concrete at the mixer, but there shall be no ice in the concrete when it is discharged from the mixer.

Retarder admixes shall not be used to control the setting time of the concrete.

602-2.9 Subgrade Preparation The subgrade shall be excavated or filled to the depth and width that permits the installation and bracing of form work.

All soft and yielding material shall be removed and replaced with acceptable material.

Unless otherwise called for in the plans or special provisions, fill material shall consist of select backfill.

The subgrade shall be shaped and trimmed to the depth necessary and compacted with mechanical tampers to produce a firm and even surface. Hand tamping of the subgrade shall not be permitted.

The rate of subgrade compaction shall be 95% dry density as determined by the Standard Proctor Method.

The subgrade shall be thoroughly moistened immediately prior to placing the concrete.

602-2.10 Forms After the subgrade and base course, if required, have been graded and compacted, the forms shall be set and secured in such a manner as to prevent bulging away from a true line when poured and tamped with concrete, and said forms shall be constructed of wood or steel. If made of wood, they shall not be less than 12 inches and one side planed smooth. The top edge of each form shall be clean and coated with oil or other

approved material before the concrete is placed. Forms shall have a depth not less than the depth of the concrete to be constructed.

Sidewalk, driveway, curb, and curb and gutter forms used on curves shall be capable of installation to within 2 inch of the true curve, and if the radius is less than 400 feet, the forms shall be either flexible material or shaped to fit the curve.

602-2.11 Placing Concrete The subgrade shall be moistened directly ahead of the placing of concrete. The concrete shall be placed on the moist subgrade and spread uniformly to the required depth with as little handling as possible and shall be mechanically vibrated to the forms or header boards to prevent voids and honeycombed surfaces. The concrete shall be consolidated so as to produce a uniformly dense concrete and so as to flush sufficient mortar to the surface to permit a proper finish without additional water added to the surface. Excessive water, laitance or other inert material shall be floated from the surface.

602-2.12 Surface Finish Concrete surfaces shall be wood-floated to be a true and even plane and steel trowled. The surface shall then be lightly roughened by brooming. The broom shall be drawn transversely across the surface. The brooming shall be just sufficient to leave marks. The Contractor shall provide factory made straight edges, 10 feet in length, for use in checking forms and final finish of all surfaces. The maximum allowable deviation from a true plane shall be 3 inch in 10 feet on the top and face of forms and all exposed surfaces of the finished surface.

602-2.13 Protection and Curing All concrete work shall be carefully protected from sun, wind, storms and travel until thoroughly set, and the Contractor will be held responsible and must make good at his own expense any damage from any cause until approved and accepted by the Engineer. As soon as the concrete has hardened sufficiently to prevent damage, the finished surface shall be covered and sprinkled with water and kept wet at least 3 days or a chemical curing agent shall be used and applied in accordance with the manufacturer's specifications.

602-2.14 Concrete Removal Existing concrete shall be removed to the extent and lines authorized by the Engineer.

The concrete shall be removed to an existing control joint or an edge sawn by the Contractor.

Removal of concrete slabs in excess of 8 inch thickness shall be classified as Concrete Pavement Removal.

Removal of concrete slabs reinforced with steel bars at intervals of 18 inches or less shall be classified as Reinforced Concrete Removal.

Curbing and curb and gutter shall be removed to an existing control joint or to an edge sawn by the Contractor.

When a concrete disposal area is not specified or shown on the plans, the Contractor shall provide a disposal area or haul the concrete to the Williston landfill and pay the required disposal fees.

602-2.15 Asphalt Removal Existing asphalt shall be removed to the extent and lines authorized by the Engineer.

Asphalt shall be removed to an edge sawn by the Contractor or cut by a jack hammer or other suitable method producing a reasonably smooth and vertical edge.

When an asphalt disposal area is not specified or shown on the plans, the contractor shall provide a disposal area or haul the asphalt to the Williston landfill and pay the required disposal fees.

602-2.16 Asphalt Replacement Unless called for on the plans or in the special provisions, the Contractor shall replace removed asphalt with cold mix asphalt.

The cold mix shall be compacted by a mechanical tamper.

602-2.17 Asphalt and Concrete Repair When made necessary by the Contractor's actions, asphalt or concrete surfaces have been damaged or removed beyond the extent authorized by the Engineer or called for on the plans, repair or replacement shall be made by the Contractor at the Contractor's expense.

602-2.18 Sawing All concrete or asphalt sawings designated on the plans or required by the Engineer shall be a minimum of 2 inches thick for surfaces to be removed.

Control joints sawn in new concrete shall be a minimum of 13 the slab's depth and shall be sawn within 48 hours of the placement of the concrete.

602-2.19 Select Backfill The material furnished under this item shall be pitrun gravel with 100% passing a 1 inch sieve, 60% to 100% passing a 3/4 inch sieve and 40% to 80% passing a 3 inch sieve and shall be mechanically tamped in place in layers not exceeding 6 inches in depth.

602-2.20 Backfill After the Contractor has removed the form work, the Contractor shall backfill the newly constructed concrete. Backfill shall consist of select backfill or soils approved for backfilling purposes approved by the Engineer. The backfill shall be placed in uniform 6 inch layers and compacted to 95% dry density of the Standard Proctor Method. Backfill shall be brought to the elevations, lines, and grades shown on the plans or as directed by the Engineer.

Sod and topsoil salvaged from the excavation may be used in the top 6 inches of the backfill. Sod and topsoil shall be firmly tamped in place. Any voids in and around the sod shall be filled with topsoil or select backfill.

SECTION 604

PORTLAND CEMENT CONCRETE SIDEWALKS AND DRIVEWAYS

604-1 DESCRIPTION This work shall consist of the construction of Air-Entrained Portland Cement concrete sidewalks and driveways in accordance with these specifications and standard details at the locations and to the lines and grades shown on the plans or as directed by the Engineer. This work shall also include the removal of old sidewalk and driveways, when listed on the proposal, as shown on the plans or as directed by the Engineer.

604-2 MATERIALS Materials shall meet the requirements of Section 601.

604-3 CONSTRUCTION REQUIREMENTS Construction requirements shall conform to Section 602 with the following additional provisions:

604-3.1 Joints Expansion joints and contraction joints shall be placed at the locations and intervals shown on the standard details.

Expansion joints shall be placed between all new and existing concrete surfaces, between sidewalks and driveways, between new concrete sidewalks or driveways and adjacent buildings, curbs or curb and gutter.

The expansion joint material shall be at least 2 inch thick and extend to the full depth of the concrete.

604-3.2 Excavation Excavations required to install sidewalks or driveways whose depth exceeds the depth of the concrete plus 6 inches shall be considered extra work.

Excess excavation shall be disposed of by the Contractor.

604-3.3 Fill Fill shall consist of select backfill or soil materials approved by the Engineer.

Fill in excess of 6 inch depth shall be considered extra work.

604-3.4 Aggregate Base In areas where frost heaving is known to occur, the Contractor shall, at the direction of the Engineer, subcut and replace the unsuitable soil with select backfill as approved by the Engineer.

The select backfill shall be installed in 6 inch compacted lifts.

604-3.5 Curb Stops and Other Appurtenances The Contractor shall notify the Engineer 48 hours in advance of any work at any individual site in order that any curb stop can be located and checked for adequate operation. If any curb stop is found to be inoperable, the City shall replace it prior to placing

any concrete. This may result in minor delays of the Contractor's operation. No claims for extra work or extra costs resulting from this type of delay will be recognized by the Owner.

The Contractor shall box out all curb stops, gate valves, street light poles, utility poles, street signs and other such appurtenances in a manner acceptable to the Engineer. These box outs shall be considered incidental to the project.

604-4 MEASUREMENT AND PAYMENT

604-4.1 Concrete Sidewalks Concrete sidewalks shall be measured on the square foot (SF) basis and paid for at the unit price bid for "(Depth) Concrete Sidewalk".

604-4.2 Concrete Driveways Concrete driveways shall be measured on the square foot (SF) basis and paid for at the unit price bid for "(Depth) Concrete Driveway".

604-4.3 Expansion Joint Expansion joints shall be measured on the linear foot (LF) basis and paid for at the unit price bid for "(Depth) Expansion Joint".

604-4.4 Concrete Removal Removal of concrete slabs less than 8 inches thick shall be measured on the square foot (SF) basis and paid for at the unit price bid for "Concrete Removal".

604-4.5 Concrete Pavement Removal Removal of Concrete slabs 8 inches or more thick shall be measured on the square foot (SF) basis and paid for at the unit price bid for "Concrete Pavement Removal".

604-4.6 Reinforced Concrete Removal Removal of reinforced concrete slabs shall be measured on the square foot (SF) basis and paid for at the unit price bid for "Reinforced Concrete Removal".

604-4.7 Asphalt Removal Asphalt removal shall be measured on the square foot (SF) basis and paid for at the unit price bid for "Asphalt Removal".

604-4.8 Asphalt Replacement Asphalt replacement shall be measured on the square foot (SF) basis and paid for at the unit price bid for "Asphalt Replacement".

604-4.9 Saw Cutting Asphalt and concrete saw cutting shall be measured on the linear foot (LF) basis and paid for at the unit price bid for "Saw Cut".

Unless called for on the plans or in the special provisions, the saw cutting of crack control joints shall be considered incidental to the project.

604-4.10 Aggregate Base The aggregate base including subcut excavation shall be measured by the square foot (SF) basis and paid for at the unit price bid for "6 inch Aggregate Base".

When deeper aggregate bases are required, the Contractor shall be paid in multiples of the unit price bid for "6 inch Aggregate Base". (A 12 inch base would be paid at twice the unit bid price; an 18 inch base at three times the unit bid price, etc.)

604-4.11 Reinforcing Steel Reinforcing steel shall be measured on the linear foot (LF) of 2 inch diameter deformed reinforcing bar and paid for at the unit price bid for "Reinforcing Steel".

SECTION 605

PORTLAND CEMENT CONCRETE CURB AND CURB & GUTTER

605-1 DESCRIPTION This work shall consist of the construction of Air-Entrained Portland cement concrete curb and curb & gutter in accordance with these specifications and standard details at the locations and to the lines and grades shown on the plans or as directed by the Engineer.

This work shall also include the removal of old curbing and curb and gutter when listed on the proposal, as shown on the plans or as directed by the Engineer.

605-2 MATERIALS Materials shall meet the requirements of Section 601.

605-3 CLASSIFICATION

605-3.1 Standard Curb The curb constructed under the designation shall be unreinforced or reinforced concrete construction as shown on the standard details. All curbing constructed on a straight line or on a curve shall be considered as standard curb.

605-3.2 Standard Curb and Gutter The work to be completed under this item shall be unreinforced or reinforced concrete construction as shown on the Standard Details as a combined curb and gutter section. All curb and gutter constructed on a straight line or on a curve shall be considered as standard curb and gutter.

605-3.3 Curb and Gutter (Variable Curb) The work to be completed under this item shall be one course reinforced or unreinforced concrete construction as shown in the Standard Details as a combined curb and gutter section with a curb height of greater or less than the standard 6 inch height. All curb and gutter constructed on a straight line or on a curve under this item shall be classified as standard curb and gutter.

605-4 CONSTRUCTION REQUIREMENTS Construction requirements shall conform to Section 602 with the following additional provisions:

605-4.1 Joints Expansion joints and contraction joints shall be placed at the locations and intervals shown on the standard details.

Expansion joints shall be placed between all curbs or curb & gutter, and adjacent sidewalks or driveways.

The expansion joint material shall be of one piece, cut and trimmed to fit the shape of the curb or curb & gutter.

605-4.2 Forms On small radius curves such as driveways and street intersections, the Contractor may use masonite or equal, metal or 2 inch dimension lumber.

605-4.3 Dowels All dowels, as detailed shall be considered incidental to each item of curb or curb & gutter construction. Where future construction will add to the construction in progress, dowels shall be placed in the last slab to maintain a tie for future construction.

605-4.4 Surface Finish The final surface finish shall be obtained by uniformly brushing the surface. No plastering will be permitted.

605-4.5 Curb & Gutter Extrusion Machine This type of machine shall be capable of producing concrete curb or curb & gutter to conform to the requirements of this section and line, grade, shape and dimensions given in the plans and specifications or approved by the Engineer, using materials conforming to the specifications.

The Contractor shall provide the Engineer with the following information prior to being given permission to produce a test section with the machine:

1. Complete machine specifications regarding the machine and its performance.

2. Details of the proposed section of curb or curb & gutter to be produced by the machine.

3. Provide evidence of having previous experience of operating and maintaining the proposed machine.

If the above items are found to be satisfactory to the Engineer, written permission will be given to the Contractor to provide a 100 foot test section in place with the proposed machine.

If the test section and the performance of the extrusion machine proves to be satisfactory, the Engineer shall then issue final written approval to the Contractor. If during the course of construction on the project, said manufacture and said performance becomes unsatisfactory, the Engineer shall disallow the continued use of said machine.

605-5 MEASUREMENT AND PAYMENT

605-5.1 Standard Curb Standard Curb shall be measured by the linear foot (LF) and paid for at the unit price bid for "Standard Curb" complete in place and accepted by the Engineer.

605-5.2 Standard Curb and Gutter Standard Curb and Gutter shall be measured by the linear foot (LF) and paid for at the unit price bid for "Standard Curb and Gutter" complete in place and accepted by the Engineer.

605-5.3 Reinforcing Steel Reinforcing Steel shall be measured by the linear foot (LF) of 2 inch diameter deformed reinforcing bar and paid for at the unit price bid for "Reinforcing Steel" complete in place and accepted by the Engineer.

605-5.4 Curb and Gutter Removal Curb or curb and gutter removed shall be measured by the linear foot (LF) and paid for at the unit price bid for "Curb and Gutter Removal" complete in place and approved by the Engineer.

605-5.5 Expansion Joint Expansion joints shall be measured on the linear foot (LF) basis and paid for at the unit price bid for "(Depth) Expansion Joint".

SECTION 606

PORTLAND CEMENT CONCRETE VALLEY GUTTERS

606-1 DESCRIPTION This work shall consist of the construction of Air-Entrained Portland Cement Concrete Valley Gutters in accordance with these specifications and standard details at the locations and to the lines and grades shown on the plans or as directed by the Engineer. This work shall also include the removal of old valley gutters when listed on the Proposal, as shown on the Plans, or as directed by the Engineer.

606-2 MATERIALS Materials shall meet the requirements of Section 601.

606-3 CONSTRUCTION REQUIREMENTS Construction requirements shall conform to Section 602 with the following additional provisions:

606-3.1 Valley Gutter Removal All concrete valley gutter removed shall be disposed of in accordance with Section 602.

603-3.2 Joints Expansion joints shall be placed in valley gutters at intervals as shown on the Standard Details. Expansion joints shall be placed between the valley gutters and any abutting curb, pavement, driveway, or other structure, and shall entirely separate the valley gutter from the abutting structure. The expansion joint material shall have a thickness of not less than ½ inch. Expansion joint shall be considered incidental to the work.

606-3.3 Order of Construction Valley gutters shall be constructed before adjacent paving is started. Valley gutters shall be allowed to cure for 72 hours prior to any adjacent construction being done.

606-4 MEASUREMENT AND PAYMENT

606-4.1 Valley Gutter Concrete valley gutter shall be measured by the square foot (SF) and paid for at the unit price bid for "(Depth) Valley Gutter" complete in place and accepted by the Engineer.

606-4.2 Valley Gutter Removal Valley gutter removed and disposed of shall be measured by the square foot (SF) and paid for at the unit price bid for "Valley Gutter Removal".

606-4.3 Reinforcing Steel Reinforcing steel shall be measured on the linear foot (LF) basis of ½ inch diameter deformed reinforcing bar and paid for at the unit price bid for "Reinforcing Steel".

SECTION 701

HOT BITUMINOUS ASPHALT

701-1 DESCRIPTION This item shall consist of a hot plant mix seal and hot bituminous asphalt composed of mineral aggregate and bituminous material, mixed in a central mixing plant and placed on a prepared base in accordance with these specifications and in conformity with the dimensions and typical cross sections shown on the plans and with lines and grades established by the Engineer.

Leveling, base or surface courses shall be constructed as shown on the plans in lifts not to exceed three inches in thickness.

701-2 MATERIALS

701-2.1 Aggregate The aggregate shall consist of crushed stone, crushed gravel, gravel, sand gravel, sand or other natural granular, and approved material which has essentially the same qualities and meets all requirements when combined within the limits for gradation.

The aggregate shall be tough, durable and sound and shall consist of angular fragments reasonably uniform in density and quality. The aggregate shall be free of dirt and other objectionable matter and shall not contain more than 8% of thin and elongated pieces nor more than 5% of soft pieces.

The coarse aggregate (retained on the No. 8 sieve) shall not show more than 50% wear when tested in accordance with A.S.T.M. C131. The coarse aggregate shall not show evidence of disintegration nor show a total loss greater than 12% when subjected to five cycles of the sodium sulphate accelerated soundness test as specified in A.S.T.M. C83.

The fine aggregate (passing the No. 8 sieve), including any blended filler, shall have a plasticity index of not more than 6 as determined by A.S.T.M. D424 and a liquid limit of not more than 25 as determined by A.S.T.M. D423.

701-2.2 Filler If filler, in addition to that naturally present in the aggregate, is necessary, it shall consist of stone dust, loess, Portland cement, hydrated lime, or other approved mineral matter. The filler material shall meet the requirements of A.S.T.M. D242.

701-2.3 Bituminous Material The bituminous material shall be an asphalt cement with a performance grade (PG) as called for in the bidder's proposal or special conditions.

701-2.4 Job Mix Formula The contractor shall submit for Engineer's written approval a job mix formula for the mixture to be supplied for the project. The job mix formula with the allowable tolerances shall be within the master range

specified for the particular type of bituminous material. The job mix formula for each mixture shall be in effect unless modified in writing by the Engineer. The job mix formula for each mixture shall establish a single percentage of aggregate passing each required sieve size and a single percentage of bituminous material to be added to the aggregate.

After the job mix formula is established, all mixtures furnished for the project shall conform thereto within the following ranges of tolerances:

Passing No. 4 and larger sieves	+ or - 7%
Passing No. 50 sieve	+ or - 4%
Passing No. 200 sieve	+ or - 2%
Bitumen	+ or - 0.4%
Mixing Temperature	+ or - 20° F

Should a change in sources of materials be made, a new job mix formula shall be established before the new material is used. When unsatisfactory results or other conditions make it necessary, the Engineer may establish a new job mix formula.

The aggregate shall be accepted in stockpile at the plant site. The plant mixed material shall be accepted after blending and mixing at the plant.

701-3 COMPOSITION OF MIXTURE The mineral aggregate for the hot plant mix seal and hot bituminous asphalt shall be of such size that the percentage composition by weight, as determined by laboratory sieves, will conform to the gradation specified. The percent by weight for the bituminous material shall be within the limits given. The bituminous content of the mixture shall be calculated on a percentage basis by weight of the total mix.

The composition limits tabulated shall govern, but a closer control appropriate to the job materials will be required for the specific project in accordance with job mix formula. The final gradations decided on, within the limits designated in the table, shall be well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieves or vice versa.

For the aggregate gradations the mixture shall meet the requirements of the following A.S.T.M. tests, plus the stated limitations on voids:

Marshall Stability	A.S.T.M. D-1559
Number of blows each end of specimen	50
Stability (Min.)	500

Marshall Stability	A.S.T.M. D-1559
Flow (Max.) hundredths of an inch	18
Flow (Min.) hundredths of an inch	8
Percent voids	3 to 5

HOT BITUMINOUS ASPHALT

This gradation is intended to meet the current version of the NDDOT Class 27 gradation.

Square Mesh Sieve Size	Percent By Weight Passing
_"	100
½"	70-100
No. 4	40-70
No. 8	33-55
No. 16	25-45
No. 30	15-35
No. 50	10-30
No. 200	2.9 - 9.0
% Shale	5 (max.)
L.A. Abrasion Loss	40 (max.)
Plasticity Index	3
Fractured Faces	55
Crushed Fines	10

HOT PLANT MIX SEAL

Square Mesh Sieve Size	Percent By Weight Passing

Square Mesh Sieve Size	Percent By Weight Passing
_"	100
No. 4	75-100
No. 8	55-95
No. 30	25-60
No. 50	15-40
No. 100	5-25
No. 200	3-10
% Clay Total Sample	5 (max.)
% Shale & Soft Rock Total Sample	5 (max.)
L.A. Abrasion Loss	40 (max.)
Asphalt Cement	6.0 - 11.0

At least 75% of the material by weight retained on the No. 4 sieve shall be particles having at least one fractured face or 50% of the total material shall be manufactured from sound aggregate retained on the 3/8" sieve.

A sample of the coarse and fine aggregates shall be washed to determine the percentage of the total material passing the No. 200 mesh sieve; of the amount of the material passing the No. 200 mesh sieve, at least one-half shall pass the no. 200 mesh sieve by dry sieving.

The percentage of bituminous material, by weight, to be added to the aggregate shall be specified by the Engineer on the basis of preliminary laboratory tests and field sieve analysis.

701-4 EQUIPMENT

701-4.1 Equipment and Organization All methods and equipment, tools, plants, and machinery used for handling materials and executing any part of the work shall be subject to the approval of the Engineer before the work is started. If unsatisfactory, they shall be changed and improved as required.

701-4.2 Bituminous Mixing Plant (General) Adequate storage space shall be provided to prevent intermingling of stockpiles containing separated aggregate sizes until the aggregates are delivered into the plant. The various units of the plant shall be designed and coordinated to permit uniform, uninterrupted production under the normal operating conditions. The plant shall be provided with means for readily obtaining representative

samples and for calibrating and checking the proportions of each ingredient used in the mixture.

A. Requirements for All Plants Mixing plants shall be of sufficient capacity and coordinated to adequately handle the proposed bituminous construction.

1. Plant Scales Scales shall be accurate to within 0.5% of the required maximum load. Poises shall be designed to be locked in any position to prevent unauthorized change of position. In lieu of plant and truck scales, the contractor may provide an approved automatic printer system to print the weights of the material delivered, provided the system is used in conjunction with an approved automatic batching and mixing control system. Such weights shall be evidenced by a weigh ticket for each load. Scales shall be inspected and sealed as often as the Engineer may deem necessary to assure their continued accuracy. The contractor shall have on hand not less than ten 50-pound weights for testing the scales.

2. Equipment for Preparation of Bituminous Material Tanks for the storage of bituminous material shall be equipped to heat and hold the material at the required temperatures. Heating shall be accomplished by steam coils, electricity, or other approved means so that flame(s) will not contact the tank. The circulating system for the bituminous material shall be designed to assure proper and continuous circulation during the operating period. Provision shall be made for measuring and sampling storage tanks.

3. Feeder for Drier The plant shall be provided with accurate mechanical means for uniformly feeding the aggregate into the drier to obtain uniform production and temperature.

4. Drier The plant shall include a drier(s) which continuously agitates the aggregate during the heating and drying process.

5. Screens Plant screens, capable of screening all aggregate to the specified sizes and proportion and having normal capacities in excess of the full capacity of the mixer, shall be provided.

6. Bins The plant shall include storage bins of sufficient capacity to supply a mixer operating at full capacity. Bins shall be arranged to assure separate and adequate storage of appropriate fractions of the mineral aggregates. When used, separate dry storage shall be provided for filler or hydrated lime and the plant shall be equipped to feed such material into the mixer. Each bin shall be provided with overflow pipes of such size and at such location to prevent backup of material

into other compartments or bins. Each compartment shall be provided with its own individual outlet gate, constructed so as to prevent leakage. The gates shall cut off quickly and completely. Bins shall be so constructed that samples may be obtained readily. Bins shall be equipped with adequate telltale devices which indicate the position of the aggregates in the bins at the lower quarter points.

7. Bituminous Control Unit Satisfactory means, either by weighing or metering, shall be provided to obtain the specified amount of bituminous material in the mix. Means shall be provided for checking the quantity or rate of flow of bituminous material into the mixer.

8. Thermometric Equipment Dual armored thermometers of adequate range shall be fixed in the bituminous feed line at a suitable location near the charging valve of the mixer unit.

The plant shall also be equipped with an approved thermometric instrument placed at the discharge chute of the drier to indicate the temperature of the heated aggregated. The Engineer may require replacement of any thermometer by an approved temperature recording apparatus for better regulation of the temperature of aggregates.

9. Dust Collector The plant shall be equipped with a dust collector to waste or return uniformly to the hot elevator all or any part of the material collected.

10. Truck Scales The bituminous mixture shall be weighed on an approved scale furnished by the contractor or on public scales at the contractor's expense. Scales shall be inspected and sealed as often as the Engineer deems necessary to assure their accuracy.

11. Safety Requirements Adequate and safe stairways to the mixer platform and sampling points shall be provided, and guarded ladders to other plant units shall be placed at all points where accessibility to plant operations is required. Accessibility to the top of truck bodies shall be provided by a suitable device to enable the Engineer to obtain samples and mixture temperature data. Means shall be provided to raise and lower scale calibration equipment, sampling equipment, and other similar equipment between the ground and the mixer platform. All gears, pulleys, chains, sprockets, and other dangerous moving parts shall be thoroughly guarded. Ample and unobstructed passage shall be maintained at all times in and around the truck loading area. This area shall be kept free of drippings from the mixing platform.

B. Cold Feed Control The Contractor may elect to operate the hot plant without plant screens. The basic requirements of this method of operation are to remove all plant screens with the exception of the scalping screen. Permission to continue under this option may be rescinded upon failure to maintain production within the specified gradation limits.

The volume or tonnage placed in each of the two or more stockpiles shall be such a significant portion of the whole tonnage produced, as to enable adequate control of the gradation within the job mix formula.

Each individual aggregate shall be fed through a separate feeder that has a positive feed and that can be easily and accurately calibrated. The feed shall be quick adjusting and shall maintain a constant and uniform flow throughout the range of its calibration.

1. Batch Plants and Continuous Mix Plants The point of acceptance for the physical properties of the aggregates will be in the stockpiles at the plant site. Acceptance testing for aggregate gradation will be performed just prior to the addition of bituminous material to the mixture.

   In batch mix plants a surge bin shall be provided between the drier and the batch plant, and the discharge into the weigh hopper shall be from one bin only which shall discharge into the center of the weigh hopper. The amount of aggregate stored in the bin at any one time shall not exceed one batch in weight and shall be fed into the bin in a manner that will prevent sloughing and segregation.

   In continuous mix plants, a surge bin and mechanical feeder shall be provided. The storage in each bin used shall be limited in amount so that sloughing and segregation will not occur. If more than one bin is used, separation shall be accomplished in such a manner as to insure flow to each bin and preclude segregation of the total material as obtained from the individual bins.

C. Dryer Drum Plants An approved dryer drum mixing process will be permitted in lieu of pugmill mixing. The system shall provide positive weight control of the cold aggregate feed, by use of a belt scale or other device which will automatically regulate the feed gate and permit instant correction of variations in load. The cold feed flow shall be automatically coupled with the bitumen flow to maintain the required proportions. Proportioning shall be within the tolerances specified in the job mix formula. The system shall be equipped with automatic burner controls and shall provide for temperature sensing of the bituminous mixture at discharge.

1. General The moisture contents of the bituminous mixture at discharge from the mixer shall not exceed 0.5%.

The temperature of the bituminous mixture at discharge from the mixer shall not exceed 325° F. The temperature of the mix at lay down shall be not less than 230° F. The actual mixing temperature shall be adjusted as directed by the Engineer within the allowable limitations to best suit construction conditions.

701-4.3 Hauling Equipment Trucks used for hauling bituminous mixtures shall have tight, clean, smooth metal beds which have been lightly coated with a minimum amount of paraffin oil, lime solution, or other approved material to prevent the mixture from adhering to the beds. In adverse weather each truck shall have a suitable cover to protect the mixture.

701-4.4 Bituminous Pavers Bituminous Pavers shall be self-contained, power propelled units, provided with an activated screed or strike-off assembly, heated as necessary. It shall be capable of spreading and finishing courses of bituminous plant mix material which will meet the specified thickness, smoothness, and grade. The paver shall be capable of spreading and finishing courses of bituminous plant mix material in lanes not less than ten feet in width and shall be capable of operating at a forward speed consistent with satisfactory laying of the mixture. Pavers shall be equipped with automatic screed controls to control screed elevation and transverse slope.

The paver shall have a receiving hopper of sufficient capacity for a uniform spreading operation. The hopper shall be equipped with a distribution system to place the mixture uniformly in front of the screed.

The screed or strike-off assembly shall effectively produce a finished surface of the required evenness and texture without tearing, shoving, or gouging the mixture.

701-4.5 Rollers Rollers shall be in good condition, capable of reversing without backlash and shall operate at slow speeds to avoid displacement of the bituminous mixture in such a manner as to be smooth and free of irregularities. The number, type and weight of rollers used shall be sufficient to compact the mixture to the required density while the mixture is still in a workable condition. The use of equipment which results in excessive crushing of the aggregate will not be permitted.

701-5 CONSTRUCTION REQUIREMENTS

701-5.1 Weather and Seasonal Limitations The bituminous material shall be constructed only when the surface is dry, the atmospheric temperature is above 40° F, the base is not frozen, and the weather is not foggy or rainy. Hot Plant Mix Seal shall be constructed only when the surface is dry. The existing mat temperature is at least 40° F, and the weather is not foggy or

rainy. The temperature requirement may be waived, but only when so directed by the Engineer.

701-5.2 Preparation of Bituminous Material The bituminous material shall be heated to the mixing temperature of between 250° F to 325° F in a manner that will avoid local overheating and provide a continuous supply of the bituminous material to the mixer at a uniform temperature at all times.

701-5.3 Preparation of Mineral Aggregate The aggregate for the mixture shall be dried and heated at the paving plant before entering the mixer. When introduced into the mixer, the combined aggregate shall not contain more than 0.5% moisture. Water in the aggregate shall be removed by heating to the extent that there is no subsequent foaming in the mixture prior to the placing of material. The aggregate shall be heated to temperature as designated by the job formula within the job tolerance specified. The maximum temperature and rate of heating shall be such that no permanent damage occurs to the aggregates. Particular care shall be taken that aggregates high in calcium or magnesium content are not damaged by heating. The aggregate shall be screened to specified sizes and conveyed into separate bins ready for mixing with bituminous material.

701-5.4 Preparation of Bituminous Mixture Before delivery, the aggregate shall be mixed with the bituminous material at a central mixing plant. The mixture shall be prepared at a temperature of between 250° F to 325° F.

The dry aggregates, dried and heated as specified, shall be combined in the plant in proportionate amounts of each fraction of aggregate required to meet the specified gradation. The quantity of aggregate for each batch shall be determined, measured and conveyed into the mixer. In case of volumetric proportioning, the size of the grate openings shall be determined, and the gates locked in position.

The quantity of bituminous material for each batch of calibrated amount shall be determined by the Engineer. The bituminous material shall be measured by weight or volume and introduced into the mixer at the specified temperature, using the lowest range possible for adequate mixing and spreading. For batch mixers, all mineral aggregates shall be in the mixer before the bituminous material is added. The exact temperature within the specified range shall be fixed by the Engineer. As determined by the Engineer, the mixing shall continue for the time necessary to coat all particles uniformly. This time is dependent upon the mix designs and the type of mixing equipment used.

701-5.5 Transportation and Delivery of the Mixture The mixture shall be placed at a minimum temperature of 225° F. When mixture is being placed during warm weather and the Engineer has determined that satisfactory results can be obtained at lower temperatures, he may direct that the mixture be mixed and delivered at the lower temperatures.

Loads shall not be sent out so late as to interfere with spreading and compacting the mixture during daylight unless artificial light, satisfactory to the Engineer, is provided. The mixture shall be delivered at a temperature within the tolerance specified in the approved job formula.

701-5.6 Spreading and Laying

A. Preparation for Placing Immediately before placing the bituminous mixtures, existing underlying asphalt courses shall be cleaned of loose or deleterious materials and tacked.

The mixture shall be laid only upon an approved underlying course which is dry and only when weather conditions are suitable. No mixture shall be placed when air temperature away from the artificial heat is 40° F or lower, unless so directed by the Engineer. The Engineer may, however, permit work of this character to continue when overtaken by sudden rains, up to the amount which may be in transit from the plant at the time, provided the mixture is within the temperature limits specified.

Placing shall commence at the point(s) farthest from the mixing plant and progress continuously toward the plant, unless otherwise ordered by the Engineer. Hauling over material already placed shall not be permitted until the material has been thoroughly compacted as specified and allowed to cool to atmospheric temperature.

B. Machine Spreading Hot Bituminous Asphalt Leveling Course The leveling course material that has been processed in a plant shall be placed on the prepared underlying course and compacted in layers of the thickness shown on the plans. The depositing and spreading of the material shall commence where designated and shall progress continuously without breaks. The material shall be deposited and spread in lanes in a uniform layer and without segregation of size to such loose depth that, when compacted, the layer shall have the required thickness. The leveling course material shall be spread in a uniform layer of required depth and width and to the typical cross section. The spreading shall be by a self-powered blade grader, mechanical spreader, or other approved method. In spreading, care shall be taken to prevent cutting into the underlying layer. The material shall be bladed until a smooth, uniform surface is obtained, true to line and grade.

The leveling course shall be constructed in a layer not to exceed 3 inches of compacted thickness. The leveling course material as spread shall be of uniform grading with no pockets of fine or coarse materials. Compaction of the leveling course shall be completed before the material's temperature falls below 185° F. When more than one layer is required, the construction procedure described herein shall apply similarly to each layer.

C. Machine Spreading Hot Bituminous Asphalt Upon arrival, the base, surface course, or hot plant mix seal mixture shall be dumped into an approved bituminous paver and immediately spread to the full width required. It shall be stuck off in a uniform layer of such depth that, when the work is completed, it will have the required thickness and will conform to the grade and surface contour required. The speed of the paver shall be regulated to eliminate the pulling and tearing of the bituminous mat.

The mixture shall be placed in strips of a minimum width of 10 feet. To insure proper drainage, the spreading shall begin along the centerline of the pavement on a crowned section or on the high side of the pavement with a one way slope. After the first strip or width has been compacted, the second width shall be placed, finished and compacted in the same manner as the first width. After the second strip has been placed and rolled, a 10 foot straight edge shall be placed across the longitudinal joint to determine if the surface conforms to grade and contour requirements.

Exposed vertical edges of paved strips shall be free of all accumulations of dirt or other foreign material before any mixture is spread in adjacent lane. If joint faces become dry or dusty, the contact surfaces shall be tacked. If the spreading machine should drift from an adjacent lane during construction, the unfilled space shall be carefully filled with fresh hot mixture obtained from trucks or the hopper of the spreading machine. Stealing mixture from that already spread to fill up these areas shall not be permitted.

In limited areas where due to irregularities or unavoidable obstacles, the use of mechanical spreading and finishing equipment is not practical, the mixture may be hand spread.

When hand spreading is permitted, the mixture shall be dumped on approved dump sheets outside the area upon which it is to be spread, and then distributed into place immediately using hot shovels. It shall be spread with hot rakes in a uniformly loose layer to the full width required and of such depth that, when the work is completed, it will have the required thickness and will conform to the grade and surface contour shown on the plans.

701-5.7 Hot Bituminous Asphalt Patching All broken and loose pieces of the existing surface shall be removed. Edges of the existing surface shall be trimmed and squared by saw cutting, colter wheel, jack hammer, or similar means producing a rectangular patch area with vertical edges.

The base of the patch area shall be thoroughly compacted and leveled to conform with lines and grades of the existing base. If in the opinion of the Engineer, the base material is soft, spongy, or otherwise unstable, the Contractor shall subcut the base material and replace it with compacted aggregate material.

The edges of the patch area shall be tacked prior to placing the patch material. Hot asphalt patching material may be placed by hand, blade, or paver in compacted lifts not exceeding three inches.

701-5.8 Compaction of Mixtures After spreading, the mixture shall be thoroughly and uniformly compacted with power rollers as directed by the Engineer. Rolling of the mixture shall begin as soon after spreading as it will bear the roller without undue displacement or hair checking. On the first strip spread, rolling shall start in the center and continue toward either edge. On subsequent strips laid, rolling shall start on the edge adjacent to previously laid material and continue toward the opposite edge.

Initial rolling shall be done longitudinally. The rollers shall overlap on successive trips. Alternate trips of the roller shall be of slightly different lengths, and cross rolling shall not exceed more than one-half the width of the pavement of crowned sections. The speed of the roller shall, at all times, be slow to avoid displacement of the hot mixture. Any displacement occurring as a result of reversing the direction of the roller, or from any other cause, shall be corrected at once by rakes and fresh mixture.

Initial rolling of Hot Plant Mix Seal shall be done with a smooth wheeled steel roller or a self-propelled pneumatic roller. The intermediate rolling shall be with a self-propelled pneumatic roller until the surface is tightly bound and shows no objectionable displacement under this roller. The final rolling shall be done with a smooth wheeled steel roller. Rolling shall be completed before the mat temperature falls below 185° F.

Sufficient rollers shall be furnished to handle the output of the plant. Rolling shall continue until all roller marks are eliminated, the surface is of uniform texture and true to grade and cross section and density of at least 95% of the density determined by the job mix formula (design) is obtained. Field density tests shall be made at least once daily.

To prevent adhesion of the mixture to the roller, the wheels shall be kept properly moistened, but excessive water will not be permitted.

In areas not accessible to the roller, the mixture shall be thoroughly compacted with hot hand tampers.

Any mixture which becomes loose and broken, mixed with dirt, or in any way defective prior to the application of the finish coat shall be removed and replaced with fresh hot mix and immediately compacted to conform with the surrounding area. This shall be done at the contractor's expense.

701-5.9 Joints

A. General The mixture at the joints shall comply with the surface requirements and present the same uniformity of texture, density, smoothness, etc., as other sections of the course. In the formation of all joints, provision shall be made for proper bond with the adjacent

course for the specified depth on the course. Joints shall be formed by cutting back on the previous day's run to expose the full depth of the course. The exposed edge shall then be tacked as required by the Engineer, and the fresh mixture raked against the joint, thoroughly tamped with tampers and rolled.

B. Transverse The placing of the course shall be as continuous as possible. The roller shall pass over the unprotected end of the freshly laid mixture only when discontinuing the laying of the course.

C. Longitudinal The placing of the course shall be as specified and in such a manner that the joint is exposed for the shortest period possible. The joints shall be placed so that they will be offset at least one foot from base joints.

701-5.10 Shaping Edges While the surface is being compacted and finished, the contractor shall carefully trim the outside edges of the pavement to the proper alignment. The edges so formed shall be beveled while still hot with the back of the rake or a smoothing iron and thoroughly compacted by tampers or by other satisfactory methods.

701-5.11 Surface Tests Tests for conformity with the specified crown and grade shall be made by the contractor immediately after initial compaction. Any variation shall be corrected by the removal or addition of materials and by continuous rolling.

The finished surface shall not vary more than 3/8 inch when tested with a 10 foot straight edge applied parallel with, or at right angles to, the centerline. The surface tolerance for blade laying shall be 3/8" in 10 feet.

After the completion of final rolling, the smoothness of the course shall again be tested; the humps or depressions exceeding the specified tolerances or that retain water on the surface shall be corrected immediately as directed by the Engineer; this shall be done at the contractor's expense.

701-5.12 Sampling Pavement The contractor shall remove suitable size samples of the completed pavement from locations designated by the Engineer to enable him to determine the composition, compaction, and density of the pavement. A sample shall be taken for each day, or fraction thereof. The contractor shall replace the pavement free of charge. If the pavement is deficient in composition, compaction, or thickness, satisfactory correction shall be made.

701-5.13 Bituminous and Aggregate Material Contractor's Responsibility Samples of the bituminous and aggregate materials that the contractor proposes to use, together with a statement of their source and character, shall be submitted to the Engineer; approval must be obtained before the use of such materials begins. The contractor shall require the manufacturer or producer of the bituminous and aggregate materials to furnish material subject to this and all other pertinent requirements of the contract. Only those materials that have

demonstrated performance under the proposed design requirements will be accepted.

The Engineer or his authorized representative shall have access, at all times, to all parts of the paving plant for the purpose of inspecting equipment, conditions and operation of the plant, for verification of weights or proportions and character of materials, and to determine temperatures maintained in the preparation of the mixtures.

The contractor shall furnish vendor's certified test reports for each truck load or equivalent of bitumen shipped to the project. The report shall be delivered to the Engineer before permission is granted for use of the material. The furnishing of the vendor's certified test report for the bituminous material shall not be interpreted as a basis for final acceptance. All such test reports shall be subject to verification by testing samples of materials received for use on the project.

701-6 MEASUREMENT AND PAYMENT

701-6.1 Hot Bituminous Asphalt Surface Course Hot bituminous asphalt surface course shall be measured on the square yard (SY) basis and paid for at the unit price bid for "(Depth) Hot Bituminous Surface Course" complete in place and accepted by the Engineer.

701-6.2 Hot Bituminous Asphalt Base Course Hot bituminous asphalt base course shall be measured on the square yard (SY) basis and paid for at the unit price bid for "(Depth) Hot Bituminous Base Course" complete in place and accepted by the Engineer.

701-6.3 Hot Bituminous Asphalt Leveling Course Hot bituminous asphalt leveling course shall be measured on the ton basis and paid for at the unit price bid for "Hot bituminous Asphalt Leveling Course" complete in place and accepted by the Engineer.

701-6.4 Hot Bituminous Asphalt Patching Material Hot bituminous asphalt patching material shall be measured on the ton basis and paid for at the unit price bid for "Hot Bituminous Asphalt Patching Material" complete in place and accepted by the Engineer.

701-6.5 Hot Plant Mix Seal Hot plant mix seal shall be measured on the square yard (SY) basis and paid for at the unit price bid for "Hot Plant Mix Seal" complete in place and accepted by the Engineer.

SECTION 702

BITUMINOUS PRIME, FOG OR TACK COAT

702-1 DESCRIPTION This item shall consist of supplying and applying bituminous material to a previously prepared, bonded and/or bituminized binder, leveling or base course or existing pavement in accordance with these specifications and to the width shown on the typical cross section on the plans.

702-2 MATERIALS

702-2.1 Quantity of Material The approximate amount of bituminous material per square yard for prime, fog, or tack coat shall be as provided in the following table. The exact amount shall be as ordered by the Engineer.

Material	Amount
Bituminous Prime Coat	0.25 to 0.50 Gal./SY
Bituminous Tack Coat	0.05 to 0.20 Gal./SY
Bituminous Fog Coat	0.05 Gal./SY

702-2.2 Bituminous Material The types, grades, controlling specifications, and application temperatures for the bituminous materials are shown in the following table. The specific material to be used shall be designated by special provision or by the Engineer. The supplier of the bituminous material shall supply asphalt viscosity charts for the material delivered.

PRIME COATS

Type & Grade	Specification	Application Temp.
RC-70	AASHTO M-81	120 -175E F
MC-30	AASHTO M-82	85 -140E F
MC-70	AASHTO M-82	120 -175E F

TACK COATS

Type & Grade	Specification	Application Temp.
SS-1, SS-1h	AASHTO M-140	75 -130E F

702-2.3 Blotter Sand This material shall consist of sound durable particles of screened and/or crushed sand or gravel and shall have the following gradation:

Square Mesh Sieve Size	Percent Passing By Weight
3/8"	100
NO. 200	0-20

702-3 CONSTRUCTION REQUIREMENTS

702-3.1 Weather Limitations for Prime Coat The prime coat shall be applied only when the existing surface is dry or contains sufficient moisture to get uniform distribution of the bituminous material, when the atmospheric temperature is above 60E F and when the weather is not foggy or rainy. The temperature requirements may be waived, but only when so directed by the Engineer.

702-3.2 Weather Limitation for Fog and Tack Coats The fog or tack coat shall be applied only when the existing surface is dry, the weather is not foggy or rainy, and the atmospheric temperature is above 40° F. The temperature requirement may be waived, but only when so directed by the Engineer with the use of an approved alternate bituminous material.

702-3.3 Equipment The equipment used by the Contractor shall include a self-powered pressure bituminous material distributor and equipment for heating bituminous material.

The distributor shall have pneumatic tires of such width and number that the load produced on the surface shall not exceed 650 pounds per inch of tire width and shall be designed, equipped and operated so that bituminous material at even heat can be applied uniformly on variable widths of surface at readily controlled rates from 0.05 to 0.5 gallons per square yard. The material shall be applied within a pressure range from 25 to 75 pounds per square inch and with an allowable variation from any specified rate not to exceed 5%. Distributor equipment shall include a thermometer for reading temperatures of tank contents, a tachometer, pressure gauges, and volume measuring devices.

Mechanical spreaders shall be capable of depositing the designated amount of aggregate per square yard in a smooth, uniform layer or on the freshly deposited bitumen, and in such a manner that the wheels of the equipment will not contact any bitumen which has not been covered by the aggregate. The rate of aggregate discharge shall be uniform over the full application width and whenever necessary, cut-off plates or other approved means shall be provided to reduce the width of spread in suitable increments to meet the job requirements. The spreader shall be so adjusted by individual gates over the wheel tracks to allow additional aggregate to be deposited to prevent tracking by the spreader and the trucks.

The blotter sand spreader may be a mechanical truck mounted type.

702-3.4 Application of Bituminous Material Immediately before applying the tack or prime coat, the full width of surface to be treated shall be swept with a power broom to remove all loose dirt and other objectionable material.

The application of the bituminous material shall be made by means of a pressure distributor at the pressure, temperature, and in the amounts directed by the Engineer.

During all applications, the surfaces at adjacent structures shall be protected in such a manner as to prevent their being spattered, marred or tracked.

Following the application, the surface shall be allowed to cure without being disturbed for such period of time as may be necessary to permit drying out and setting of the fog, tack or prime coat. This period shall be determined by the Engineer. The surface shall then be maintained by the Contractor until the next course has been placed. Suitable precautions shall be taken by the Contractor to protect the surface against damage during this interval, including any sand necessary to blot up excess bituminous material.

702-3.5 Bituminous Material Contractor's Responsibility Samples of the bituminous material that the Contractor proposes to use, together with a statement as to its source and character, must be submitted and approved before use of such material begins. The Contractor shall require the manufacturer or producer of the bituminous material to furnish material subject to this and all other pertinent requirements of the contract. Only satisfactory materials so demonstrated by service tests, shall be acceptable.

The Contractor shall furnish vendor's certified test reports for each truck load, or equivalent, of bituminous material shipped to the project. The report shall be delivered to the Engineer before permission is granted for use of the material. The furnishing of the vendor's certified test report for the bituminous material shall not be interpreted as a basis for final acceptance. All such test reports shall be subject to verification by testing samples of material received for use on the project.

702-3.6 Freight and Weight Bills Before the final estimate is allowed, the Contractor shall file with the Engineer receipted bills when railroad shipments are made, and certified weight bills when materials are received in any other manner, of the bituminous materials actually used in the construction covered by the contract.

Copies of freight bill and weight bills shall be furnished to the Engineer during the progress of the work.

702-4 MEASUREMENT AND PAYMENT

702-4.1 Bituminous Prime Coat Bituminous prime coat shall be measured by the gallon corrected to 60E F and paid for at the unit price bid for "(Type) Bituminous Prime Coat" complete in place and accepted by the Engineer.

702-4.2 Bituminous Fog Coat Bituminous fog coat shall be measured by the gallon corrected to 60E F and paid for at the unit price bid for "(Type) Bituminous Fog Coat" complete in place and accepted by the Engineer.

702-4.3 Bituminous Tack Coat Bituminous tack coat shall be measured by the gallon corrected to 60° F and paid for at the unit price bid for "(Type) Bituminous Tack Coat" complete in place and accepted by the Engineer.

702-4.4 Blotter Sand Blotter sand shall be measured by the ton and paid for at the unit price bid for "Blotter Sand" complete in place and accepted by the Engineer.

SECTION 703

SPECIFICATIONS FOR SEAL COAT

703-1 DESCRIPTION This item shall consist of a bituminous surface treatment as a wearing course composed of single or multiple applications of bituminous material and aggregate cover placed on the prepared primed base or properly cured wearing surface, in accordance with these specifications, and shall conform to the dimensions and typical cross section shown on the plans, and with lines and grades established by the Engineer.

703-2 MATERIALS

703-2.1 Quantity of Material. The approximate amounts of bituminous material and aggregates per square yard for the Bituminous Seal shall be as provided in the following table. The exact amount shall be as ordered by the Engineer.

Material	Amount
Bituminous Material	0.25 to 0.40 Gal./Sq.Yd.
Cover Aggregate	25 to 35 Lbs./Sq.Yd.
Blotter Sand	As needed

703-2.2 Cover Aggregate This material shall consist of sound, durable particles of gravel and sand, either crushed or a combination of both, and shall be in accordance with the requirements for gradation shown in the following table:

	Chip Seal CL-43	Chip Seal CL-43 Modified	Sand Seal CL-45	Blotter Sand CL-44
5/8 Inch				100
3/8 Inch	100	100	100	
No. 4	20-70	0-40	85-100	90-100
No. 8	0-17	0-10		
No. 16			45-80	
No. 50			10-30	
No. 200	0-2	0-2	0-3	0-20
Shale	8% Max.	8% Max.	3% Max.	
L.A. Abrasion	40% Max.	40% Max.		

Aggregate gradations are intended to comply with the current NDDOT aggregate class specifications.

The chip seal aggregate shall be flushed with clear water, but not so wet that free water will be draining from aggregate to truck bed before applying.

703-2.3 Bituminous Material The types, grades, controlling specifications, and application temperatures for the bituminous materials are given below. The bituminous material shall be CRS-2, unless otherwise specified in the plans or special provisions. The supplier of the bituminous materials shall supply asphalt viscosity charts for the material delivered.

Type & Grade	Specification	Application Temperatures
MC 3000	AASHTO M-82	230 - 290 F
RC 250	AASHTO M-81	165 - 220 F
RC 800	AASHTO M-81	195 - 255 F
RC 3000	AASHTO M-81	230 - 290 F
RS-1, RS-2K, SS-1, SS-K	AASHTO M-140	75 - 130 F
CRS-1, CRS-2	AASHTO M-140	110 - 160 F

703-2.4 Material Acceptance

The Contractor shall provide an adequate sized sample of aggregate and bituminous material, as determined by the Engineer, to be tested in accordance with A.S.T.M. 1664 for Coating and Stripping of Bitumin Aggregate Mixtures, 15 days prior to applying the seal coat.

The cover aggregate will be sampled in lots of at least every 1,000 tons (or 65,000 sq yd) or once per day, whichever is more frequent.

If the cover aggregate does not meet the gradation specified above, the following equation shall be used to calculate a reduction in the contract unit price for that lot. Unit price reduction equals:

$$\frac{100 - 5 \text{ (sum of percent of deviation from range limits)}}{100}$$

The Contractor shall obtain 2 oil samples from each load of oil delivered to the project in 1 gallon wide-mouth pails. The oil samples shall be submitted to the Engineer for testing in accordance with current NDDOT testing procedures for that oil. The Contractor will receive a deduct of 30% of the invoice price (FOB refinery) for those loads of oil where samples fail to meet the current NDDOT specifications.

703-3 CONSTRUCTION REQUIREMENTS

703-3.1 Weather Limitations Bituminous material shall not be applied to a wet surface, during sand or dust storms, or in winds exceeding 30 mph.

Unless authorized by the Engineer, the Contractor shall not apply any bituminous material when the atmospheric temperature is less than 70° F. and the Engineer may require the Contractor to delay the application of bituminous material until the atmospheric and pavement surface conditions are satisfactory. No bituminous material shall be placed which cannot be cared for during daylight hours.

Seal Coats shall not be applied after September 15th of any calendar year, except on written permission by the Engineer to complete the seal coat already started on a project.

703-3.2 Operation of Pits and Quarries The aggregate material shall be obtained from sources approved by the Engineer. The Contractor shall make all necessary arrangements for obtaining the material, and all work involved in clearing and stripping pits or quarries and handling unsuitable material shall be performed by the Contractor at his own expense. The material in the pits shall be handled so that a uniform and satisfactory product shall be secured. Unless otherwise directed, pits shall be adequately drained and shall be left in a neat and presentable condition with all slopes dressed uniformly. Quarries shall be left as neat and presentable as practicable.

703-3.3 Equipment and Organization Each unit required in the execution of these specifications shall be under the continuous supervision of a competent superintendent thoroughly experienced in this type of work. Experienced operators will be required on all equipment used in hauling and applying bituminous material and aggregates.

All equipment necessary to perform this work properly shall be on the project, in first class working condition, and approved by the Engineer before construction is permitted to start. The Contractor shall furnish, while applying the seal coat, all barricades, lights, flagmen or other traffic control devices as directed by the Engineer.

The following equipment will be the minimum required for this type of construction, and additional machinery shall be secured if, in the opinion of the Engineer, it is necessary to fulfill the conditions of these specifications or to complete the item with the time specified:

A. The distributor shall have pneumatic tires of such width and number that the load produced on the pavement surface shall not exceed the legal gross vehicle weight and it shall be designed and operated so that bituminous material at even heat may be applied uniformly on variable widths of surface at readily controlled rates from 0.05 to 2.0 gallons per square yard. The bituminous material shall be applied within a pressure range of 25 to 75 pounds per square inch and with

an allowable variation from any specified rate not to exceed 5%. Distributor equipment shall include a tachometer, pressure gauges, volume measuring devices and a thermometer for reading temperatures of tank contents.

The Contractor shall furnish to the Engineer a complete manual of manufacturer's recommendations on operation of the distributor. It shall include such information as to spray bar height, pump operating pressures or gallons per minute discharge for the various types and grades of bituminous material orifice sizes and general operating instructions. This material shall be submitted to the Engineer 15 days prior to Seal Coat application. The distributor shall be fully calibrated by the Engineer at the start of the project and checked periodically.

B. The mechanical spreader shall be capable of depositing the designated amount of aggregate per square yard in a smooth, uniform layer or on the freshly deposited bitumen, and in such a manner that the wheels of the equipment will not contact any bitumen which has not been covered by the aggregate. The rate of aggregate discharge shall be uniform over the full application width and whenever necessary, cutoff plates or other approved means shall be provided to reduce the width of spread in suitable increments to meet the job requirements. The spreader shall be so adjusted by individual gates over the wheel tracks to allow additional aggregate to be deposited to prevent tracking by the spreader and the trucks.

C. The blotter sand spreader may be a mechanical truck mounted type.

D. The steel wheel rollers shall be of the self-propelled tandem or three wheel type rollers. The wheels on the rollers shall be equipped with adjustable scrapers which shall be used when necessary to clean the wheel surfaces. Rollers shall be equipped with tanks and sprinkling apparatus which shall be used to keep the wheels wet and prevent the surfacing materials from sticking. A minimum of 1 steel wheel roller shall be used on the project.

E. The pneumatic roller shall consist of pneumatic tires arranged in a manner to provide a satisfactory compacting unit. The roller shall have an effective rolling width of at least 60 inches and shall give a compression of at least 275 pounds per inch of tread width when fully loaded. The wheels shall be staggered on the front and rear axles to provide complete coverage of the area over which the roller travels.

A minimum of 2 Pneumatic Rollers shall be used on the project. The rollers shall be self-propelled type, capable of starting, stopping and reversing direction smoothly, without jerking or backlash, and shall be equipped with positive, accurate steering control.

F. A power broom or power blower, broom dragging equipment and equipment for heating aggregate shall be included, when needed.

G. A "pick-up" sweeper shall be provided to pick up surplus aggregate.

The Contractor shall supply such auxiliary equipment as needed and all equipment shall meet the approval of the Engineer.

703-3.4 Preparing Underlying Course 15 days prior to the commencement of seal coat operations, the Contractor shall spray all weeds within the seal coat area with glyphosphate, N-phosphonl methyl/=glycine in the form of isopropylamine salt (a.k.a. Roundup) to ensure all weeds are killed. Dead weeds shall be removed by Contractor prior to seal coat work. Spray and weed removal shall be incidental to other bid items.

All dirt, vegetation and other objectionable material shall be removed from the surface and disposed of by the Contractor.

When cleaning the asphalt surfaces prior to the application of seal coat, the Contractor shall make every effort necessary to limit the amount of sweeping swept onto boulevards, sidewalks and driveways.

The Contractor shall be required to remove all sweepings from sidewalks and driveways and all sweepings collected in the flow lines of the gutters adjacent to the street. The temporary placement of sweepings on the boulevard will not be allowed.

When, in the opinion of the Engineer, objectionable amounts of sweepings have accumulated on the boulevard, the Contractor shall be required to remove the sweepings from the boulevard.

When specified, the Contractor shall be required to patch, with premixed material, any holes or other malformations deviating from the true cross section and grade. The premixed material shall be made of the bituminous material specified in the proposal or on the plans and prepared by the method as directed by the Engineer. Areas to be patched shall be tacked or primed prior to placement of the bituminous material. All small patches shall be thoroughly hand tamped while large patches shall be rolled with a power or pneumatic roller.

703-3.5 Protection of Utility Castings By using duct tape, tar paper, or similar material, the Contractor shall protect the joints and pick holes of all manholes, gate valves, storm inlet grates, and similar utility castings from intrusion of the seal oil. Upon completion of the application of the aggregate chip seal, the Contractor shall remove the protecting tape, open the casting, and remove any accumulated seal oil from the joints and pick holes. All materials used for protecting utility castings shall be removed from the street surface and properly disposed of.

The Contractor shall immediately report to the Engineer any damaged or unsound casting.

For estimating purposes only, there are approximately 1.5 manholes and 1.5 gate valves per intersection.

The costs of the protection of utility castings shall be considered incidental to the project.

703-3.6 Application of Bituminous Material Bituminous material shall be applied upon the properly prepared surface at the rate and temperature specified using a pressure distributor to obtain uniform distribution at all points. The yardage over which the binder is spread in advance of placing the aggregate shall be as determined by the Engineer. During all applications, the surfaces of the adjacent structures shall be protected in such manner as to prevent their being spattered or marred.

703-3.7 Application of Aggregate Material Immediately after the application of the bituminous material or when directed, the aggregates at the rate specified for each designated application shall be spread uniformly over the bituminous material with the aggregate equipment specified. Trucks spreading aggregate shall be operated backward so that the bituminous material will be covered before the truck wheels pass over it. The aggregate shall be spread in the same width of application as the bituminous material and shall not be applied in such thickness as to cause blanketing. Back spotting or sprinkling of additional aggregate material, and spraying additional bituminous material over areas that show up having insufficient cover of bitumen, shall be done by hand whenever necessary. Additional spreading of aggregate material shall be done by means of a broom drag, or other approved method, as directed by the Engineer.

Power rollers shall be used immediately after the aggregate is spread. Following the rolling with the pneumatic rollers, the course shall be further rolled with a steel wheel roller to the satisfaction of the Engineer to insure proper imbedding into the bitumen. The blotter sand shall be applied as directed and rolling shall be continued until no more aggregate material can be worked into the surface. Further brooming and rolling on the strip being placed or on adjacent strips previously placed, shall be done as often as necessary to keep the aggregate material uniformly distributed. These operations shall be continued until the surface is evenly covered and cured to the satisfaction of the Engineer.

Succeeding applications shall not be applied until the proceeding application has set and excess aggregate has been removed. If dust, dirt, or other foreign matter accumulates on the surface between the applications, the Contractor shall be required to sweep and clean the surface as specified herein. The bituminous material and the aggregate shall be spread upon the clean and properly cured surface and handled as required. Extreme care shall be taken in all applications to avoid brooming or tracking dirt or any foreign matter on any portion of the pavement surface under construction. Traffic shall be restricted for a minimum of 6 hours after rolling has been completed or as directed by the Engineer.

A small crew and proper equipment shall be available to control bleeding of seal oil for a period of 15 days after the date of application. If bleeding occurs during the maintenance period and after final sweeping, the Contractor shall control bleeding by spreading light coats of blotter sand. Blotter sand shall not be applied in anticipation of bleeding, but only after bleeding actually occurs. If bleeding occurs after the maintenance period, the Contractor shall continue to spread light coats of blotter sand. The cost for blotter sand after the maintenance period shall be entirely at the Contractor's expense.

All surplus aggregate shall be swept off the surface and removed prior to final acceptance of the work. The removal of excess cover aggregate shall be accomplished by the Contractor, using a "Pickup" type of sweeper.

As soon as practicable after sealing and no later than 5 days after the seal has been applied, all excess cover coat material shall be swept and removed from the entire surface as directed by the Engineer. The cover aggregate picked up shall become the property of the City of Williston and shall be stockpiled by the end of each work day at the Public Works stockpile site, or at an area designated by the City Engineer.

703-3.8 Correction of Defects Any defects, such as raveling, low centers, lack of uniformity, or other imperfections caused by faulty workmanship, shall be corrected to the satisfaction of the Engineer.

All defective materials resulting from overheating, improper handling, or application shall be removed by the Contractor and replaced with approved materials as provided for in these specifications.

703-3.9 Bituminous Material Contractor's Responsibility Samples of the bituminous materials that the Contractor proposed to use, together with a statement as to their source and character, shall be submitted and approval obtained before use of such materials begin.

The Contractor shall furnish vendor's certified test reports for each truck load, or equivalent, of bitumen shipped to the project. The report shall be delivered to the Engineer before permission is granted for use of the material. The furnishing of the vendor's certified test report for the bituminous material shall not be interpreted as a basis for final acceptance. All such test reports shall be subject to verifications by testing sample materials as received for use on the project.

703-3.10 Freight and Weigh Bills Before the final estimate is allowed, the Contractor shall file with the Engineer, receipted bills where railroad shipments are made, and certified weigh bills when materials are received in any other manner, of the bituminous and covering materials actually used in the construction covered by the contract.

Three copies of all freight bills and weigh bills shall be furnished to the Engineer during the progress of the work.

703-3.11 Test Section The Contractor and the Engineer shall determine a suitable sized area within the project to use to calibrate the equipment and determine the best method of rolling. It shall be anticipated to have some delays in the operation at this point to evaluate the results. There shall be no additional compensation for these delays.

703.3-12 First Anniversary Inspection The seal coat surface shall be inspected by representatives of the Owner and the Contractor at approximately one years time after final acceptance, to determine whether any repair work is necessary.

The Owner shall establish the date for the inspection and shall notify the Contractor at least 30 days in advance. If an inspection has not been established within 13 months after the seal coat work was completed, the first anniversary inspection shall be considered to be waived.

Any location where the seal coat shows excessive weathering, cracking, raveling or poor sealing characteristics shall be considered to be a failure of the seal coat system. The Contractor shall make repairs at all points where failures are observed by cleaning the surface, and recoating with the same seal coat system.

The Contractor shall prepare and deliver to the Owner an inspection report covering the first anniversary inspection, setting forth the number and type of failures observed, the percentage of the surface area where failure has occurred, and the names of the persons making the inspection. Color photographs illustrating each type of failure shall be included in the report.

703-4 MEASUREMENT AND PAYMENT

703-4.1 Chip Seal Coat Chip seal shall be measured by the square yard (SY) basis and paid for at the unit price bid for "(Type) Chip Seal" complete in place and accepted by the Engineer.

703-4.2 Sand Seal Coat Sand seal coat shall be measured by the square yard (SY) basis and paid for at the unit price bid for "(Type) Sand Seal Coat" complete in place and accepted by the Engineer.

703-4.3 Blotter Sand Blotter sand shall be measured by the ton and paid for at the unit price bid for "Blotter Sand" complete in place and accepted by the Engineer.

SECTION 704

SPECIFICATIONS FOR MILLING PAVEMENT SURFACE

704-1 DESCRIPTION This work consists of improving the profile, cross slope, and surface texture of an existing pavement surface by use of an asphalt milling machine.

704-2 CONSTRUCTION REQUIREMENTS The existing pavement surface shall be cleaned of deleterious material before the milling operation.

The milling shall be started at the centerline of the pavement and proceed on a longitudinal line parallel to the centerline. Succeeding passes shall progress toward the outer edge of the pavement unless a different sequence of operations is permitted by the Engineer. Milling shall progress in a manner that a single lane is not more than one day's run in advance of the adjacent lane. The Contractor may be required to alter the milling operation to best suit construction conditions. When the milling is stopped, the milled depth shall be gradually tapered to the original pavement surface.
The completed milled surface shall be free from transverse and longitudinal irregularities exceeding 1/4 inch when measured with a 10 foot straightedge. When the material is stockpiled, the stockpile site shall be shown on the Plans or if not shown, the Contractor shall select the site.

The Contractor shall clean the milled surface by brooming before opening to traffic.

Vacuum type pick-up brooms shall be used on urban section roads and streets.

704-3 MEASUREMENT AND PAYMENT

704-3.1 Asphalt Pavement Milling Asphalt pavement milling will be measured by the square yard (SY) basis and paid for at the unit price bid for "(Depth)" Asphalt Pavement Milling" complete and accepted by the Engineer.

SECTION 705

SPECIFICATIONS FOR
MILLED AND CRUSHED ASPHALT SURFACING

705-1 DESCRIPTION This work consists of the placement of a milled or crushed asphalt surface to the lines and grades shown on the plans or as directed by the Engineer and in accordance to the following specifications.

705-2 MATERIALS

705-2.1 Crushed Asphalt Existing salvaged asphalt stockpiles shall be crushed to produce a material of which 90% passes a 1 inch sieve with a maximum size of 1½ inches.

705-3 CONSTRUCTION REQUIREMENTS Unless otherwise specified, the material may be placed by means of a paving machine or by a blade. The initial course of blade laid material shall not be less than 4 inches thick. Blade laid material shall be taken from equalized windrows.

Each course shall be thoroughly watered and rolled and accepted by the Engineer before a subsequent coarse is placed.

Should rolling and watering fail to produce an adequate surface, the Contractor shall take up the placed material, adding tack oil in sufficient quantities, equalize the removed material in a windrow, and relay and recompact the material.

The Contractor shall carefully observe the material during the laydown and compaction process. Any material in excess of two inches shall be removed and disposed of.

The completed surface shall be free from transverse and longitudinal irregularities exceeding ½ inches when measured with a 10 foot straightedge.

705-4 MEASUREMENT AND PAYMENT

705-4.1 Asphalt Crushing Asphalt crushing shall be measured on the ton basis and paid for at the unit price bid for "Asphalt Crushing" complete and accepted by the Engineer.

705-4.2 Milled Asphalt Surfacing Milled asphalt surfacing shall be measured on the square yard (SY) basis and paid for at the unit price bid for "(Depth)" Milled Asphalt Surface".

705-4.3 Crushed Asphalt Surfacing Crushed asphalt surfacing shall be measured on the square yard (SY) basis and paid for at the unit price bid for "(Depth)" Crushed Asphalt Surface".

705-4.4 Crushed or Milled Asphalt Recompaction When ordered by the Engineer, the recompaction of the crushed or milled asphalt surface shall be measured on the hour (HR) basis and paid for at the unit price bid for "(Type) Surface Recompaction". The quantity shown in the Bidder's Proposal is for bid purposes only.

SECTION 800

SPECIFICATIONS FOR AGGREGATE BASE AND SURFACE

800-1 DESCRIPTION This item consists of the construction of aggregate bases and surfaces conforming to the lines and grades shown on the Plans and these Specifications.

800-2 MATERIALS The gradation of the aggregate shall meet the following:

	Class 5	Class 13
	Percent Passing By Weight	
Square Mesh Sieve Size	Aggregate Base	Aggregate Surface
1"	100%	100%
¾"	90-100%	70-100%
No. 4	35-70%	38-75%
No. 8		22-62%
No. 30	16-40%	12-45%
No. 200	4-10%	7-15%
Shale	12% max.	12% max.
L.A. Abrasion	50% max.	50% max.
Fractured Faces	10% min.	10% min.

These gradations are intended to meet the current version of the NDDOT Class 5 and Class 13 aggregate gradations.

800-3 CONSTRUCTION REQUIREMENTS

800-3.1 Spreading Unless otherwise directed by the Engineer aggregates shall be spread from equalized windrows.

The initial aggregate layer shall not exceed a 6 inch compacted thickness. Subsequent layers shall not exceed a 3 inch compacted thickness.

Aggregate shall not be spread in snow or on a frozen, soft, or muddy subgrade. Any soft spots which develop in the subgrade shall be repaired by the Contractor.

800-3.2 Finishing and Compacting While the aggregate is being spread, it shall be thoroughly compacted with pneumatic rollers. Rolling shall continue until the aggregate has thoroughly set, voids have been reduced to the minimum, and the aggregate no longer creeps ahead of the roller. Blading and rolling shall be done alternately to obtain a smooth uniform section. Areas inaccessible to a roller shall be tamped with mechanical tampers. Sprinkling of the aggregate may be used to aid in compaction.

After the aggregate has been compacted, the surface shall be at the elevations required by the plans. The surface shall not vary more than 1/2 inch from a 10 foot straight edge.

800-3.3 Maintenance The Contractor shall maintain the aggregate base until such time it has been primed or paved.

The Contractor shall maintain the aggregate surface until the project has been accepted.

800-4 MEASUREMENT AND PAYMENT

800-4.1 Pitrun Gravel Pitrun gravel used to construct a base or surface shall be measured on the square yard (SY) basis and paid for at the unit price bid for "(Depth) Pitrun Gravel".

800-4.2 Aggregate Base Aggregate bases shall be measured on the square yard (SY) basis and paid for at the unit price bid for "(Depth) Aggregate Base".

800-4.3 Aggregate Surface Aggregate Surfaces shall be measured on the square yard (SY) basis and paid for at the unit price bid for "(Depth) Aggregate Surface".

SECTION 1501
SPECIFICATIONS FOR STREET LIGHTS

1501-1. GENERAL CONDITIONS: The intent of this section of the specification and the accompanying drawings is to comply in every respect with the requirements set forth by the National Electric Code, the North Dakota State Electrical Board, the Occupational Safety and Health Act (OSHA), the ordinances established by the City of Williston and the requirements of Montana Dakota Utilities Company. The Contractor shall familiarize himself with all of the above regulations and shall be responsible for insuring that all requirements are met.

In the event that all regulations are not complied with by plans or specifications through omission of equipment, material and methods of installation, or by specification of material, equipment or installation method, the Contractor shall immediately notify the Engineer of the discrepancy prior to bidding. Any required changes will be published in addenda for inclusion in the bid. Any proposed changes to the contract after bid date shall be accompanied with complete substantiating documentation, including take off and pricing sheets, and letters of quotation. Restocking charges shall not apply to any credited material.

The contractor shall guarantee materials, workmanship and the proper operation of equipment for a period of one year after the acceptance of the project by the City of Williston. Contractor shall correct all equipment, material and workmanship found to be defective or non-conforming to the contract documents without cost to the Owner. This guarantee shall not relieve the Contractor from liability arising from improper installation or non-compliance with applicable codes. Costs to repair third party damage to the system shall be the Contractor's responsibility prior to project acceptance and the Owner's responsibility after project acceptance.

1501-2. DESCRIPTION: This work consists of providing new street lighting with underground wiring in designated areas in Williston, ND. Areas are outlined on cover sheet of plans and in advertisement. Portions of the work lay in existing residential and commercial areas and as such the Contractor shall plan and layout his work so as to create the least amount of inconvenience to the residents and businesses.

A. Vehicle and pedestrian traffic into and out of the area must be maintained. Provide all necessary barriers and signs.

B. Contractor shall concentrate on smaller areas within the overall area and complete work and clean up as project progresses.

C. Clean up of area shall be a continuous process with final clean up kept within one block of construction.

D. Street gutters shall be kept free of excavated dirt. Dirt shall be cleaned up immediately and in no case shall dirt be left in gutters overnight.

E. The Contractor shall comply with requirements of the latest edition of the Manual of Uniform Traffic Control Devices.

1501-3. MATERIALS

A. Materials furnished by the Contractor shall include all materials required to install the street lighting, in place as shown on the plans, complete and operating.

B. All materials and equipment shall be new and listed by a Nationally Recognized Testing Laboratory as conforming to its standards in every case where such a standard has been established for the particular item in question.

C. Where items of equipment and/or materials are specifically identified herein by a manufacturer's name, model or catalog number, only such specific items may be used in the base bid. If the Contractor desires to use items of material and equipment other than that named in the base bid, the Contractor or Supplier shall apply in writing to the Engineer for approval of substitution at least 14 days prior to opening of bids. Request shall be in duplicate. Submittals must indicate the specific item or items to be furnished in lieu of those specified together with complete technical data and comparative data on specified items and proposed items.

D. All approved substitute items will be clearly identified in an addenda which will be sent to all bidders well in advance of opening of bids. Only those items listed on the drawings and specifications and those items approved prior to bidding shall be furnished and installed on this project.

E. Where substitute items are used by the Contractor, he shall assume all responsibility for physical dimensions and pay for all changes resulting from the substitutions. This responsibility shall also include all extra work necessitated by other trades as a result of the substitutions.

F. Shop Drawings

1. Before any materials are delivered to the job, submit to Engineer complete shop drawings for each item indicated. Include catalog numbers, performance data, dimensions and other descriptive information. Shop drawings shall be bound together, neatly indexed and tabbed, and stamped, initialed, & dated by Contractor to indicate he has thoroughly reviewed them.

2. Provide shop drawings for: Cable, Conduit, Standards, Luminaires, Pull Boxes, and Feed Points.

G. Record Drawings: as work progresses, Contractor shall mark in red, on a clean set of plans, the actual conditions of installation. Particular attention shall be given to marking locations of feeders and underground runs.

H. Manuals: upon completion of work, compile one Manual in loose-leaf binder. List project name, date, and Contractor’s information on the exterior. Provide indexed and tabbed information on each major piece of equipment. ALSO INCLUDE ALL INSTALLATION, OPERATION AND MAINTENANCE DATA PACKAGED WITH THE EQUIPMENT.

1501-4. FEEDER AND DISTRIBUTION CIRCUITS

A. All feeders and distribution circuits shall be of the multiple type, 120/240 volt, single phase and shall consist of two or three conductors constituting one or two 120 volt circuits. The plans clearly indicate where three wire (2-120 V. circuits) and two wire (1-120 V. circuit) are to be installed.

B. The system shall be laid out as shown on the plans and distribution circuits shall be routed as shown.

C. Individual lamp circuits are to be fused in the base of each lighting standard. See "Post Wiring, Bonding, and Grounding" for requirements. The neutral conductor shall be solidly connected, unfused, throughout the system.

1501-5. UNDERGROUND CABLE AND CONDUCTORS

A. Underground circuit conductors shall be No. 4 stranded copper type for direct burial.

B. Direct burial conductors shall be rated 600 volts. Conductor sheath shall be marked as to voltage, AWG, type (RHH, RHW-2 or USE-2) and manufacturer.

C. Provide No. 6 S.D. bare or insulated (RHH, RHW-2 or USE-2) copper ground conductor between all metal poles and associated feed points. Bond all metal components of the system.

D. Conductors shall be continuous from pole base to pole base or from feed point to pole base. Splicing conductors underground will not be allowed without specific approval of the Engineer. Conductor to be placed in trench, minimum of 24 inches below grade. (Exceptions: 48 inches between MDU power source and feed point.)

E. All conductors to be routed into and out of pole base.

1501-6. LAYING OF CABLE: IN TRENCH AND/OR IN CONDUIT

A. Underground direct burial distribution circuits, consisting of single conductor cables, quantity and sizes designated on the drawings shall be installed in conduits crossing streets and drives and when rising up into feed point.

B. Conductors (installed direct burial or in conduit) shall be installed to a depth of not less than 24 inches below finished grade. Under streets, drives and sidewalks, conductor shall be installed not less than 24 inches below underside of concrete, asphalt or hard surface.

C. Provide 2" conduit under existing hard surfaced sidewalks, driveways, streets and alleys by jacking rigid galvanized steel conduit or installing non-metallic Schedule 40 (PVC) conduit with "mole" or drilling device. Conduits to extend 12 inches beyond each side of the surface. Rigid conduit to be complete with plastic bushings; PVC conduits to be complete with bell end fittings. Conduits under gravel or dirt streets to be laid in trench a minimum of 24 inches below grade.

D. If an obstruction is encountered when "jacking", "drilling" or "moling" conduit under a concrete or asphalt street, driveway, alley or sidewalk or for any other reason it becomes impractical to install the conduit in this manner, the Engineer or his authorized representative may grant the Contractor permission to cut the street, driveway, alley or sidewalk with a concrete saw so conduit can be trenched into place. The width of the concrete or asphalt to be removed and the depth of the saw cutting shall be performed as directed by the Engineer or his authorized representative. No extra payment will be made for cutting the concrete or asphalt. Cost of installing conduit by this method shall be included in the price for "2 Inch Conduit Jacked or Pulled in Place". Street "cuts" shall not be started until permission is granted by the Engineer - in writing.

E. Where conduits cross streets, drives, sidewalks, etc., a maximum of six No. 4 conductors may be installed in a single 2 inch conduit, plus grounding conductor when required.

F. Conduit shall be sloped to provide drainage. Provide a sand pocket at lower end.

G. PVC conduit ends shall be terminated with bell type fittings. Close up conduit by inserting a loose stopper plug of "dry oakum" or similar material to prevent earth from entering the conduit.

H. 2 inch PVC conduit shall be provided for the risers at the pad mounted feed points. Do not seal lower end of conduits at pole mounted feed points.

I. During installation, the cable shall be handled with care. Do not bend or kink cable to a radius of less than six times cable diameter.

J. All cable run through conduit shall be pulled by hand and shall not be strained in any manner so doing. Provide a slack loop in conductors prior to entering any conduit that rises vertically.

K. The street light branch circuit feeders consist of two 120 volt single pole circuits routed underground from pole to pole. Street lights are alternated on circuits. Both circuits shall be brought up into pole for splicing.

L. Where conduit or pipe is not used, cable shall be packed in sand to provide a cushion and to facilitate drainage in the following manner: Excavate trench to required depth minimum of 27 inches (Exception: 51 inches from feed points to MDU power source) then fill with 3 inches of clean washed sand, leveled and lightly tamped; the three or two single conductor cables shall be laid loosely in the trench and spaced as per drawing detail. Conductor crossovers shall be avoided. Contractor shall use a paddle template just ahead of 3 inch sand cover operation to insure proper spacing. Cover conductors with not less than 3 inches of sand. Sand shall be leveled and lightly tamped about the sides and over the cable. The trench shall then be filled and finished in the regular manner. (See trench detail on plans). Exception "if" the Engineer approves specific excavations as being free of rock and debris, the Contractor may use backfill without sand cushion.

M. In all trenches, provide 6'' wide yellow plastic marker tape 6" below final grade. Tape to read "Caution-Buried Electric Cable". Manufacturer: Blackburn #YT6 or equivalent.

N. Where excavations for cables or conduits are made as above provided, the backfill shall be compacted, in 4 inch lifts or layers, to density as specified under paragraph on "Tamping".

O. This arrangement of circuits requires no splicing of cable underground and splicing will only be allowed in junction boxes, pole bases or feed point cabinet.

1501-7. JUNCTION BOXES

A. Provide Quazite No. PG1324BA18 Junction Boxes with PG1342CA0041 Covers and PG1324EA08 Extensions at locations shown on drawings. Junction boxes to be installed in boulevard. Top of junction boxes to be same elevation as top of adjacent curb or sidewalk. See detail on drawing.

B. Provide slack loop in conductors not being spliced so conductor can be pulled out of junction box to a minimum of 24 inches above ground.

C. Provide Blackburn type USL insulated street lighting connectors for all splicing.

1. No. USL-11 Straight splice
2. No. USL-30 Three conductor splice
3. No. USL-40 Four conductor splice
4. No. USL-50 Five conductor splice
5. No. USL-60 Six conductor splice
6. Tape connector kits with 1/2 lapped layer of rubber or synthetic rubber tape and one layer of scotch 88 for a distance of 1-1/2 inches each side of joint.

1501-8. STREET LIGHT FEED POINT

A. Provide feed point where shown on drawings.

1. Pad mounted feed point. See detail on drawings.

a. Feed point enclosure to be Povolny Specialties or approved equal with two doors front and back. Doors to be complete with locking device utilizing recessed penta head bolt and padlock hasp. Padlocks to be furnished by City. Provide unistrut framing and equipment mounted brackets as required and shown. Enclosure sides and top to be solid - no louvers.

b. Concrete pad to be sized as shown and shall extend a minimum of 6 inches beyond feed point enclosure on all four sides. Provide a 4x4 14/14 wire fabric mesh cut to fit around block outs. Provide 1 inch chamfer all around and down vertical sides to a minimum of 2 inches below grade. Concrete to have a minimum strength of 3000 PSI in 28 days. Minimum of 5.75 bags of cement per cubic yard.

c. Electric panel to be, Cutler Hammer, or Siemens 12 circuit load center without door, rated 120/240 volt with 100 amp two pole main breaker. Provide 40 amp single pole branch breakers as indicated for each 120 volt street light circuit; 20 amp single pole breaker for receptacle, and 15 amp single pole breaker for control circuit. Paint handle of 15 amp breaker red.

d. Street light relays to be RCOC type MR-UD No. 6342 (N.O. contact). Control voltage to be 120 volt. Provide one relay for each three wire 120 volt street light circuit.

e. Provide a single pole 3 position switch (1900 box and raised switch cover). Switch to be connected into control circuit to bypass time clock for daytime test or select photocell operation. Provide engraved name plate.

f. Provide 1/2 inch by 10 foot ground rod in blocked out area below cabinet. Bond all conduits, relay cabinets, electric panel cabinet, enclosure and neutral.

g. Provide button style photocell as back up control. Photocell shall be Paragon LB series or equivalent. Mount to North side of feed point enclosure.

h. Street lights to be controlled by Tork Model EWZ101/120V Time Clock. Control shall have non-volatile program and time-of-day memory.

i. Provide Nema 5-20 GFCI duplex receptacle (1900 box and raised cover).

j. Exact field location of feed point to be determined by the Engineer.

2. Service.

a. Provide pad mount transformer, KVA rating as per specifications, 12470 ground wye/7200 V. to 120/240 V., single phase three wire, similar to RTE OISC distribution transformer with load break elbow connector and bayonet fuse. Service to be 2 inch conduit with three No. 2 type USE conductors.

b. Provide high voltage service from pad mounted transformer to connection point on MDU power pole. Conductor type UD-P No. 4, XLP-90° C., - 15 KV grounded neutral, aluminum conductor with copper strand 100% neutral and overall PVC jacket. Encase conductor in 2 inch rigid steel conduit from terminal on pole to pad mount. Provide conduit standoffs on MDU pole. Ground conduit at pole and at feed point. Provide pole mounted PSC cable terminal on MDU pole and terminate cable as per manufacturers instructions. Provide and turn over to MDU for installation by MDU personnel, one 9 KV arrester (Joslyn No. J9231-QS/300) and one open type fuse cutout similar to Joslyn No. J9234-2J complete with fuse.

OR

c. Provide 120/240 volt single phase service from serving utility transformer. Service conductors shall be three #2 AWG type USE conductors installed

direct bury between feed point and transformer Enclose conductors in 2" conduit within feed point. Service conductors shall be in trench separate from street light circuits. Provide meter socket and utility company transformer pad as required. Coordinate with utility company.

d. All costs associated with installing service conductors and any transformer/utility requirements shall be included with feed point Bid Item.

1501-9. STREET LIGHT STANDARD FOUNDATIONS

A. Foundations for Steel Galvanized Standards—Type A and C series Concrete base for metal standards shall be installed as per detail on drawing. Bases to be complete with anchor bolts, rebar and conduit stub-in and ground rod. (1/2 inch by 10 feet). Concrete to be minimum of 3000 PSI strength at 28 days.

B. Foundation for Butt Type Concrete Standards—Type B and D series A concrete trim ring of dimensions shown in detail on the plans shall be constructed around the base of the butt type concrete standard. A bearing pad, 6 inches thick to be provided in bottom of hole as shown. No extra payment will be made for this item. All costs of constructing the concrete rings and pads shall be included in the price bid for furnishing and installing street light standards. The concrete to be used in the construction of the concrete rings and pads shall be 3000 pound concrete with a minimum of six bags of cement per cubic yard of concrete and shall conform to all respects to the City's specifications for sidewalks, curbs and gutters where it applies. Provide 1/4 inch expansion joint between poles and trim rings. Provide 1/2 inch expansion joint between base and sidewalk.

Base excavations shall be backfilled with a dry mix consisting of 1 part cement and 15 parts clean washed sand. The dry mix shall be wet compacted by thoroughly tamping at 1 foot intervals. Cement to be type II/III cement.

1501-10. STREET LIGHT STANDARDS

A. Steel Galvanized Standards - Type A and C series

1. Steel light standards shall be of one or two piece construction. Galvanizing shall be in accordance with ASTM A-123. The shaft shall have only one longitudinal weld and shall have a minimum yield strength of 50,000 PSI. Shaft may be round or octagonal.

2. The Davit type mast arm shall be constructed of one piece galvanized steel material. Mast arm shall have a tenon adaptor for luminaire mounting.

3. The anchor shall be a one piece steel casting secured to the lower end of the shaft by two continuous welds. One weld shall be inside the base at the bottom of the shaft and the other shall be on the outside of the shaft at the top of the anchor base. The welded connection shall develop the full strength of the adjacent shaft section. The anchor base shall be complete with bolts, washers, shims and bolt covers with cap screws for attaching covers to base. Grounding lug to be provided inside of base.

4. A hand hole shall be provided in shaft opposite the roadside of pole. Hand holes to be a minimum of 4 inches by 6 inches with reinforced frame and removable cover. Cover to be secured in place with tamper proof screws. Provide the City with a minimum of six tamper proof screw removal tools.

B. Concrete Butt Type Standards - Type B series

1. All concrete street light standards shall be prestressed spun concrete of the precast butt type and shall be set as shown on plans with the hand hole and cable entrance hole facing away from the roadway. Poles shall have gray acrylic finish with 6' galvanized steel tenon bracket and extra support brace to provide a mounting height of 29'+. Poles to be complete with decorative top cap, hand holes, and cover with tamper proof screw. Provide the City with a minimum of six tamper proof screw removal tools.

2. Manufacturer: Ameron #MEO8.5-MOSC6/Brace-113-Fin or approved equal.

C. Decorative Type Standards - Type D series

1. All concrete street light standards shall be prestressed spun concrete of the precast butt type and shall be set as shown on plans with the hand hole and cable entrance hole facing away from the roadway. Poles shall have gray acrylic finish with 3" O.D. tenon to provide a mounting height of 14'. Poles to be complete with hand holes and cover with tamper proof screw. Provide the City with a minimum of six tamper proof screw removal tools.

2. Manufacturer: Ameron #SER4.3-W3-113 or approved equal.

D. Decorative Type Standards – Type H series

1501-1. STREET LIGHT LUMINAIRES

A. Type A, B and C Luminaires

1. Luminaires shall consist of a cast aluminum head with integral quick disconnect ballast module and borosilicate glass optical assembly. Lamp socket shall be adjustable. Refer to drawings for lamp wattage and IES distribution. Head shall be furnished with adjustable 2 inch slip fitter for ±5° horizontal mounting.

2. Type A and B: General Electric #M2AR series
American Electric Lighting #315 series

3. Type C: General Electric #MDRA series
American Electric Lighting #325 series

B. Type D Luminaire

1. Decorative post top type with cast aluminum housing, integral ballast, 100W lamp, and borosilicate glass optical assembly for Type III distribution.

2. Holophane #PTU100HP12BG3B or approved equal.

C. Type H Luminaire

1. Decorative post top ……..

2. Sterner # ……

D. High Pressure Sodium lamps to be clear:
General Electric, Sylvania or Phillips
100W— 9500 lumens
150W—16000 lumens
250W—28000 lumens
400W—51000 lumens

E. The HPS ballasts shall be of a high power factor, regulator type, 120 volt with ±10% voltage variation and suitable for cold weather starting at an ambient temperature of -30°F. Provide data listing start and normal operating currents.

1501-2. POST WIRING, BONDING AND GROUNDING

A. All post wiring between cable or neutral wires, and the luminaires or convenience outlet, shall be No. 12 A.W.G. (copper) stranded, (THWN/THHN) 600 volt cable of the same type specified for the underground distribution circuits.

B. In each post, one feeder lead (hot wire) and one neutral wire shall be run from the cable in the base to each luminaire.

C. The feeder leads to the luminaire shall extend from the cable in the post base through a Buss type HEB in line fuse holder with a type FNM 10 ampere fuse. The fuse housing shall be supported by the conductors at the level of the post hand hole. Tape fuse kits with half-lapped layer of scotch 88 for a distance of 1-1/2 inches each side of joint with conductor. Sufficient excess conductor length shall be provided to permit withdrawal of the fuse holder through the hand hole for purposes of fuse installation and inspection. The neutral wire shall not be fused.

D. Ground all metal standards. Bond to ground conductor and to ground rod.

1501-3. REPAIRS TO ALLEYS, DRIVEWAYS, SIDEWALKS AND STREETS

A. Where the work requires the removal of asphalt or concrete surfacing, the surfacing shall be cut full depth with a concrete saw to the dimensions determined by the Engineer. Concrete may be removed to the nearest control joint with out cutting. No extra payment will be made for the cutting and removal of asphalt or concrete surfacing.

B. Where concrete surfacing has been removed to install the work, the contractor shall replace the concrete to its original thickness using 4,000 psi concrete.

C. Where asphalt surfacing has been removed to install the work, the contractor shall replace the asphalt by installing a 4” concrete base patch surfaced with 2” of hot bituminous asphalt. When hot bituminous asphalt is not available the City will make available cold mix at cost.

D. Where gravel surfacing has been removed to install the work, the contractor shall replace the removed gravel with 6” of new gravel surfacing.

1501-4. TAMPING

A. The use of muck, quicksand, rock, soft clay, spongy or perishable materials for earth fill in trenches is prohibited even though such materials may have been excavated from the trench.

B. Tamping when stated in these specifications shall mean compacting by approved methods to 90% of maximum dry density at optimum moisture in accordance with A.S.T.M. D1577 when under future pavement or concrete. Otherwise, when under the boulevard or other grass areas, the disturbed areas shall be compacted to 80% of maximum dry density at optimum moisture. Tamping backfill shall be completed in 4 inch lifts.

1501-5. MEASUREMENT AND PAYMENT

A. Street Lights

Street Lights shall include street light standard and foundation, trim rings, luminaire with ballast and lamp, wiring and the fused connections to the underground circuits.

Street Lights shall be measured on an Individual (Ea) Basis and paid for at the unit price bid for “Type (__) Street Lights w/ (__)W Luminaire”, complete, in place and accepted by the Engineer.

B. 2 Inch Conduit

2 Inch Conduit shall consist of 2 inch schedule 40 PVC conduit, pulled in place by use of "Mole" or drill at proper depth, sloped for drainage complete with bushings each end and extending 12 inches beyond each side of a hard surfaced roadway, alley, driveway or sidewalk and includes all excavation, backfill, hard surfacing cutting and removal necessary to complete the work.

2 Inch Conduit shall be measured on the Linear Foot (LF) Basis and paid for at the unit price bid for “2 Inch Conduit” complete, in place and accepted by the Engineer.

C. Trenching

Trenching shall include all excavation, sand cushion and backfill required for conductor trenches.

Trenching shall be measured on the Linear Foot (LF) Basis and paid for at the unit price bid for "(__)" Deep Trenching complete, in place and accepted by the Engineer.

D. Copper Circuit Conductors

Copper Circuit Conductors shall consist of the installation of the type and size of conductors, including ground wires necessary to complete a circuit as laid out and called for on the plans including all connections and splices at light poles, junction boxes and feed points.

Copper Circuit Conductors shall be measured on the Linear Foot (LF) Basis from center line to center line of poles, feed points and junction boxes and paid for at the unit price bid for "(__) Circuitry" complete, in place and accepted by the Engineer. The Contractor shall make allowance for necessary conductors in and out of poles, junction boxes and feed points in unit price.

E. Junction Boxes

Junction Boxes shall include the box, excavation, gravel base and backfill required to install Junction Boxes.

Junction Boxes shall be measured on the Individual (Ea) Basis and paid for at the unit price bid for "Junction Boxes" complete in place and accepted by the Engineer.

F. Feed Points

Feed Points shall include the provision and installation of the following:

1. Concrete Pad
2. Enclosure
3. Panel & Circuit Breakers
4. Relays
5. Test Switch
6. Transformer
7. Photo Cell & Time Clock
8. Receptacle
9. Control Circuit
10. Time Switch
11. High Voltage Service
12. And all other components specified.

Feed Points shall be measured on an Individual (Ea) Basis and paid for at the unit price bid for "Feed Point" complete, in place and accepted by the Engineer.

G. Concrete Replacement

Concrete Replacement includes the sawing, removal and disposal of existing concrete surfacing and the replacement of the removed concrete to its original lines, grades, depth and elevation. Unless the plans specifically call for the removal and replacement of concrete the quantity listed in the proposal is for pricing purposes to be used only if concrete removal might become necessary.

Concrete Replacement will be measured on the Square Foot (SF) Basis and paid for at the unit price bid for “Concrete Replacement” complete, in place and accepted by the Engineer.

H. Asphalt Replacement

Asphalt Replacement includes the sawing, removal and disposal of existing asphalt surfacing and the replacement of the removed asphalt with a 6” concrete base patch and 2” asphalt surface patch to the original asphalts lines, grades and elevation. Unless the plans specifically call for the removal and replacement of asphalt the quantity listed in the proposal is for pricing purposes to be used only if asphalt removal might become necessary.

Asphalt Replacement will be measured on the Square Foot (SF) Basis and paid for at the unit price bid for “Asphalt Replacement” complete, in place and accepted by the Engineer.

1600

Required City Issued

"Sewer and Water Installers" or "Master Plumber" License

City Ordinance No. 726 requires that Water and Sewer Systems be installed by or under the direct supervision of an individual holding a CITY ISSUED Sewer and Water Installers License or Master Plumber.

License requirements and application forms are available at the Building Official's office located at:

City Hall
22 East Broadway
PO Box 1306
Williston ND 58802-1306
Telephone: 701-577-8115
Fax: 701-577-8880

A Sewer and Water Installers License or a Master Plumber License issued by the North Dakota State Plumbing Board and a Certificate of Liability Insurance are requirements of the license application. It may take up to four weeks for the license application to be processed and issued by the City Commission.

Contractors and their subcontractors shall submit copies of their City issued Sewer and Water Installers or Master Plumbers Licenses prior to award of the contract.