FREDERICK COUNTY DIVISION OF UTILITIES AND SOLID WASTE MANAGEMENT
GENERAL CONDITIONS
AND
STANDARD SPECIFICATIONS
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GENERAL CONDITIONS

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GENERAL CONDITIONS

Article 1: DEFINITIONS

1.1 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.

1.2 The masculine gender shall include the feminine and neuter genders and vice versa as the context shall require.

Addenda- Written or graphic instruments issued prior to the Award of the Contract which modify or interpret the Contract Documents, Drawings and Specifications by additions, deletions, clarifications or corrections.

Approval- Written approval by the Engineer.

Award – The decision of an owner/agent to accept the proposal of the lowest responsible bidder for the work. Subject to the execution and approval of a satisfactory contract and bond to secure the performance of the work to such conditions as may be specified or otherwise required by law.

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

Bidder – Any person, firm or corporation submitting a Bid for the Work.

Bonds – Bid Bond, Performance Bonds, Labor and Material Payment Bonds, Maintenance Bonds, and other instruments of security furnished by the Contractor and his surety in accordance with the Contract Documents.

Calendar Day – Every day shown on the calendar, Saturday, Sunday and Holiday included.

Change Order – A written order to the Contractor approved by the County 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 or Contract Time.

Conditional Acceptance – See Article 20, subparagraph 20.1.

Construction Manager – The representative of the County, with the authority to inspect, approve payments, process change orders, who administers the contract during construction of the project.

Contract Documents – A set of documents issued by the County for the

Project which includes the Invitation to Bid, Information for Bidders, Bid Bond, Bid Form, Supplementary General Conditions, Special Conditions, Special Provisions and other forms and attachments.

Contract Price – The total monies payable to the Contractor under the terms and Conditions of the Contract Documents.

Contract Time – The specific date or the number of days stated in the Bid Form for the completion of the Work, starting from the Notice to Proceed until Conditional Acceptance of the Project.

Contractor – The person, firm or other entity whose bid for the work has been accepted and has entered the Contract with the Board of County Commissioners of Frederick County to perform the work. This term shall also mean the contractor's representative.

County – Frederick County, Maryland Government

County Commissioners – Board of County Commissioners

Day – A calendar day of 24 hours lasting from midnight one day to midnight the next day.

DPW – Division of Public Works of Frederick County.

Drawings – The part of the Contract Documents which show the characteristics and scope of the Work to be performed and which have been prepared by or for the County. The terms is used interchangeably with the work "Plans" and includes Standard Details bound with the Specifications.

Easement – A grant of right of use of the property of an owner for a certain purpose at the will of the grantee.

Engineer – The Chief Engineer, of the Frederick County Engineering Department or his duly authorized representative, such representative acting within the scope of the particular duties assigned to him or of the authority given him.

Engineering Department – Frederick County Engineering Department.

Environmental Pollution – The presence and action of physical, chemical, biological, and human agents that adversely affect individual and community health and welfare; unfavorably alter or destroy ecosystems of importance to man; or degrade significant aesthetic and recreational values.

Equal – Where a product or system is specified in the Contract Documents by one, two ore more trade names followed by the phrase "or

equal" the "or equal" will be determined by the Engineer.

Field Order – A written order issued by the Engineer to the Contractor during construction effecting a change in the Work not involving an adjustment in the Contract Price or an extension of the Contract Time or a directive to conform to the terms of the Contract.

Final Acceptance – The act of accepting those portions of the project after the one year guarantee period from the Conditional Acceptance Date.

Granular Material – A form of uniformly graded crusted stone or gravel as more particularly specified in the various sections herein and in the drawings in the Standard Details.

Inspector – The authorized representative of the Engineer assigned to make detailed inspection of any or all portions of the Work or Materials therefor.

Notice of Award – The written notice of the acceptance of the Bid from the County to the successful Bidder.

Notice to Proceed – Written communication issued by the County to the Contractor authorizing him to proceed with the Work and establishing the dates of commencement and completion of the Work.

Project – The undertaking to be performed as provided in the Contract Documents.

Punch List – A list, made near the completion of work, indicating items to be furnished or work to be performed by the Contractor or subcontractor in order to complete the work as specified in Contract Documents.

Rock – Any indurated material that, in the judgment of the Engineer/Inspector, requires drilling, wedging, blasting or other method of brute force to excavate. (See Section 2200).

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

Special Conditions – General requirements which are unique to a particular Contract supplementing, modifying or deleting items cover in Division 1 of the Standard Specifications.

Special Provisions – Technical requirements which are unique to a particular Contract supplementing, modifying or deleting items covered in the various Sections of Divisions 2 through 15 of the Standard Specifications. The Special Provisions for each Specification are

delineated separately by the Section number which it supplements, modifies or deletes, or they appear as new Sections with a corresponding new Section Number.

Specifications – Invitation to Bid, Information for Bidders, Special Conditions, Standard Specifications, Special Provisions and Bid Form.

Standard Details – Engineering Department details showing standard products, methods and materials for use on Public Water and Sewer systems.

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. Subcontractor shall not mean supplier.

Supplemental General Conditions – Modifications to General Conditions required for the Project.

Supplier – Any person or organization who supplies materials or equipment for the work (including that fabricated to a special design), but who does not perform labor at the site.

Work – Any and all obligations, duties and responsibilities necessary to the successful completion of the project assigned to or undertaken by the Contractor under the contract documents, labor, materials, equipment and other incidentals and the furnishing thereof.

Written Notice – Any notice to any party of the Contract relative to any part of the Contract in writing and considered delivered and the service thereof completed when posted by mail to the said party at his last given address, or delivered in person to said party or his authorized representative of the Project.

Article 2: ADDITIONAL INSTRUCTIONS AND DETAIL DRAWINGS

2.1 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.

2.2 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.

Article 3: SCHEDULES, REPORTS AND RECORDS

3.1 The Contractor shall submit to the Engineer such schedule of quantities and costs, construction progress schedules, payrolls, breakdown of lump sum items, reports, estimates, records and other data where applicable, as are required by the Contract Documents. See Sections 1100 and 1200.

Article 4: CONTRACT DOCUMENTS

4.1 The intent of the Contract Documents 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.

4.2 In resolving conflicts, errors and discrepancies within the Contrat Docuemnts, the Documents shall be given precedence in the following order:

Field Orders
Change Orders
Addenda
Supplemental General Conditions
Specifications
General Conditions
Drawings
Standard Details

Anything mentioned in the Specifications and not shown in the Drawings or shown on the Drawings and not mentioned in the Specifications shall be of like effect as if shown or mentioned in both. Figure dimensions on Drawings shall govern over scale dimensions and detailed Drawings shall govern over general Drawings.

4.3 Any discrepancies found between the Drawings and Specifications or any inconsistencies or ambiguities in the Drawings or Specifications shall be immediately reported to the Engineer, who shall promptly correct such inconsistencies or ambiguities in writing. Work done by the Contractor after his discovery of such discrepancies, inconsistencies or ambiguities prior to corrections directed by the Engineer shall be done at the Contractor's risk.

Article 5: SHOP DRAWINGS

5.1 The Contractor shall provide Shop Drawings as may be necessary for the prosecution of the Work as required by the Contract Documents. See Section 1200.

Article 6: MATERIALS, SERVICES AND FACILITIES

6.1 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, light, power, transportation, supervisions, 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. See Sections 1000 and 1800.

6.2 Materials and equipment shall be so stored as to ensure 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 ready inspection. Provide temporary fence where required.

6.3 Manufactured articles, materials and equipment shall be stored, applied, installed, connected, erected, used, cleaned and conditioned as directed by the manufacturer, and as approved by the Engineer. Mechanical and electrical equipment delivered to the job site shall be stored under roof or other approved covering, on pedestals above the ground. All enclosures for equipment shall be weatherproof. Any motors which are not totally enclosed, that are involved in the work, shall be stored in a heated area with a minimum temperature of 50 degrees F. All valves shall be stored under roof on wood pedestals above ground. The Contractor shall follow all written instructions and recommendations of the manufacturer and all requirements of the Engineer in oiling, protection and maintenance of equipment during storage.

6.4 Materials, supplies and equipment shall be in accordance with samples, shop drawings and catalogue cuts submitted by the Contractor and approved by the Engineer.

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

6.6 All work included in this Contract shall be performed in a skillful and workmanlike manner. The Contractor shall employ no plant, equipment, materials, methods or persons to which the Engineer objects, and shall remove no plant, equipment or other facilities from the site of the work without permission fo the Engineer. The Contractor's failure to comply with these requirements will constitute a Breach of Contract and, as such, may result in the dismissal of the contractor by the County.

6.7 The Contractor shall submit to the Engineer an invoice for each moveable item furnished, including tools, office furniture and equipment and laboratory equipment.

Article 7: INSPECTION AND TESTING

7.1 All materials and equipment used in the construction oft eh Project shall be subject to adequate inspection and testing in accordance with generally accepted standards as required and defined in the Contract Documents. See Section 1100.

7.2 If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any work to be specifically inspected, tested or approved by someone other than the Contractor, and/or the County, the

Contractor shall give the Engineer three (3) working days notice of readiness. The Contractor shall then furnish the Engineer the required certificates of inspection, testing or approval.

7.3 Inspection, tests or approvals by the Engineer or others will not relive the Contrctor from his obligations to perform the Work in accordance with the requirements of the Contract Documents.

7.4 The Engineer and his representatives will at all times have access to the Work. In additional, authorized representatives and agents of any participating Federal, State or local agency shall be permitted to inspect all work, materials, payrolls, records of personnel, invoices of materials and other relevant data and records. All such records shall remain available and accessible during the performance of the Contract and until three (3) years from the date of Final Payment, or, in case of dispute, for a period of three (3) years after resolution of said dispute, which ever is later. The Contractor shall provide proper facilities for such access and observation of the Work and also for any inspection or testing thereof.

7.5 If any work is covered without the approval of the Engineer or contrary to requirements elsewhere in the Contract Documents, it must, if requested by the Engineer, be uncovered for his observation and recovered all at the Contractor's expense.

7.6 if the Engineer considers it necessary or advisable that approved covered work be inspected or tested by others, the Contractor , at the Engineer's request, shall uncover, expose or otherwise make that portion of the work available for observation, inspection or testing as the Engineer may require by furnishing all necessary labor, materials, tools, and equipment. IF it is fond that such work is defective, the Contractor shall bear all the expenses of such uncovering, exposure observation, inspection and testing 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 will be issued.

Article 8: SUBSTITUTIONS

8.1 Substitutions will be allowed within the parameters set forth elsewhere in the Contract Documents. See Section 1700.

Article 9: PATENTS

9.1 The Contractor shall pay all applicable royalties and license fees. He shall defend all suits or claims for infringement of any patent rights and save the County harmless from loss on account thereof, except that the County will be responsible for any such loss when a particular process, design or the produce of a particular manufacturer or manufacturers as specified is an infringement of a patent. He shall be responsible for such loss unless he promptly gives such information to the Engineer.

Article 10: SURVEYS, PERMITS, REGULATIONS

10.1 Unless otherwise specified, the Engineer will furnish all boundary surveys and establish all baselines for locating the principal component parts of the Work together with suitable number of benchmarks adjacent to the Work as shown in the Contract Documents. See Section 1000.

10.2 Permits and licenses of a temporary nature necessary for the prosecution of the work, such as plumbing and electrical permits, shall be secured and paid for by the contractor unless otherwise stated in the Contract Documents. Permits, licenses and easements for permanent structures or permanent changes in existing facilities shall be secure and paid for by the County unless otherwise specified.

10.3 The Contractor shall give all notices and comply with all permits, laws, ordinances, rules and regulations bearing on the conduct of the work as drawn and specified. If the Contractor observes that the Contract Docuemtns are at variance therwith, he shall promptly notify the Engineer in writing and any necessary changes shall be adjusted as provided in Article 13/Changes in the Work.

10.4 If any permit, license, or certificate expires, or is revoked, terminated or suspended as a result of any action on the part of the Contractor, he shall not be entitled to any additional compensation, nor will he be entitled to an extension of the Contract time.

10.5 Permits obtained by the County for this Project are listed in the Special Conditions and those not bound therewith are available for inspection in the County office.

Article 11: PROTECTION OF WORK, PROPERTY AND PERSONS

11.1 The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work in accordance with the MOSHA regulations. A MOSHA inspector shall be allowed to enter the job site without delay. He shall take all necessary precautions for the safety of, and shall 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.

In case of suspension of work for any cause whatever, the Contractor shall be responsible for the Project and shall take such precautions as many be necessary to prevent damage to the Work, provide for proper drainage and shall erect any necessary temporary structures, signs, or other facilities at his expense. During such period of suspension of work, the Contractor shall

properly and continuously maintain in acceptable growing condition, all living material in newly established plantings, seedlings, and sodding furnished under this Contract, and shall take adequate precautions to protect new growth and other important growth against injury.

11.2 The Contractor shall comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction. He shall erect and maintain, as required by the conditions and progress of the work, all necessary safeguards for safety and protection. He shall notify owners of adjacent utilities that prosecution of the work may affect them. See Section 1010.

11.3 In emergencies affecting the safety of persons or the work or property at the site or adjacent thereto, the Contractor shall act, at his discretion, to prevent threatened damage, injury or loss. Any additional compensation or extension of time claimed by the Contractor on account of emergency work shall be determined as provided in Articles 13 and 14.

11.4 When the Engineer has been notified by others of emergency situations requiring, in his opinion, immediate attention and rectification, the Engineer will so notify the Contractor. Should the Contractor not commence work to rectify the situation within one hour after notification, the County may have the required work performed and deduct the costs thereof from monies owed the Contractor.

Article 12: SUPERVISION BY CONTRACTOR

12.1 The Contractor shall supervise and direct the work. He shall be solely responsible for the means, methods, techniques, sequences and procedures of construction. The Contractor shall 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 regardless of the scope of the work. The supervisor shall have full authority to act on behalf of the Contactor and all communications given to the supervisor shall be bending 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 as determined by the Engineer.

Article 13: CHANGES IN THE WORK

13.1 Without invalidating the Contract, the Engineer may, at any time or from time to time, by written order, and without notice to the sureties, order additions, deletions or revisions in the work. These will be authorized by Change Orders. Upon receipt of the Change Order, the Contractor shall promptly and diligently proceed with he work involved. If any Change Order causes an increase or decrease in the contract price or scope of the work, or an extension or shortening of the contract time, an equitable adjustment will be made within the Change Order.

The Engineer may, at the request of the Contractor, issue interpretations, clarifications and other instructions as to the intent of the Contract Documents, in

the form of Field Orders. Upon receipt of such a Field Order containing interpretations, clarifications and other instructions, the Contractor shall proceed with the work and comply with the Field Order.

13.2 The Engineer 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 changes in the work so ordered by the Engineer and should the Contractor believe that such Field Order entitles him to a change in Contract Price or Time, or both, he shall give the Engineer Written Notice thereof within seven (7) days after the receipt of the Field Order. Thereafter, the Contractor shall document the basis for the change in Contract Price or Time within thirty (30) days. Failure by the Contractor to so proceed shall constitute a waiver of claim for additional compensation or extension of the Contract Time. Request for a Change Order arising out of a Field Order will not be considered without the attachment there to of a copy of the referenced Field Order. No claim by the Contractor will be allowed if asserted after Final Payment under this Contract.

Article 14: CHANGES IN CONTRACT PRICE AND TIME

14.1 The Contract Price and Time may be changed only by a Change Order. The change in the Contract Price or the commitment to pay same shall be determined in the manner provided herein, in the following order of precedence:

a. An agreed lump sum

b. An Agreed Unit price

14.1.1 The contractor shall be allowed to add the following maximum percentages for overhead and profit to his costs for labor, materials and equipment:

1) 20% may be added by the subcontractor for overhead and profit for work performed by his own forces.

2) 15% may be added by the subcontractor for overhead and profit for work performed by the subcontractor; the Contractor may add an additional 5% of the subcontractor's costs for labor, material and equipment.

3) The provisions of paragraphs 1 and 2 above apply only to price adjustments negotiated prior to completion of the added or changed work.

14.2 Extensions of time, when granted, will be based upon the effect of delays to the Work as a whole. Extensions of time will not be granted for non-controlling delays to minor included portions of work unless it can be shown that such delays did, in fact, delay the progress of the Work as a whole. Extensions of time will not be granted until such time as the County is satisfied they are appropriate and justified.

14.3 Unauthorized Work

Any work which may be done by the Contractor prior to receipt of the notice to proceed, work done contrary to or regardless of the instructions of the Construction Manager, work done beyond the lines and grades shown on the contract drawings, or as given, or any extra work done without written authority will be considered as unauthorized and at the expense of the Contractor

Article 15: TIME FOR COMPLETION AND LIQUIDATED DAMAGES

15.1 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 the date specified in the Notice to Proceed.

15.2 The Contractor shall proceed with the work at such rate of progress to ensure full completion within the Contract Time. It is expressly understood and agreed by and between the Contractor and the County that the Contract Time for the completion of the work described herein is a reasonable time, taking into consideration the average climate and economic conditions and other factors prevailing in the locality of the work.

15.3 If the Contractor should fail to complete the work within the Contract Time, or extension of time granted by the County, then the Contractor shall pay to the County the amount of liquidated damages as specified bellow for each calendar day that the Contractor shall be in default after the time or date stipulated thereon; and the County may deduct the same from monies due from current progress payments or to become due to the Contractor otherwise.

a. Original Contract Amount

From More Than	To and Including	
$ 0	$ 100,000	$150.00/Calendar Day
$ 100,000	$ 300,000	$300.00/Calendar Day
$ 300,000	$1,000,000	$400.00/Calendar Day
$1,000,000	or more	$500.00/Calendar Day

15.3.1 Should the Contractor abandon performance of the work, the County shall have the right to complete the work with its own or other forces, and the liquidated damages provisions set forth herein as well as other provisions of the Contact shall remain in effect; and such liquidated damages provisions shall not be construed to be a substitute for damages caused by increased cost to the work, but shall be compensatory only for delay in completion of the contract.

15.3.2 This paragraph does not exclude the recovery of damages for delay by either party under other provisions of the Contract Documents.

15.4 The Contractor will 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 given Written Notice of such delay to the Engineer within seven (7) days of the occurrence.

15.4.1 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 County Engineering Department, acts of another Contractor in the performance of a Contract with the Engineering Department, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and unusually severe weather so documented by the Contractor.

15.4.2 To any delays of Subcontractors occasioned by any of the causes specified in Paragraph 15.4.1 of this article.

15.5 No claim by the Contractor for extension of time will be allowed based on work performed under Change Order which increases or decreases the amount due under the Contract Documents unless a time extension is granted pursuant to Article 14.2 as part of the Change Order.

Article 16: CORRECTION OF WORK

16.1 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 County and shall bear the expense of making good all work of other Contractors destroyed or damaged by such removal or replacement.

16.2 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 (10) days after receipt of Written Notice, the County Engineer may remove such work and store the materials all at the expense of the Contractor.

16.3 Any work which may be done or materials ordered by the Contractor prior to receipt of the Notice to Proceed, incorporation of previously rejected work, work done contrary to or regardless of the instructions of the Engineer, extra work performed without written authority from the Engineer, work done beyond the limits shown on the Plans, except as herein specified or any extra work done without written authority from the Engineer, will be considered as unauthorized and many not be paid for. Work so done may be ordered removed ore placed at the Contractor's expense.

Article 17: CHANGED CONDITIONS

17.1 The Contractor shall, within seven (7) days, and before such conditions are disturbed, except in the event of an emergency, notify the Engineer by Written Notice of:

17.1.1 Subsurface or latent 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.

17.2 The Engineer will promptly investigate the conditions, and if he finds that such conditions do materially so differ and cause an increase or decrease in the cost of , or in the time required for performance of the work, an equitable adjustment will be made and the Contract Documents will 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 Engineer may, if he determines the facts so justify, consider and adjust such claims asserted before the date of final payment.

Article 18: SUSPENSION OF WORK TERMINATION AND DELAY

18.1 The Engineer may order the Contractor in writing to suspend, delay, or interrupt all or any part of the Work for such period of time as he may determine to be appropriate for the convenience of the County.

18.1.1 No claim under this article shall be allowed (1) for any costs incurred more than seven (7) days before the Contractor shall have notified the Engineer in writing of the act or failure to act involved (but this requirement shall not apply as to a claim resulting from a suspension order, and 92) unless the claim, in an amount stated, is asserted in writing as soon as practicable after the termination of such suspension, delay or interruption, but not later than the date of final payment under the Contract.

18.2 If the Contractor is adjudged as 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, of 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 for labor, materials or equipment, or if he refuses or fails to prosecute the Work or any separable part thereof, with such diligence as will ensure its completion within the Contract Time, or if he fails to complete said work within said time, or if he disregards laws, ordinances, rules, regulations, directions or orders of any public body having jurisdiction over the Work or if he disregards the authority of the Engineer, or if he otherwise violates any provision of the Contract Documents, then the County may, without prejudice to any other right o remedy and after given the Contractor and his surety a minimum of ten (10) 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 it may deem expedient. In such case, the Contractor will not be entitled to receive any future 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 will be paid to the Contractor except that the maximum payment will not exceed 10% of the original contract. If such costs exceed such unpaid balance, the Contractor shall pay the difference to the County. Such costs incurred by the County will be determined by the Engineer and incorporated in a Change Order.

18.3 Termination of the Contract for any of the above-listed causes, including delinquency of the Contractor during restoration may result in disqualification of the Contractor from bidding on future projects for the County.

18.4 Where the Contractor's services have been so terminated by the County, said termination shall not affect any right of the County against the Contractor then existing or which may thereafter accrue. Any retention payment of monies by the County due the Contractor will not release the Contractor from compliance with he Contract Documents.

18.5 After ten (10) days from delivery of a Written Notice to the Contractor, the County 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 expenses sustained therefrom plus reasonable profit for that portion of the work completed at the date of termination.

Article 19: USE OF THE JOB SITE

19.1 The County will have the right to enter the job site for the purpose of doing any work. 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 damaged work except such as may be caused by agents or employees of the County.

19.2 Prior to Conditional Acceptance, the County with the concurrence of the Contractor, may use any completed portion of the work. Such u8se shall not constitute an acceptance of such portions of the work.

Article 20: CONDITIONAL ACCEPTANCE FOR A PORTION OF THE WORK

20.1 Whenever the Engineer determines that a piece of equipment and/or a portion of the work is in an apparent acceptable condition and that placing that piece of equipment and/or portion of work into operation will result in a benefit to the County, that piece of equipment and/or portion of the work shall be tested for issuance of a letter of Conditional Acceptance. Upon issuance of the Letter of Conditional Acceptance by the Engineer, it shall be placed into beneficial operation. The date of Conditional Acceptance shall be the effective commencement date for any guarantee applicable to the specific equipment or work. The Contractor shall be advised of operation and maintenance responsibility for that particular piece of equipment and/or portion of work commencing with the date of Conditional Acceptance.

20.2 All written conditions, if any, in the Letter of Conditional Acceptance are binding

to the Contractor. Failure to comply with such conditions within the time stated therein will be cause for rescission of the Letter of Conditional Acceptance and rescission of commencement of the guarantee. Conditional Acceptance and commencement of the guarantee may be reinstated upon reissuance of a Letter of Conditional Acceptance by the Engineer as set forth above.

Letter of Conditional Acceptance does not relieve the Contractor of his responsibility under any of the provisions of these Contract Documents unless explicitly noted herein and/or in the written Letter of Conditional Acceptance.

Written consent of surety and endorsement from the insurance carrier or carriers permitting prior occupancy or use of any completed or partially completed portions of the work by the County shall be secured and submitted to the Engineer prior to issuance of a Letter of Conditional Acceptance.

20.3 Until approval of the final estimate for the entire Contract by the County, it shall be the Contractor's responsibility to protect and guarantee all portions of the conditionally accepted work against damages resulting from vandalism, theft, floods, fires and malfunction due to other equipment or work not yet accepted unless such damage is the direct result of negligence on the part of the County personnel or fair wear and tear. Should repairs be required due to any reasons other than the exceptions stated above, they shall be performed at no expense to the County and the guarantee commitment date shall be modified to coincide with the date of re-acceptance in accordance with the provisions set forth herein.

20.4 Should the Contractor be unable to perform repairs, the Engineer may direct that the necessary repairs be performed by others, and the cost therefore be deducted from monies owed the Contractor. In such a case, the guarantee commitment date shall be modified to coincide with the date of completion of repairs by others.

20.5 Any Punch List items not corrected by the Contractor within ninety (90) days after Written Notice during the one (1) year guarantee period from the date of Conditional Acceptance, will be corrected by Frederick County and the expense of correcting will be deducted from the retainage. If the contract is funded partially or in fully by the State or Federal Government, sufficient funds will be withheld by the County to insure that all Punch List items are corrected.

Article 21: PAYMENTS TO THE CONTRACTOR

21.1 At least ten (10) days before each progress payment falls due (the tenth of each month), the Contractors shall 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 (the previous month) and supported by such data as the basis of materials and equipment not incorporated in the Work, and partial payment estimate shall also be accompanied by supporting data; satisfactory to the Engineer, as will protect the County interest therein, including applicable insurance. See paragraph 21.2. The Engineer will, within ten (10) days after receipt of each partial payment estimate, either indicate

in writing his approval of payment and present the partial payment estimate to the Contractor indicating in writing his approval of payment and present 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 County will, within thirty (30) days of receipt of an approved partial payment estimate, pay the Contractor a progress payment on the basis of the approved partial payment estimate. The County will retain ten percent (10%) of the amount of each payment until Conditional Acceptance or Final Acceptance of all the work covered by the Contract Documents, then the retainage will be reduced to five percent (5%). This five percent (5%) will be retained for a period of one (1) year to insure that any work needed to meet the requirements of Article 30 is met a not cost to the County. The one year 5 percent retention shall start from the date of conditional acceptance.

21.1.1 Prior to receiving each payment, the Contractor shall certify in writing that he has made payment from prior payments and that he will make timely payments from the proceeds of progress and final payment then due him, to his Subcontractors and Suppliers in accordance with his Contractual arrangement with them.

21.1.2 No payments for installation of equipment requiring O&M manuals will be made prior to receipt of final approved copies of the O&M manuals as described in Section 1200 para. I.C.I.C.

21.2 The request for payment may also include an allowance for the cost of major materials and equipment not yet incorporated in the Work.

21.2.1 Payment Allowance – When requested in writing and approved by the Engineer, a one hundred percent (100%) payment allowance will be made for non-perishable major material and equipment to be incorporated in the work delivered and stock piled at the work site or other approved site. Material for which payment has been made shall not be removed from the work site or other approved site. The Contractor shall furnish validated invoices showing the payment has been made, plus a bill of lading showing delivery of the material. No payment for stored material will be made if it is anticipated that the material will be incorporated into the work within 30 days of the written request. A ratio will be established by the Inspector between the dollar amount of the material as invoiced and the quantity the material represents from the appropriate proposal items.

Payment to the Contractor under this paragraph for material on hand will not be constituted as acceptance by the County of title to the material. Title shall remain with the Contractor until the project has been completed and accepted in accordance with provisions herein.

21.3 Upon completion and acceptance of the Work, the Engineer will issue a certificate attached to the final payment request with a copy sent to the

Contractor that the Work has been accepted by him under the conditions of the Contract Documents.

Article 22: ACCEPTANCE OF FINAL PAYMENT AS RELEASE

22.1 The acceptance by the Contractor of final retainage payment shall be and shall operate as a release to the County from all claims and all liability to the Contractor.

22.2 The County shall not be precluded or estopped by any measurement, estimate, or certificate made either before or after the completion and acceptance of the Work and payment therefore, from showing the true amount and character of the work performed and materials furnished by the Contractor, nor from showing that any such measurement, estimate or certificate is untrue or is incorrectly made, nor from showing that the work or material do not in fact conform to the Contract. The County shall not be precluded or estopped, notwithstanding any such measurement, estimate or certificate and payment in accordance therewith, from recovering from the Contractor or his Sureties, or both, such damage as it may sustain by reason of his failure to comply with the terms of the Contract.

22.3 Neither the acceptance by the County or ay representative of the County nor any payment for or acceptance of the whole or any part of the Work, nor any extension of time, nor any possession taken by the County shall operate as a waiver of any portion of the Contract or of any power herein reserved, or of any right to recover damages.

The wavier of any breach of the Contract shall nto be held to be waiver of an other or subsequent breach.

Article 23: INSURANCE

23.1 The Contractor shall purchase and maintain insurance meeting requirements specified herein as will protect the County and himself from consequential liability which may arise out of or result from the Contractor's execution of the work, whether done personally 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.

23.1.1 Unless already on file and current, certificates of insurance shall be filed with the County within ten (10) days after receipt of the Notice of Award. These certificates shall contain a provision that policy coverages will not be cancelled, altered or materially changed without thirty (30) days prior written notice provided to the County via registered or certified mail, to the address below:

Frederick County
Division of Public Works
Engineering and Planning Department
118 North Market Street

Frederick, Maryland 21701'

23.2 The Contractor shall provide the following:

23.2.1 General Public Liability and Property Damages (including vehicles): Such coverage as will protect the Contractor and the County from claims for damages because of:

23.2.1.1 Injury to or destruction of tangible property, including loss of use resulting therefrom;

23.2.1.2 Bodily injury, sickness or disease or death of any person other than those under direct employment of the Contractor;

23.2.1.3 Personal injury sustained by any person as a result of an offense directly or indirectly related to the employment of such person by the Contractor or by any other person;

23.2.1.4 Employee disability and other similar employee benefit acts, including occupational sickness, disease or employee fatalities. Specific insurance requirements include:

23.2.2 Worker's Compensation and Employer's Liability Policy

23.2.2.1 Section A – Statutory limits of state in which work is to be performed.

23.2.2.2 Section B (Employer's Liability) - $100,000.00 each accident.

23.2.3 Comprehensive General Liability

23.2.3.1 Blanket Contractual Coverage

Bodily Injury - $500,000.00 each occurrence
Property Damage - $250,000.00 each occurrence

23.2.3.2 Independent Contractors Coverage

Bodily Injury - $500,000.00 each occurrence
Property Damage - $250,000.00 each occurrence

23.2.3.3 Products and Completed Operations Coverage

$500,000.00 aggregate applicable to Bodily Injury and $250,000.00 each occurrence applicable to Property Damage

23.2.3.4 Personal Injury Coverage (Sections A, B, and C)

$500,000.00 aggregate

Comprehensive General Liability Policy containing an endorsement indicating that the U (Underground) exclusion applicable to a contractor's policy has been deleted, with policy limits accordingly afforded at $250,000.00 for each occurrence of Property Damage.

23.2.3.5 Deletion of XC Exclusions:

For certain work, the Comprehensive General Liability Policy shall contain an endorsement indicating that the SC (Explosion and Collapse) exclusions applicable to a contractor's policy has been deleted. Policy limits shall be as specified above for each occurrence of Property Damage. The XC exclusions must be deleted under the following conditions:

23.2.3.5.1 Water Main and Sanitary Sewer Construction Contracts:

Whenever explosives of any type are to be used to perform work as set forth in the contract, and

When deemed necessary in the best interests of the County.

23.2.3.5.2 Buildings and Facilities Construction Contracts:

On all contracts under which the Contractor will be constructing buildings and/or facilities.

23.2.4 Comprehensive Automobile Liability Applicable to Owned, Non-Owned and Hired Vehicles

Bodily Injury - $250,000.00 each person; $500,000.00 each occurrence

Property Damage - $100,000.00 each occurrence

23.2.5 Excess Liability (Umbrella Form)

23.2.5.1 $1,000,000.00 with a retention rate not to exceed $50,000.00 where no underlying coverage exists.

23.2.6 Builders' Risk Completed Value Form Affording All Risk Coverage; required for all contracts which include erection of a structure or facility.

23.2.6.1 The amount of coverage shall be based upon the 100% projected completed value of the structure of facility and shall be in effect prior to any work commencing and until the project is completed by the Contractor and accepted by the County.

23.2.7 Fire Legal Liability Insurance or Broad Form Property Damage Coverage which contains no water damage exclusion;

Coverage in the amount indicated in the Supplementary General Conditions. If not indicated, coverage shall be in the amount of the current repair and replacement value of such facility, to include the contents, boilers and machinery contained within such facility.

23.2.8 Railroad Protective Liability Insurance; Policy limits fro Bodily Injury of $2,000,000.00 for each occurrence, and Property Damage of $1,000,000.00 each occurrence, with an aggregate not less than $2,000,000.00, required for all contracts which include work in close proximity to a Railroad.

Article 24: CONTRACT SECURITY

24.1 The Contractor shall, within ten (10) days after the receipt of the Notice of Award, furnish the County with a Performance Bond, Labor and Materials, 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, materials and services 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 of Maryland and named on the current list of “Surety Companies Acceptable on Federal Bonds” as published in the Treasury Department Circular Number 570. The expense of these Bonds shall be borne by the Contractor. If at any time a surety on any such Bond is declared bankrupt or loses its right to do business in the State of Maryland or is removed from the list of Surety Companies accepted on Federal Bonds, the Contractor shall, within ten (10) days after notice from the County to do so, substitute an acceptable Bond (or Bonds) in such form and sum and signed by such other surety or sureties as may be satisfactory to the County. The premiums on such Bond shall be paid by the Contractor.

Article 25: ASSIGNMENTS

25.1 Neither the Contractor nor the County 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 both parties.

Article 26: INDEMNIFICATION

26.1 The Contractor shall defend, indemnify and safe harmless the County from all suits, actions and damages or costs of every name and description to which the County may be subject or put by reason of injury to persons (bodily injury, including death, or any personal injury) or property damages as a result of the work whether caused or alleged to be caused by the negligence, carelessness or willfulness on the part of agents or other cause. Monies due or to become due the Contractor under the Contract as may be considered necessary by the County shall be retained by the County until such suits or claims for damages shall have been settled or otherwise disposed of or satisfactory evidence to that effect has been furnished to the County.

Article 27: SEPARATE CONTRACTS

27.1 The County 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 or 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 any defects in such work that render it unsuitable.

27.2 The County may perform additional work related to the Project by itself, or it may let other contracts containing provisions similar to these. The Contractor shall afford the other contractors who are parties to such contracts, the County if it is performing the additional work itself, reasonable opportunity for the introduction and storage of materials and equipment and the execution of work shall property connect and coordinate his work with theirs.

Article 28: SUBCONTRACTING

28.1 The Contractor may utilize the services of specialty subcontractors approved by the County on those parts of the Work which, under normal contracting practices are performed by specialty subcontractors.

28.2 The Contractor shall not award work to subcontractors in excess of fifty percent (50%) of the Contract Price without prior written approval of the County.

28.3 The Contractor shall be fully responsible to the County 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.

The Contractor shall be fully responsible for the coordination of the work of the trades, subcontractors and suppliers and their officers, agents and employees.

28.4 The Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the work to bond 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 County may exercise over the Contractor under any provision of the Contract Documents.

28.5 Nothing contained in the Contract Documents shall create any contractual arrangement between any subcontractor and the County.

Article 29: ENGINEER'S AND INSPECTOR'S AUTHORITY

29.1 The Engineer will act as the County representative during the construction period. He shall decide questions which may arise as to quality and acceptability of materials furnished and work performed. He will, within a reasonable time, make decisions relative to interpretation of the Contract Documents in a fair and unbiased manner, which shall be final and binding upon the parties. The Engineer will make visits to the site as required to determine if the Work is proceeding in accordance with the Contract Documents.

29.2 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.

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

29.4 Authority and duties of Inspectors

29.4.1 Inspectors are authorized agents of the Engineer and are authorized to inspect all work done and all material furnished. Such inspection may extend to all or any part of work and to the preparation, fabrication or manufacture of the materials to be used. The Inspector is not authorized to revoke, alter or waive any requirements of the Contract, nor is he authorized to approve or accept any portion of the complete Project. He is authorized to call to the attention of the Contractor any failure of the work or materials to conform to the Contract. He will have the authority to reject materials or suspend the Work until any questions at issue can be referred to and decided by the Engineer. Inspectors will perform their duties at such times and in such manner as will not unnecessarily impede progress on the Contract.

29.4.2 The Inspector will in no case act as foreman or perform other duties for the Contractor, nor interfere with the management of the Work by the latter. Any advice which the Inspector may give the Contractor shall not be construed as binding the Engineer in any way, or releasing the Contractor from fulfilling all of the terms of the Contract.

29.4.3 Where there is disagreement between the Contractor (or his representative superintendent) and the Inspector, such as refusal by the Contractor to sue properly approved materials; for performing work not in

compliance with the Contract Documents; and refusing to suspend work until problems at issue can be referred to a decision by the Engineer, the Inspector will immediately direct the Engineer's attention to the issues of disagreement and if the Contractor still refuses to make corrections, comply or suspend work, the Engineer will prepare and deliver in writing to the Contractor, by mail or otherwise, a written order suspending the work and explaining the reason for such shutdown. As soon as the Inspector is advised of the delivery of the shutdown order, the Inspector will immediately leave the site of the work. Work performed during the Inspector's absence will not be accepted or paid for and may be required to be removed and disposed of at the Contractor's expense.

Article 30: GUARANTEE

30.1 The Contractor shall guarantee all materials and equipment furnished and work performed for a period of one (1) year from the date of Conditional Acceptance. The Contractor warrants and guarantees for a period of one (1) year from the date of Conditional Acceptance 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 County 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 County may have the work accomplished and the Contract amount retained may be used to pay for these repairs of the work or material under this guarantee.

Article 31: ARBITRATION

31.1 Pursuant to Sections 1A(e), (f), (9) of Article 25 of the Annotated Code of Maryland (1957), as amended, in the event of a dispute between ' the parties to this contract involving $10.000.00 or more regarding the terms of the contract or performance under the contract, the question involved in the dispute shall be subject to a determination of questions of fact by the Director, Division of Public Works or, in his absence, such other official designated by the Board of County Commissioners, provided that the decision of the Director or other, official is subject to review on the record by the Circuit Court of Frederick County.

Likewise, in the event of such a dispute referred to above involving $10,000.00 or less, any such dispute involving the terms of the contract or performance under the contract shall be determined by the Director or his successor and the decision of the Director or his successor shall be final, binding on the parties to the dispute, and conclusive of the issue.

Under this contract it is agreed that the only parties to a dispute shall be the Contractor and the owner, unless the Contractor and Owner otherwise agree to allow additional parties

31.2 Notice of a request for the determination of a dispute shall be sent in writing to the other party to the Owner-Contractor Agreement, and a copy sent to the Consultant.

31.3 Unless otherwise agreed, the Contractor shall carry on the work and maintain its progress during any dispute proceedings, and the Owner shall continue to make payments to the Contractor in accordance with the contract documents.

Article 32: TAXES

32.1 The Contractor shall pay all sales, consumer, use and other similar taxes required by the law of the place where the Work is performed. The Contractor can recover these taxes only as part of the bid price or prices.

Article 33: OFFICIAL NOT TO BENEFIT

33.1 No employee of the County shall be admitted to any share or part of the Contract or any benefit that may arise therefrom, and any contract entered into by the County which any employee of the County shall be personally interested shall be void, and no payment shall be made thereon by the Engineering Department or any employee thereof; but this provision shall not be construed to extend to the Contract if made with a corporation for its general benefit.

Article 34: BRIBES

34.1 In accordance with Article 78A, Sec. 16 D(h) of the Maryland Code on all contracts with the County and affidavit is required stating that the Contractor or the individuals of the company have never been convicted of bribery, attempted bribery, or conspiracy to bribe in Maryland or any of the other states or the Federal government.

34.2 A bribe or attempt to bribe any employee of the County by the Contractor shall be considered as execution of the Contract in bad faith, and shall thus empower the County to have the work completed by others and deduct the entire cost thereof from any monies due or to become due the Contractor under the Contract, all as set forth in Article 18.

AFFIDAVIT OF QUALIFICATION TO BID

I hereby affirm that

1. I am the _____(Title)_____ and the duly authorized representative of the firm of _____(Name of Corporation)_____ whose address is _____ and that I possess the legal authority to make this affidavit on behalf of myself and the firm for which I am acting.

2. Except as described in paragraph 3 below, neither I nor the above firm, nor to the best of my knowledge, any of its officers, directors, or partners, or any of its employees directly involved in obtaining contracts with the State or any county, bi-county or multi-county agency, or subdivision of the State have been convicted of, or have pleaded nolo contendere to a charge of, or have during the course of an official investigation or other proceeding admitted in writing or under oath acts or omissions which constitute bribery, attempted bribery, or conspiracy to bribe under the provisions of Article 27 of the Annotated Code of Maryland or under the laws of any state or the federal government (conduct prior to July 1, 1977 is not required to be reported).

3. [State "none" or, as appropriate, list any conviction, plea, or admission described in paragraph 2 above, with the date; court, official, or administrative body; the individuals involved and their position with the firm, and the sentence or disposition, if any.]

_____

_____

_____

I acknowledge that this affidavit is to be furnished to [list relevant agencies or entities] and, where appropriate, to the Board of Public Works and to the Attorney General under section 16D of Article 78A of the Annotated Code of Maryland. I acknowledge that, if the representations set forth in this affidavit are not true and correct, [insert name of public entity] may terminate any contract awarded and take any other appropriate action. I further acknowledge that I am executing this affidavit in compliance with section 16D of Article 78A of the Annotated Code of Maryland, which provides that certain persons who have been convicted of or have admitted to bribery, attempted bribery, or conspiracy to bribe may be disqualified, either by operation of law or after a hearing, from entering into contracts with the State or any of its agencies of subdivisions.

I do solemnly declare and affirm under the penalties of perjury that the contents of this affidavit are true and correct.

_____(Signature)_____

_____(Date)_____

Article 35: BID PROPOSAL INFORMATION

35.1 PREPARATION OF BID PROPSAL

Proposals shall be made on the blank proposal forms provided with the Bid Documents and signed by an authorized agent of the Bidder. Each Bidder shall state in his proposal, without interlineations, alterations or erasures, a unit price or lump sum written in ink in figures, for each of the separate items called for in the proposal. Bidders shall fill out the "Total Price" column and total their proposals, so that the results of the bidding, barring possible arithmetical errors, will be at once known. Any error computation will be corrected by the Engineer when the proposals are checked. In case of error between a unit price and its extension, the unit price shall govern.

35.2 INTERPRETATION OF PROPOSAL QUANTITIES

The estimate of quantities of the work to be done and materials to be furnished, listed in the proposal forms and shown on the Drawings, are made from original surveys and/or scaled. Such quantities are approximate only and subject to increase or decrease without changing the unit prices to be paid for the work. Final payment will be made only for the actual measured quantity of authorized work done or material furnished under each of the several items at the actual unit prices bid or fixed therefore.

35.3 FAMILIARITY WITH PROPOSED WORK

Bidders are required to examine carefully the Drawings and Specifications and to make a personal examination of the location and nature of the proposed work. In case doubt shall arise as to the meaning or intent of anything shown on the Drawings or described in the Specifications, inquiry should be made of the Engineer before the proposal is submitted. The submission of a proposal shall be prima facie evidence that the bidder thoroughly understands the Drawings and the terms of the Specifications.

The Bidder is assumed to have made himself familiar with all Federal, State, and local, County laws, ordinances, rules and regulations which in any manner affect those engaged or employed in the work, or the materials or equipment used in or upon the work, or in any way affect the work, and no plea of misunderstanding will be considered on account of ignorance thereof.

35.4 PROPOSAL GUARANTEE

Each proposal must be accompanied by a certified check for five percent (5%) of the amount of the proposal unless more stringent requirements are delineated in the Special Provisions, or a satisfactory bidder's bond in like amount, payable to the County. Unless the proposal is so accompanied, it will not be considered.

35.5 DELIVERY OF PROPOSALS

Each proposal, with guarantee, shall be delivered, sealed in the envelope provided with Information for Bidders, to the Purchasing Offices of Frederick County.

Whether submitted through the mail or delivered by the Bidder, proposals must be received at the Purchasing Office of Frederick County by the time specified for opening of proposals.

35.6 WITHDRAWAL OF PROPOSALS

Bidders may withdraw a proposal after it has been deposited with the County any time prior to the stipulated time for opening such proposals. Thereafter, no proposal may be withdrawn for a period of sixty (60) days.

35.7 OPENING OF PROPOSALS

Proposals will be received until the date and time stated in the Invitation to Bid and will be publicly opened and read at the place, time and date stated.

35.8 IRREGULAR PROPOSALS

Proposals made on any other than the proposal form furnished by the County will not be considered. Changes in phraseology of the proposal, additions, or limiting provisions, will render the proposal informal and may cause its rejection. Unbalanced proposals shall be liable to rejection.

35.9 COMPETENCY OF BIDDERS

Each Bidder must be prepared to submit within ten (10) days after date of opening of bids, the following information to the County:

A. A statement prepared by an independent Certified Public Accountant as to financial ability, which statement shall show all assets and liabilities, and which shall include verification of lines of credit extended by banks. No financial statement will be admissible which has been prepared by a Certified Public Accountant who has direct or indirect interest in the business of the Contractor submitting the statement.

B. A statement as to plant and equipment owned by, or available to the Bidder and which he proposes to use on the Project. This statement shall include complete details as to type, age and condition.

C. A statement listing previous experience in the type of construction required by the contract. This statement shall list the size of his previous jobs and the number of years that the Bidder has been involved in this type of work.

Article 36: AWARD OF BID AND EXECUTION OF CONTRACT

37.1 RIGHT TO REJECT PROPOSALS

The right is reserved by the County to waive informalities, to reject any or all proposals, to advertise for new bids, to proceed to do the work otherwise or to defer or abandon the work, as the interests of the County may require.

36.2 AWARD OF BID

The award of the Contract, if it be awarded, will be to the lowest responsible Bidder whose Proposal complies with all the requirements prescribed. The successful Bidder will be notified, by letter sent to the address shown on his Proposal, that his Bid has been accepted and he has been awarded the Contract.

36.3 RETURN OF CERTIFIED CHECKS

The County will hold as many of the checks submitted with the proposals as it may deem advisable, until the execution and delivery of the Contract and bond, whereupon they shall be returned. All other checks will be returned as soon as the Contract is executed.

36.4 BOND

The successful bidder shall be required to furnish bonds in accordance with Article 24.1.

36.5 EXECUTION OF CONTRACT

The Bidder to whom the Contract has been awarded shall return the prescribed number of copies of the Contract and bonds, properly executed, to the office of the County within ten (10) days after they have been sent for execution. No proposal shall be considered binding upon the County until the Contract has been awarded by action of the County, and until the successful bidder has executed and filed the Contract and satisfactory bonds, and he has been approved by the County.

36.6. FAILURE TO EXECUTE CONTRACT

Failure of the successful bidder to give satisfactory bond or to execute the Contract within ten (10) days as specified may be cause for annulment of the award. In the event of the annulment of the award of the Contract, the certified check or bid bond accompanying the proposal shall be forfeited to the County as liquidated damages.

In the event that the award is annulled as indicated above, the award may then be made to the second lowest qualified bidder, and such bidder shall fulfill every stipulation embraced herein, as if he were the original party to whom the award was made; or the County may reject all of the bids, as its interests may require.

Article 37: NOTICE TO PROCEED

36.1 NOTICE TO PROCEED

After the contract has been executed, the Construction Manager will issue to the Contractor a "Notice to Proceed" and the notice will stipulate the date on which the Contractor is expected to begin work. The specified contract time shall begin on the day stipulated in the "Notice to Proceed". Any preliminary work started or material ordered, before receipt of the "Notice to Proceed" shall be at the risk of the Contractor.

STANDARD SPECIFICATIONS
SECTION 1000
SUMMARY OF WORK

1. General

A. Description

This section includes requirements of a general nature applicable to the Contract.

1. Work to be performed in this Contract in accordance with the Contract Documents is as described in the invitation to bid.

B. Work Periods and Holidays

1. The normal time of work for this Contract is limited to 40 hours per week and shall generally be between the hours of 7:00 a.m. and 6:00 p.m., Monday through Friday. The Contractor may elect to work beyond these hours or on weekends provided that all costs incurred by the Owner for additional engineering shall be borne by the Contractor. The contractor must submit a written request to work outside the normal hours to the inspector for the project and it must be approved by the Department of Engineering and Planning. This is to be done 5 business days in advance.

   a. The Owner shall deduct the cost of additional engineering costs from monies due the Contractor.

2. If it shall become imperative to perform work at night, the Owner and Engineer shall be informed according to item B.1 a reasonable time in advance of the beginning of such work. Temporary lighting and all other necessary facilities for performing and inspecting the work shall be provided and maintained by the Contractor.

3. Unless otherwise specifically permitted, all work that would be subject to damage shall be stopped during inclement, stormy or freezing weather. Only such work as will not suffer injury to workmanship or materials will be permitted. Contractor shall carefully protect his work against damage or injury from the weather, and when work is permitted during freezing weather, he shall provide and maintain approved facilities for heating the materials and for protecting the finished work.

4. County Holidays

   a. The County observes the following holidays: New Year's Day; Memorial Day; Independence Day; Labor Day; Veteran's Day; Thanksgiving Day; Christmas Day.

5. Permission to Work

a. Except as noted below, the Contractor will not be permitted to do any work which requires the services of the County's inspection more than nine hours a day nor on the days on which the above-mentioned holidays are observed by the County or on Saturdays or Sundays, unless otherwise authorized by the Engineer in writing. However, the contractor with verbal permission of the Engineer, may be permitted to perform clean-up and such other items for which no specific payment is involved on Saturdays and holidays.

(1) On portions of Contract involving tunneling work, the Contractor may after seven days written request and approval by the Engineer, work additional hours and days, up to 24 hours continuous operation, subject to jurisdictional restrictions and special commitments contained in the Contract Documents.

b. In case of extreme emergency, which may require that the work be done on Saturdays, Sundays, holidays or longer than nine hours per day, the Contractor shall request permission of the Engineer to perform work. If, in the opinion of the Engineer, the work is bona fide, he will grant permission of the Contractor to work such hours as may be necessary. Also, if in the opinion of the Engineer a bona fide emergency exists, he may direct the Contractor to work such hour as may be necessary whether the Contractor requests permission to do so or not.

6. If it shall become absolutely necessary to perform work at night, the Engineer shall be informed a reasonable time in advance of the beginning of performance of such work. Only such work will be done at night as can be done satisfactorily and in a first class manner. Good lighting and all other necessary facilities for carrying out and inspecting the work and for the safety of personnel shall be provided and maintained at all points where such work is being done.

C. Construction Permits, Easements and Encroachments

1. The Owner shall obtain or cause to be obtained all permanent and temporary construction easements as shown on the Drawings. The Owner shall further obtain or cause to be obtained a right-of-way encroachment from. The Contractor shall verify that these agreements have been obtained and shall comply with the conditions set forth in each agreement.

2. The Contractor shall obtain, keep current and pay all fees for any necessary construction permits from those authorities, agencies, or

municipalities having jurisdiction over land areas, utilities, or structures which are located within the Contract limits and which will be occupied, encountered, used, or temporarily interrupted by the Contractor's operations unless otherwise stated. Record copies of all permits shall be furnished to the Engineer.

3. When construction permits are accompanied by regulations or requirements issued by a particular authority, agency or municipality, it shall be the Contractor's responsibility to familiarize himself and comply with such regulations or requirements as they apply to his operations on this Project.

4. The Contractor shall provide any required Performance and Indemnity Bond(s) and any additional specific insurance coverage required of the Owner by the Encroachment Agreement(s) in accordance with the Encroachment Agreement(s) between the Owner and the Maryland Department of Transportation – State Highway Administration. The Contractor shall fully comply with all of the requirements of the Owner included in the Encroachment Agreement(s). Encroachment Agreements are included herein and are found at the end of this Section.

D. Reference Documents

1. Applicable Codes, Specifications and Standards

a. All references to codes, specifications, and standards referred to in the Contract Documents shall mean and are intended to be, the latest edition, amendment and/or revision of such reference standard in effect as of the date of bid opening for this Contract.

2. Documents on the Site

a. The Contractor shall maintain on the site copies of all appropriate documents including codes, specifications, permits and reference standards referred to in the contract documents for the project.

E. Abbreviations and Symbols

1. Reference to a technical society, institution, association, or governmental authority is made in the specifications in accordance with the following abbreviations:

AA	Aluminum Association
AAMA	Architectural Aluminum Manufacturer's Association
AAN	American Association of Nurserymen

AAR	Association of American Railroads
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ACPA	American Concrete Pipe Association
AGA	American Gas Association
AGMA	American Gear Manufacturer's Association
AI	Asphalt Institute
AIA	American Institute of Architects
AIEE	American Institute of Electrical Engineers
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ALS	American Lumber Standards
AMCA	Air Moving and Conditioning Association, Inc.
ANSI	American National Standards Institute
APA	American Plywood Association
AREA	American Railway Engineering Association
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASLA	American Society of Landscape Architects
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing and Materials
AWG	American Wire Gauge
AWPA	American Wood Preservers Association

AWPE	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Water Works Association
B & S	Brown and Sharpe Wire Gauge
BOCA	Building Officials Code Administration International, Inc.
CABRA	Copper and Brass Research Association
CIPRA	Cast Iron Pipe Research Association
CRSI	Concrete Reinforcing Steel Institute
CSPA	Clay Sewer Pipe Association
EPA	Environmental Protection Agency (Federal)
FCC	Federal Communications Commission
FS	Federal Specifications or Federal Standards
IEEE	Institute of Electrical and Electronic Engineers
IES	Illuminating Engineering Society
IPCEA	Insulated Power Cable Engineers Association
MBF	Thousand Board Feet
MDOT	Maryland Department of Transportation
MOSHA	Maryland Occupational Safety and Health Act
MIL	Military Specifications
MPS	Maryland Park Service
MSHA	Maryland State Highway Administration
MSCS	Maryland Soil Conservation Service
MSS	Manufacturer's Standardization Society of the Valve and Fittings Industry
NAAMM	National Association of Architectural Metal Manufacturers

NAPCA	National Association of Pipe Coating Applicators
NBFU	National Board of Fire Underwriters
NBS	National Bureau of Standards
NEC	National Electrical Code
NEMA	National Electrical Manufacturer's Association
NESC	National Electrical Safety Code
NETA	National Electrical Testing Association, Inc.
NFC	National Fire Code
NFPA	National Forest Protection Association
NHLA	National Hardware Lumber Association
NPS	National Park Service
NSF	National Sanitation Foundation
O & M	Operations and Maintenance
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
PCI	Pre-stressed Concrete Institute
SBI	Steel Boiler Institute
SCPI	Structural Clay Products Institute
SCS	Soil Conservation Service
SDI	Steel Deck Institute
SHA	see: MSHA
SJI	Steel Joist Institute
SMACC	Sheet Metal and Air Conditioning Contractors, Inc.
SPR	Simplified Practice Recommendation

	U.S. Department of Commerce
SSPC	Steel Structure Painting Council
ULI	Underwriter's Laboratories Incorporated
USSG	United States Standard Gauge
USSWG	United States Steel Wire Gauge

F. Glossary of Terms

1. Provide means furnish and install, complete in place.

2. Easement means a grant of right of use of the property of an owner for a certain purpose at the will of the grantee.

3. Structure means structural entity including but not limited to building, manhole, ductbank, tank foundation, road, pavement, pipe conductor, substation, pumping station.

2. Environmental Pollution means presence and action of physical, chemical, biological, and human agents that adversely affect individual and community health and welfare; unfavorably alter or destroy ecosystems of importance to man; or degrade significant aesthetic and recreational values.

3. Or equal means where a product or system is specified in the Contract Documents by one, two or more trade names followed by the phrase "or equal", the "or equal" will be determined by the Engineer. Products or systems deemed "equal" by the Contractor which he proposes to incorporate into the work shall be submitted to the Engineer for consideration and evaluation in accordance with requirements set forth in Section 1700.

4. Approval means written approval from the Engineer.

5. Shall means mandatory.

6. Average Daily Flow - The total quantity of liquid tributary to a point divided by the number of days of flow measurement.

7. Bedding - The materials on which a pipe or conduit is supported.

8. Building Sewer - The pipe carrying wastewater from a building to a common sewer.

9. Cross Connection (1) A physical connection through which a supply of potable water could be contaminated or polluted. (2) A connection

between a supervised potable water supply of unknown potability.

10. Combined Sewer - A sewer intended to receive both wastewater and storm or surface water.

11. Drop Manhole - A manhole installed in sewer where the elevation of the incoming sewer considerably exceeds that of the outgoing sewer; a vertical waterway outside or inside (we now allow inside drops) the manhole is provided to divert the wastewater from the upper to the lower level so that it does not fall freely into the manhole except at peak rate of flow.

12. Energy Gradient - The elevation of the hydraulic grade line plus the velocity head of the following wastewater.

13. Exfiltration - The quantity of wastewater which leaks to the surrounding ground through unintentional openings in a sewer. Also, the process whereby this leaking occurs.

14. Haunching - The granular material supporting the sides of a pipe above the bedding.

15. Hydraulic Grade Line - The head of water or wastewater calculated by summing the pressure head and gravitational head.

16. Infiltration - The discharge of ground waters into sewers, through defects in pipe lines, joints, manholes or other sewer structures.

17. Inflow - The discharge of any kinds of water into sewer lines from such sources as roof leaders, cellar, and yard area drains, foundation drains, commercial and industrial so-called "clean water" discharges, drains from springs and swampy areas, etc. It does not include "infiltration" and is distinguished from such wastewater discharges, as previously defined.

18. Infiltration/Inflow - A combination of infiltration and inflow wastewater volumes in sewer lines, with no way to distinguish either of the two basic sources and with the same effect of usurping the capacities of sewer systems and other sewer system facilities.

19. Infiltration Allowance - The amount of infiltration anticipated in sewer systems; considered inevitable under sewer construction and sewer service conditions and authorized and provided for in a sewer system capacity design and in sewer construction practice. A distinction is made between "sewer design infiltration allowances" which the designer provides for in structuring the total sewer system and "construction infiltration allowances" permitted in the specifications covering the construction of specific projects and specific sections of the total sewer system.

20. Interceptor Sewer - A sewer which receives the flow from the collector sewers and conveys the wastewaters to treatment facilities.

21. Joints - The means of connecting sectional lengths of sewer pipe into a continuous sewer line, using various types of jointing materials with various types of pipe formations that make possible the jointing of the sections of pipe into a continuous collecting sewer line. The number of joints depends on the lengths of the pipe sections used in the specific sewer construction work.

22. Main Sewer - In larger systems, the principal sewer to which branch sewers and submains are tributary; also called trunk sewer. In small systems, a sewer to which one or more branch sewers are tributary.

23. Manhole - An opening in a hydraulic structure provided for the purpose of permitting a man to enter or leave the sewer.

24. Peak - The maximum quantity that occurs over a relatively short period of time. Also called peak demand, peak load.

G. County Responsibilities

1. The County and Developer will secure all land and right-of-way necessary for carrying out and completing the work. The County will obtain permits for construction easements to the limits shown on the drawings.

   a. All items or work attributed to permit compliance as set forth in the permits which are described by items in the bid schedule shall be measured and paid for under those items. All other costs attributable to permit compliance shall be considered as incidental to the contract.

2. The County will supply materials and perform work as set forth elsewhere in the contract documents.

H. Contractor Responsibilities

1. Use of Premises and Off-Site Work

   a. Lands by contractor. Any land and access thereto not furnished by the County that the Contractor deems necessary for the Contract work, for temporary construction facilities, access and egress or for storage of material shall be provided by the Contractor at no cost to the County. The Contractor shall confine his apparatus and storage to such additional areas as he may provide at his expense. The Contractor shall obtain permits and written approvals from the appropriate jurisdictional agency and property owner for use of premises not furnished by the County as described above, and of all off-site areas which include off-site

borrow pits and waste areas, such permits and approvals must specify treatment of said areas during and at the completion of construction. Copies of all permits and approvals shall be furnished to the Engineer before utilization of the areas. Section 1800 sets forth criteria for securing additional grading and sediment control permits.

b. Private and Public Property. The Contractor shall not enter upon private property for any purpose without obtaining written permission from the property owners shall be filed with the Engineer prior to entering private property.

2. The Contractor shall not load nor permit any part of any structure to be loaded with weights that will endanger the structure, nor shall he subject any part of the work to stresses or pressures that will endanger it.

3. Public Convenience

a. The Contractor shall at all times conduct his work to ensure the least possible obstruction to traffic and inconvenience to the County, the general public and the residents in the vicinity of the work, and to ensure the protection of persons and property. Fire hydrants on or adjacent to the work shall be kept accessible to fire fighting equipment at all times. Temporary provisions shall be made by the Contractor to ensure the use of sidewalks and the proper functioning of all gutters, storm water systems, drainage ditches, and culverts, which shall not be obstructed. See Maintenance of Traffic, Section 1800.

4. Cutting and Patching

a. The Contractor shall do all cutting fitting and patching of his work that may be required to make its several parts come together properly and fit it to receive or be received by such other work.

b. The Contractor shall not endanger any work whether his own or that of others, cutting and excavating or otherwise altering the work and will only cut or alter work with the written consent of the Engineer. The cutting of holes in structural members will not be permitted without written consent of the Engineer. The Engineer's consent does not relieve the Contractor of responsibility for weakening of members as a result of cutting. Such weakening shall be corrected to the satisfaction of the Engineer at no cost to the County.

5. Explosives

a. The use of explosives will not be permitted without the written permission of the Engineer. If explosives are permitted, the

Contractor shall employ a specialized blaster in accordance with MOSHACFR-1926, 901 "BLASTER QUALIFICATIONS". Explosives shall be stored and operations shall be conducted in accordance with requirements specified therein. Explosives shall not be stored at the site during non-working hours.

b. When the use of explosives is necessary for the prosecution of the work, the Contractor shall exercise the utmost care not to endanger life or property. The Contractor shall be responsible for any and all damage or injury to persons or property resulting from the use of explosives. Use of explosives shall be in accordance with Specification Section 02202, Excavation By Blasting.

6. Measurements

a. All dimensions shown on existing work and all dimensions required for work that is to connect to existing work shall be verified by the Contractor by actual measurement of the existing work. Any discrepancies between Contract Documents and the existing conditions shall be referred to the Engineer before any work affected thereby is commenced.

7. The Contractor shall insure that rough grading be within half a foot of finished grading prior to the starting of any trenching for water of sewer lines.

8. The Contractor shall notify "Miss Utility, five (5) days prior to the start of construction.

I. Guarantee

1. As set forth in the General Conditions, the Contractor guarantees all of the work performed under this contract for a period of one year after the testing of systems and/or sub-systems is complete and a letter of conditional acceptance has been obtained from the Engineer. This guarantee shall include but not necessarily be limited to the following items:

a. Against all faulty or imperfect materials, subsidence of backfills, fills and embankments, and vegetation stabilization, and against all imperfect, careless and/or unskilled workmanship.

b. That the work performed under this Contract, including mechanical and electrical equipment, and appurtenances, and each and every part thereof, shall operate (with proper care and maintenance), in a satisfactory and efficient manner and in accordance with the requirements of these Contract Documents. For equipment bearing a manufacturer's warranty in excess of one year, furnish a copy of the warranty to the Engineer naming the

County as beneficiary.

c. That the Contractor agrees to replace with proper workmanship and materials, and re-execute, correct or repair without cost to the County any work which may be found to be improper or imperfect and/or which does not operate in a satisfactory manner or fails to perform as specified, or in any other way does not conform to the Contract Document, unless such damage is the direct result of negligence on the part of County personnel, or due to fair wear and tear.

d. That the structures shall be watertight and leakproof at every point and in every joint.

e. No use or acceptance by the County of the work or any part thereof, nor any failure to use same, nor any repairs, adjustments, replacements, or corrections made by or for the County due to the Contractor's failure to comply with any of his obligations under the Contract Documents, or other corrections made by the County shall impair in any way the guarantee obligations assumed by the Contractor under these Contract Documents.

J. Construction Stake Out by County and/or Developer

1. The County or developer will furnish all necessary horizontal and vertical control information for the establishment of lines grades and elevations for the guidance of the Contractor as follows:

a. bench marks

b. manhole ties

c. traverse stations

K. Construction Stake Out by Contractor

1. The Contractor shall provide all engineering and stakeout necessary for the setting of batter-boards, forms, string line and finished grade control, slope stakes and other controls which may be required for the proper construction of the work in this Contract.

2. The County will establish or has established baselines, bench marks or other necessary control points for the Contractor's use. The Contractor shall perform all stake out from the County furnished control points (traverse, property lines, bench marks and the like) and he shall employ qualified and experienced personnel to provide said stake out. Said personnel shall be approved by the Engineer in writing prior to the start of stake out work.

3. The Contractor shall preserve and maintain in proper position all bench marks and baselines provided by the County. If such are disturbed by the Contractor's employees, equipment or his neglect to give them proper protection, those so disturbed shall be reset by the Contractor at his own expense.

4. Notify the Engineer of changed conditions in accordance with Article 17 in the General Conditions.

5. For pipeline construction, the Contractor's responsibilities shall also include the following:

   a. Stake out test pits and provide the Engineer with actual utility locations and elevations as directed otherwise.

   b. Stake out centerlines and offset lines at 25 foot maximum spacing of stations (stakes, nails, crosses).

   c. Stake out intermediate points (P.C., P.T., structures, sittings, end of lines topographic changes) as required and as deemed necessary by the Engineer.

   d. Prepare and submit cut sheets showing existing ground elevation at each manhole, the planned profile elevation, the percent of grade of the sewer line, finished structure elevation and the elevation of the top of the offset points, plus the stationing of each house lateral. The attached sample cut sheet form shall be utilized. (see page 1000-16)

   e. Provide flag stakes for protection of all stakes installed to aid in their preservation and maintenance.

   f. Provide all other engineering and stake outs necessary for the setting of batterboards, forms, string lines and finished grade control, slope stakes and other controls which may be required for the proper construction of the work in this Contract.

   g. Provide stake out of the right of way.

   h. The cost of making the connection and the alterations necessary to the existing Water Mains and Sanitary Sewers shall be included in the Unit Price Bid therefore unless a specific pay item is shown in the proposal to cover that phase of the work.

6. For other types of construction, the Contractor shall provide necessary stake out as required and as deemed necessary by the Engineer.

7. Construction shall not begin in any given area until cut sheets have been submitted to and signed for by the Engineer or Inspector and the

Engineer has received one copy of the notes.

8. Work done without lines and grades or without written approval of the Engineer will not be estimated or paid for. Any work so done may be ordered removed and replaced at no cost to the County.

9. Maintain current complete as-built drawing(s) and submit final as-builts within ten days of completion, complying with requirements as set forth in Section 1100 incorporating all changes in the course of the Contract.

L. Project Progress Meetings

1. Project Progress Meetings will be held periodically in order that the Engineer can review the status of the Project. The Contractor's superintendent shall attend the meeting and accompany the Engineer and/or County on an inspection of the job site. During inclement weather, the Contractor, if required, shall provide space in his field office for the meeting. The date and time of the meetings shall be as directed by the Engineer. The holding of the Project Meeting shall not relieve the Contractor from cooperating with the Engineer should the Engineer require additional visits to the site.

2. Progress meetings will be held monthly at the Engineer's Field Office during the performance of the work of this Contract. Additional meetings may be called as progress of work dictates.

3. Engineer will preside at meetings and record minutes of proceedings and decisions. Engineer will distribute copies of minutes to participants.

4. Attendance:

   a. Engineer

   b. Contractor

   c. Subcontractors, only with Engineer's approval or request, as pertinent to the agenda

   d. Superintendent

5. Minimum Agenda:

   a. Review and approve minutes of previous meetings.

   b. Review progress of Work since last meeting.

   c. Review proposed 30-60 day construction schedule.

d. Problems shall be submitted as a Field Oder as soon as the problem is discovered. See General Conditions article 1, article 13, and EJCDC C-700 3.03 “Reporting and Resolving Discrepancies”, for more details.

e. Develop corrective measures and procedures to regain planned schedule.

f. Revise construction schedule as indicated and plan progress during next work period.

g. Maintaining of quality and work standards.

h. Complete other current business.

i. Schedule next progress meeting.

6. The quantities appearing in the Bid Schedule are approximate only and are prepared for the canvassing of bids. Payment to the Contractor will be made only for the actual quantities of work performed or materials to be furnished in accordance with the Contract.

M. Contingent Items

1. Fixed contingent items listed in the bid schedule do not necessarily occur on the plans. However, during the course of the Work the Engineer may direct the incorporation of any or all of the items. Payment to the Contractor in such case will be for the quantities directed to by the Engineer based on the unit prices listed in the bid schedule.

N. Archaeological Artifacts

1. All articles of historical or scientific value, including coins, fossils, and items of antiquity, which may be uncovered or otherwise brought to the attention of the Contractor during the course of the Contract shall remain the property of the Owner of the property on which the articles reside. Such findings shall immediately be reported to the Engineer who will determine the method of removal , where necessary.

O. Serpentinite Rock

The use of serpentine rock (asbestos bearing rock) as an unbound surfacing material on roads, sidewalks, parking lots, road shoulders, trails and other areas subject to traffic (vehicular and pedestrians) is <u>prohibited</u>.

Contractor's Construction Cut Sheet		
Contract No.	Project:	Date:
Type of Pipe:		Date:
Water:	Sewer	Chkd:
Bench Marks:		

Plan View

All elev. to highest point hub.

Station	Invert Slope	% Slope	Stakeout Data			Const. Data		Re-marks
			Off set	Top of Stake Elev.	Cut to Invert	Ground Elev.	Cut to Invert	

P. STANDARD PROCEDURE FOR PREPARATION OF AS-BUILT DRAWINGS

To be noted on profile:

i. Changes in water line lengths.

ii. As built sewer distances center of MH to center of MH.

iii. As built MH depths. Invert to top of frame.

iv. As built MH inverts elevation.

v. % of grade as built.

vi. As built MH rims elevation

To be noted on horizontal plan:

1. Three ties to all MH's, fittings, structures, etc., when possible.

2. Fire hydrant leads, center to center.

3. As built sewer distance.

4. As built fire hydrant, etc.

5. Size and type of pipe.

In addition:

1. Water and Sewer will be color coded (red-sewer, green-water).

2. Inspectors will obtain open ditch ties on underground fittings, structures, etc. to be given to Line and Grade for plotting on their field finals.

3. On plans, such as townhouses, where congested conditions affect neatness and legibility, separate plans will be used to final water and sewer.

NOTE: Ties are to be taken to permanent structures whenever possible.

STANDARD SPECIFICATIONS

SECTION 1010

SITE CONDITIONS

1. General

A. Description:

This section includes requirements of a general nature relating to site conditions and the Contractor's responsibility for existing utilities.

B. Existing Utilities

1. The term existing utilities shall be deemed to refer to both publicly-owned and privately-owned utilities such as electric power and lighting, telephone, water, gas, storm drains, process lines, sanitary sewers and all appurtenant structures.

2. Existing utility facilities and structures are shown in accordance with the best available information. The County will not be responsible for the completeness or accuracy thereof nor for any deductions, interpretations or conclusions drawn therefrom. Forty-eight (48) hours in advance of work in the vicinity of existing facilities, the Contractor shall notify Miss Utility by calling 800-257-7777. The Contractor shall then verify to his own satisfaction by test pit or other means the actual locations of existing utilities prior to construction in their vicinity. Test pits directed by the Engineer shall be specified in Section 2200.

a. Prior to beginning any excavation work, the Contractor shall, through field investigations, determine any conflicts or interferences between existing utilities and new utilities to be constructed under this project. This determination shall be based on the actual locations, elevations, slopes, etc., of existing utilities as determined in the field investigations, and locations, elevation, slope, etc. of new utilities as shown on the Drawings. If an interference exists, the Contractor shall bring it to the attention of the Engineer as soon as possible. If the Engineer agrees that an interference exists, he shall modify the design as required. Additional costs to the Contractor for this change shall be processed through a Change Order as detailed elsewhere in these Contract Documents. In the event the Contractor fails to bring a potential conflict or interference to the attention of the Engineer prior to beginning excavation work, any actual conflict or interference which does arise during the Project shall be corrected by the Contractor, as directed by the Engineer, at no additional expense to the Owner.

b. The Contractor shall notify all public utility corporations, jurisdictional agencies or other owners to make all necessary adjustments to public utility fixtures and appurtenances within or adjacent to the limits of construction. The Contractor shall be responsible for coordinating his activities with the utility. Delays and additional costs resulting from a lack of coordination between the utilities and Contractor shall be at no cost to the County.

c. The work shall be carried out in a manner to prevent disruption of existing services and to avoid damage to the existing utilities. Temporary connections shall be provided, as required, to insure uninterruption of existing services. Any damage resulting from the work of this Contract shall be promptly repaired by the Contractor at his own expense in a manner approved by the Engineer and further subject to the requirements of any authority having jurisdiction. Where it is required by the authority having jurisdiction that they perform their own repairs or have them done by others, the Contractor shall be responsible for all costs thereof.

3. Work in Vicinity of Existing Utilities

a. At least 48 hours prior to starting work in the vicinity of underground utility structures and appurtenances, the Contractor shall notify Miss Utility by calling 800-257-7777, as stated hereinbefore. The Contractor shall support and protect all utility structures and appurtenances in accordance with the plans and owner's requirements, and shall take any other steps necessary to protect the structures from disturbance and damage. Where excavations by the Contractor require any utility lines or appurtenant structures to be temporarily supported and otherwise protected during the construction work, such support and protection shall be provided by the Contractor. All such work shall be performed in a manner satisfactory to the Engineer and the respective authority having jurisdiction over such work. In the event the Contractor fails to provide proper support or protection to any existing utility, the Engineer may, at his discretion, have the respective authority to provide such support or protection as may be necessary to insure the safety of such utility, and the costs of such measures shall be paid by the Contractor.

4. Relocations by Others

a. Relocations indicated in the Contract Documents to be performed by others are not a part of Contract. However, it shall be the Contractor's responsibility to coordinate his construction with the performer of such relocations so as not to cause delay in this Contract.

b. Relocations by others arranged by and for the convenience of the

Contractor shall be at no additional cost to the County.

5. Access to Utilities Facilities

a. The contractor shall at all times permit free and clear access to the various and affected facilities by personnel of the utility owners or operators for the purpose of inspection, maintenance, providing for additional service requirements and the construction of new facilities when personnel of the utility owners or operators are working within the limits of work to be performed by the Contractor, the Contractor will not be relieved of his responsibility for the maintenance and protection of such facilities.

C. Soil Borings & Other Soil Data

1. The County may have had subsurface test borings made in the area in which the work is to be performed. Such borings whether or not contained in the Contract Documents, are not to be considered a part of this Contract and are not to be relied upon by the Contractor, it being understood that the test borings were conducted solely for the benefit of the County. The results of these borings are maintained in the County offices and may be inspected by the Contractor. The County, however, does not warrant or guarantee the accuracy or completeness of such test nor that the conditions actually encountered in the prosecution of the work under this contract will be the same as the conditions indicated by the test borings. Each bidder shall determine to his own satisfaction the character and type soil he will encounter in the work to be done under the Contract.

2. The County may have made other test borings or constructed other facilities in the vicinity of the work under this Contract. If so, such records of previous work may include information on soils which were encountered. Copies of these records may be examined at Frederick County Engineering Department, 301 Montevue Lane, Frederick, Maryland. The selection of records to be examined and interpretation of any information indicated thereon shall be the sole responsibility of the Contractor.

II and III not used.

IV. Measurement and Payment

A. Providing for and complying with requirements set forth in this section will not be measured for payment but the cost thereof will be considered incidental to the Contract.

B. Request for extra work generated by heretofore unknown facilities shall be processed as set forth in the General Conditions for Change Orders.

STANDARD SPECIFICATIONS

SECTION 1100

INSPECTIONS, TESTS, SCHEDULES AND REPORTS

I. General

A. Description

This section includes requirements of a general nature related to the Contractor's responsibility for inspections, tests, schedules and reports.

B. Inspections

1. The Engineer or Inspector has the right to inspect any materials or equipment at any stage of development or fabrication and shall be allowed access to the site and to the Contractor's and supplier's shops to conduct such inspection. Inspection by the Engineer does not release the Contractor from responsibility or liability with respect to material or equipment.

2. When specified inspections or tests are required by the Contract Documents, the work involved shall not proceed beyond that point until such inspections or tests have been approved by the Engineer. The Contractor shall inform the Engineer of progress of the work and shall give the Engineer a minimum of three working days notice of appropriate times for specified inspections and tests. The Contractor shall ensure that a portion of the work to be inspected is in a safe, accessible, dry, ventilated and well lit location.

3. When local laws and codes require approval and inspection of the work by other agencies or organization before installation or operation, the Contractor shall obtain such approval and submit one signed original and three copies of the approval to the Engineer.

4. Inspection of House Services

a. All work under this section for the installation and testing of house services from the property line to the building drain cleanout shall be inspected by the County Inspector in accordance with the State of Maryland Plumbing Regulations "Code of Maryland Regulation 09.20".

C. Testing

1. The County will provide personnel to perform all required testing including but not necessarily limited to the following periodic inspections, engineering and associated services:

a. Soils, inspection and testing of excavations, placement and compaction of soils. Determination of suitability of excavation material. Inspect subgrades and foundations.

b. Concrete. Inspection of forms and reinforcement inspection of concrete replacement; witnessing of Contractor's slump and air entrainment tests; making cylinder samples and provide storage on site; performing seven and twenty-eight day tests on specimen cylinders.

c. Masonry. Sampling and testing of mortar, bricks and grout; inspection of brick and block samples and sample wall panels; inspection of placement of reinforcement and grouting.

2. The Contractor shall cooperate with the Engineer and the testing laboratory representative and provide at least 24 hours' prior to specified testing. The Contractor shall provide labor and materials, and necessary facilities at the site as required by the testing laboratory.

3. The Contractor shall provide a testing laboratory where so specified in the Contract Documents. The laboratory shall be operated by a member of the Independent Council of American Laboratories and shall be approved by the Engineer.

4. Equipment Testing

a. When an item of equipment which is designated for testing in the special conditions, has been completely erected, including controls and instrumentation, the Contractor shall notify the Engineer, who will designate a time for the witnessing of testing and operation of the item as required. All testing shall be performed in the presence of the Engineer, and the results of all tests shall be subject to his approval.

a. " Completely erected" shall mean that the installation is erected, all necessary adjustments have been made, required lubricants have been applied as specified elsewhere, and that the following requirements have been met: County operators have been trained and instructed in the operation of equipment; O&M Manuals, electrical system test procedures, spare parts lists, and manufacturers installation certificates have been furnished. The Contractor shall furnish labor, lubricants, and all other materials, equipment and instruments necessary for all Engineer's tests.

b. The Contractor shall provide competent and experienced engineers or superintendents, who shall represent the

manufacturers of equipment furnished and installed under the Contract, to assist the Contractor, in the installation, adjustment, and testing of equipment in conformity with the Contract Documents.

b. After an item of equipment has satisfied all of the above conditions, the Contractor shall notify the Engineer and shall at such time as directed, conduct operational tests to demonstrate to the Engineer's satisfaction that the equipment is ready for operation. A letter of conditional acceptance will then be issued and the County will be responsible for all further maintenance and operation of same.

D. Schedules

1. Construction Schedule

a. The Contractor shall, within 15 days after the date set forth in the notice to proceed, prepare and submit to the Engineer for review, a practicable and feasible schedule, showing the order in which the Contractor proposes to carry on the work, and the dates upon which he proposes to start and complete each of the salient features, including the dates for procurement of materials, plant and equipment and the schedule for submission of shop drawings. The construction schedule shall be in chart form showing contemplated completion percentages and arranged to record actual completion percentages at stated intervals.

b. The construction schedule shall be kept up to date and the current updated schedule shall be submitted to the Engineer monthly with the request for payment.

c. The construction schedule shall in general determine the order in which the work is to proceed. The Engineer, however, may order and authorize minor changes of this schedule whenever such changes are of definite advantage to or necessary for the operations of the County.

d. The Contractor shall furnish sufficient forces, construction equipment and plant as may be necessary to ensure the prosecution and completion of the work in accordance with the submitted schedule. The Contractor shall increase his forces and plant and may request from the Engineer lengthening of the working hours if he falls below the progress shown on the schedule. If, in the opinion of the Engineer, such increases are necessary for the completion of the work in accordance with terms of the Contract they will be approved. Failure of the Contractor to comply with the requirements of the Engineer may be grounds for determination by the Engineer that eh Contractor is not

proceeding at such rates as will ensure completion within the specified time and may result in the termination of the right of the Contractor to continue the work.

e. In the case of an emergency, the Engineer reserves the right to direct the Contractor to commence work at a certain location within four hours notice.

2. Progress Schedule

a. Within thirty (30) days after issuance of the Notice to Proceed, the Contractor shall prepare and submit five (5) copies of his proposed progress schedule to the Engineer for review and approval.

b. If so required, the schedule shall be revised until it is approved by the Engineer.

c. Schedule shall be updated monthly, depicting progress to the last day of the month and five (5) copies submitted to the Engineer not later than the fifth day of the month, and prior to the application for progress payment. Failure to provide monthly schedule updates will be grounds for the Engineer or Owner to withhold progress payment approval.

d. Schedule shall be prepared in the form of a horizontal bar chart showing in detail the proposed sequence of the work and identifying construction activities for each structure and for each portion of work.

e. Schedule shall be time scaled, identifying the first day of each week. The Schedule shall be provided with estimated dates for Early Start, Early Finish, Late Start and Late Finish. The work shall be scheduled to complete the Project within the Contract time. The Late Finish date shall equal the Contract Completion Date.

f. Schedule shall show duration (number of days) and float for each activity. Float shall be defined as the measure of leeway in starting or completing a scheduled activity without adversely affecting the project completion date established by the Contract Documents.

g. Updated schedule shall show all changes since the previous submittal.

h. All revisions to the schedule must have the prior approval of the Engineer.

3. Critical Path Method Construction Schedule.

a. Where so specified in the special conditions, provide CPM schedule as follows:

b. The Contractor shall submit within 15 days after receipt of notice to proceed, a preliminary schedule indicating planned operations during the first 60 days. Cost of activities expected to be completed or partially completed before submission and approval of the whole schedule shall be included.

c. Within 45 days of receipt of notice to proceed, a complete network analysis system shall be submitted and shall consist of a detailed network mathematical analysis and network diagram. Provide copies as set forth in the special conditions.

(1) The network diagram shall show the order and interdependence of activities and the sequence in which the work is to be accomplished as planned by the Contractor. The basic concept of a network analysis diagram be followed to show how the start of a given activity is dependent on the completion of preceding activities and its completion restricts the start of following activities.

(2) Detailed network activities shown on the network diagram shall include, in addition to construction activities, the submittal for approval of samples of materials and show drawings, the procurement of critical materials and equipment, fabrication of special materials and equipment and their installation and testing.

(3) Related activities shall be grouped on the network. The activities on the critical paths shall be highlighted. The network shall be time scaled using units of approximately one half-inch equals one week or other suitable scale approved by the Engineer. Weekends and holidays shall be indicated where slack exists the activities shall be shown at the earliest time they are scheduled to be accomplished. Sheet size shall be 30" x 60" minimum.

(4) The mathematical analysis of the network diagram shall include a tabulation of each activity shown on the detailed network diagram. The following information will be furnished as a minimum for each activity.

(a) Preceding and following event numbers.

(b) Activity Description.

(c) Estimated duration of activities in units of working days (being the best estimate available at time of computation).

(d) Earliest start date (by calendar date).

(e) Earliest finish date (by calendar date).

(f) Scheduled or actual start date (by calendar date).

(g) Scheduled or actual finish date (by calendar date).

(h) Latest start date (by calendar date).

(i) Latest finish date (by calendar date).

(j) Slack or float.

(k) Monetary value of activity.

(l) Responsibility of activity (prime contractor, subcontractors, suppliers).

(m) Manpower required by trade and by total. Graphic representatives will be allowed.

(5) The mathematical analysis shall list the activities in sorts or groups as follows:

(a) By the preceding event number from lowest to highest and then in the order of the following event number.

(b) By the amount of slack, then in order of activity number.

(c) By responsibility in order of earliest start date.

(6) Initial submittal and complete revisions shall be submitted in six copies.

d. Review of the system shall be as follows:

(1) The Contractor shall participate in a review of evaluation of the proposed network diagrams and analysis by the Engineer. Any revisions necessary as a result of this

review shall be resubmitted to the Engineer within ten days after the conference. Twenty days will be allowed for checking and further action by the Engineer. Progress payments will be withheld pending attainment of a mutually acceptable schedule. The mutually acceptable schedule shall then be the schedule to be used by the Contractor for planning, organizing, directing and executing the work and for reporting progress. If the contractor thereafter desires to make changes in his method of operating and scheduling he shall notify the Engineer in writing stating the reasons for the change. If the Engineer considers these changes to be of a major nature he may require the Contractor to revise and submit, without additional cost to the County all of the affected portion of the Network Diagram and mathematical analysis to show the effect on the entire project. A Change may be considered of a major nature if the time estimated to be required or actually used for an activity or the logic of sequence of an activities is varied from the original plan to a degree that there is reasonable doubt as to the effect on the Contract completion date or dates. Changes which affect activities with adequate slack time shall be considered as minor changes, except that an accumulation of minor changes may be considered a major change when their cumulative effect might affect the Contract completion date.

(2) All system start-up and test activities shall follow detailed test procedures; check lists, etc., previously approved by the Engineer. The Engineer shall be notified at least 21 days in advance of any system tests and reserves the right to have his and/or the Owner's representatives in attendance.

(3) The Contractor shall provide the services of experienced factory trained technicians, tools and equipment to field calibrate, test, inspect, and adjust all equipment in accordance with manufacturer's specifications and instructions.

(4) The Contractor (or designee) shall maintain master logbooks for <u>each</u> phase of installation, startup and testing activities specified herein. Each logbook shall include signal, loop or control strategy tag number, equipment identification, description and space for sign-off dates, Contractor signature and Engineer signature. Example test documentation specific to each phase of testing shall be approved prior to initiation of that testing, as specified hereinabove.

(5) All test data shall be recorded on test forms, previously approved by the Engineer. When each test has been successfully completed, a certified copy of all test results shall be furnished to the Engineer together with a clear and unequivocal statement that all specified test requirements have been met and that the system is operating in accordance with the Contract Documents.

(6) The Engineer will review test documentation in accordance with the Contract Documents and will give written notice of the acceptability of the tests within 10 days of receipt of the test results.

e. The Contractor shall submit at intervals of 30 days a report of the actual construction progress by updating the actual mathematical analysis. All Contract changes, including pending and approved change orders and field orders shall be included in the updated schedule. Revisions causing changes in the details network shall be noted on the network or a revised portion of the affected portions of the detailed network furnished. The network shall be revised as necessary for the sake of clarity. Failure of the contractor to update the schedule shall result in a denial of payment to the contractor until an updated schedule is received.

f. The report shall show the activities or portions of activities completed during the reporting period and their total value as basis for the Contractor's periodic request for payment. The report will state the percentage of the work actually completed and schedule as of the report date and the progress along the critical path in terms of days ahead or behind the allowable dates. If the project is behind schedule, progress along other paths with negative slack shall also be reported. Percentage of work actually completed will be reviewed by the Engineer in accordance with the procedures set forth in Article 21.1. If the Contractor fails to submit the required monthly reports and updates within the time prescribed, the Engineer shall withhold approval of progress payment estimates until such time as the Contractor submits the required reports and updates.

g. The Contractor shall simultaneously submit a narrative report with the updated analysis which shall include but not be limited to a description of the problem areas, current and anticipated delaying factors of their impact, and an explanation of corrective actions taken or proposed.

h. Extensions of time for performance required under the Contract General Conditions Articles 14, 15, 17, and 18 will be granted only to the extent that equitable time and adjustments for the activity or activities affected exceed the total float or slack along the

channels involved.

3. Schedule of Breakdown of Lump Sum Items

a. Before the first application for payment, the Contractor shall submit to the Engineer a schedule of breakdowns of each lump sum item, aggregating the total amount bid for each. Each breakdown shall include its proper share of overhead, profit, and applied general conditions. The schedule shall provide quantities if required by the Engineer, and shall subdivide the work into component parts in sufficient detail to serve as the basis for progress payments during construction.

b. The schedule shall be prepared in a form acceptable to the Engineer and be accompanied by such data to substantiate its correctness as the Engineer may require.

E. Reports

1. Certified Test Reports

a. Where certified test reports are required by the Contract Documents, they shall meet the following requirements:

(1) Before delivery of materials for which certified test reports are required, certified copies of the reports of all tests required in referenced publications or specified within the Contract Documents shall be submitted to the Engineer for approval. The testing shall have been performed in an approved independent laboratory, within one year of submittal of the reports for approval. Test reports shall be accompanied by a notarized certificate from the manufacturer or supplier certifying that the tested material meets the specified requirements and is of the same type, quality, manufacture make as those proposed to be supplied.

2. Certificate of Compliance

a. At the option of the Engineer, or where specified the Contractor may, in lieu of the specified tests and other tests required in the various reference documents, furnish a certificate of compliance from the manufacturer. The certificate shall state that the manufacturer has performed all required tests; that products to be supplied meet all test requirements; that tests have been performed within one year of submittal of the certificate; that products tested were of the same type, quality, manufacture and make of those proposed to be supplied.

3. Manufacturer's Certificates

a. The Contractor shall submit manufacturer's certificates for the installation of those items of equipment listed in the special conditions.

b. Manufacturer's certificates shall state that the equipment has been installed either under the continuous or periodic supervision of the manufacturer's authorized representative, that it has been adjusted and initially operated in the presence of the manufacturer's authorized representative, and that it is operating in accordance with the specified requirements, to the manufacturer's satisfaction.

II and III not used.

IV. Measurement and Payment

a. Providing for and complying with requirements set forth in this section will not be measured for payment but the cost thereof will be considered incidental to the Contract.

STANDARD SPECIFICATIONS

SECTION 1200

CONTRACTOR'S DRAWINGS AND SUBMITTALS

I. General

A. Description:

This section includes requirements related to the Contractor's responsibilities for drawings and submittals.

B. Technical Submittals

1. Shop Drawings

a. Original Submittal: Seven (7) legible prints each of all shop drawings shall be submitted to the Engineer for approval in accordance with the shop drawings submission schedule, with all fabrication and installation requirements allowing no more than twenty calendar days for checking and appropriate action by the Engineer. Three (3) copies of all shop drawings will be returned.

2. Procedure for Review

a. Submittals shall be transmitted in sufficient time to allow the Engineer at least thirty (30) working days for review and processing.

b. Contractor shall transmit seven (7) copies of all technical data or drawing to be reviewed.

c. Submittal shall be accompanied by a letter of transmittal containing date, project title, Contractor's name, number and titles of submittals, a list of relevant specification sections, notification of departures from any Contract requirement, and any other pertinent data to facilitate review.

d. Submittals will be annotated by the Engineer in one of the following ways:

"Furnish as Submitted" (FAS) - no exceptions are taken

"Furnish as Corrected" (FAC) - minor corrections are noted and shall be made.

“Furnish as Corrected – Confirm” (FACC) - some corrections are noted and a partial resubmittal or additional information are required as specifically requested.

"Revise and Resubmit" (R&R) - major corrections are noted and a full resubmittal is required.

"For Information Only – Not Reviewed” (FIO) – submittal was received and was distributed for record purposes without review.

e. If a submittal is satisfactory to the Engineer in full or in part, the Engineer will annotate the submittal "Furnish as Submitted", "Furnish as Corrected", or “Furnish as Corrected – Confirm”, retain four (4) copies and return remaining copies to the Contractor. If reproducible transparencies are submitted, the Engineer will retain the copies and return the reproducible transparencies to the Contractor. In the case of “Furnish as Corrected – Confirm” a partial resubmittal or additional information are required as specifically requested.

f. If a full resubmittal is required, the Engineer will annotate the submittal "Revise and Resubmit" and transmit three (3) copies to the Contractor for appropriate action. If reproducible transparencies are submitted, the Engineer will retain the copies and return the reproducible transparencies to the Contractor.

g. Contractor shall continue to resubmit submittals in part if they are returned “Furnish as Corrected – Confirm” or in full if they are returned “Revise and Resubmit” as required by the Engineer until submittals are acceptable to the Engineer. It is understood by the Contractor that Owner may charge the Contractor the Engineer's charges for review in the event a submittal is not approved (either "Furnish as Submitted" or "Furnish as Corrected") by the third submittal for a system or piece of equipment. These charges shall be for all costs associated with engineering review, meetings with the Contractor or manufacturer, etc., commencing with the fourth submittal of a system or type of equipment submitted for a particular Specification Section.

h. Acceptance of a Working Drawing by the Engineer will constitute acceptance of the subject matter for which the Drawing was submitted and not for any other structure, material, equipment or appurtenances indicated or shown.

i. Shop drawings will be returned stamped with the following classifications:

Approved: No corrections, no marks.

Approved as noted: A few minor corrections. All items may be fabricated as marked up with no further resubmission. Resubmit a corrected copy to the Engineer.

Revise & Resubmit: Minor corrections. Items not noted to be revised and corrected may be fabricated at the Contractor's option. Resubmit drawings as per original submission with corrections noted. Fifteen days will be allowed for checking and appropriate action by the Engineer.

Rejected: Major corrections or not in accordance with the Contract Documents. No items shall be fabricated. Correct and resubmit drawings as per original submission, 20 days will be allowed for checking and appropriate action by the Engineer.

Information Only: Items not reviewed or items for which submittals are not required.

3. Samples

a. Original submittal shall be two (2) samples, unless otherwise specified, of each item for which samples are required, be furnished for approval. Approval shall be obtained prior to delivery of material to the project site. Such samples shall be representative of the actual materials proposed for use in the project and of sufficient size to demonstrate design color texture and finish when these attributes will be exposed to view in the finished work.

b. Resubmittals: All rejected samples will be returned upon request, and any or all resubmittals required shall consist of new samples.

c. Approval: Upon approval one sample so noted will be returned and the other will be retained by the Engineer until completion of the work. When requested all approved samples will be returned for installation provided their identity is maintained in an approved manner until final acceptance of the project.

4. Catalog Data

a. Submittals: Six (6) copies of catalog data are required for original submittal and each subsequent resubmittal that may become necessary. Catalog data shall be submitted and returned as specified for shop drawings. If approved, such additional copies as may be requested by the Engineer shall be furnished without additional cost.

b. Manufacturer's equipment data shall be certified and shall include

materials type, performance characteristics, voltage, phase, capacity, and similar data. Provide wiring diagrams when applicable. Indicate catalog, model and serial numbers representing specified equipment.

c. Data Identification: Each submittal shall have all pertinent data contained therein that are applicable to the item submitted for approval, adequately and prominently designated.

5. Working drawings for changes substitutions or Contractor design items.

a. Working drawings and calculations as submitted shall be certified by a professional Engineer registered in the State of Maryland and shall convey or be accompanied by calculations or other sufficient information to completely explain the proposed method of construction, including but not limited to type of machinery and method proposed. Design calculations shall be submitted with the working drawings.

b. Engineer's Review

a. Engineer's review of the Contractor's submittals shall in no way relieve the Contractor of any of his responsibilities under the Contract. An acceptance of a submittal shall be interpreted to mean that the Engineer has no specific objections to the submitted material, subject to conformance with the Contract Drawings and Specifications.

b. Engineer's review will be confined to general arrangement and compliance with the Contract Drawings and Specifications only, and will not be for the purpose of checking dimensions, weights, clearances, fittings, tolerances, interferences, coordination of trades, etc.

6. Identification

a. Data: All submittals for approval shall have the following identification data, as applicable, contained thereon or permanently adhered thereto.

(1) County Contract Number.

(2) Project name and location.

(3) Submittal Numbers. Resubmittals shall bear original submittal number and be lettered.

(4) Product identification.

(5) Shop drawing title, drawing number, revision number, and date of drawing and revision.

(6) Applicable contract drawings and specification section numbers.

(7) Subcontractor's, vendor's and/or manufacturer's name, address and phone number.

(8) Contractor's certification statement.

b. Catalog data: Each separate catalog, brochure, or single page submitted shall have the identification required hereinbefore.

(1) Catalogs or brochures submitted containing multiple items for approval need the identification only on the exterior. In such instances the identification shall include page and catalog numbers.

(2) In the event that one or more of the multiple items are not approved in any submittal, the additional copies required shall not be requested until all items are approved.

c. Space: Vacant space approximately 2 ½-inches high by 4-inches wide shall be provided adjacent to the identification data to receive the Engineer's status stamp.

7. Contractor's Responsibility

a. Each shop drawing, working drawing, sample and catalog data submitted by the Contractor shall have affixed to it the following certification statement signed by the Contractor: "Certification Statement: By this submittal I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data and I have checked and coordinated each item with other applicable approved shop drawings and all Contract requirements."

b. No portion of the work requiring a shop drawing, sample, or catalog data shall be started nor shall any materials be fabricated or installed prior to the approval or qualified approval of such item. Fabrication performed, materials purchased or on-site construction accomplished which does not conform to approved shop drawings and data shall be the Contractor's responsibility. The County will not be liable for any expense or delay due to corrections or remedies required to accomplish conformity.

c. All submittals from subcontractors, manufacturers or suppliers shall be sent directly to the Contractor for checking. Contractor shall thoroughly check all Drawings for accuracy and conformance to the intent of the Contract Documents. Drawings found to be inaccurate or otherwise in error shall be returned to the subcontractors, manufacturers, or suppliers by the Contractor for correction before submitting them to the Engineer.

d. All submittals shall be bound, dated, properly labeled and consecutively numbered. Information on the label shall indicate Specification Section, Drawing number, subcontractor's, manufacturer's or supplier's name and the name or type of item the submittal covers. Each part of a submittal shall be marked and tabulated.

e. Working Drawings shall be submitted as a single complete package including all associated drawings relating to a complete assembly of the various parts necessary for a complete unit or system.

f. Shop Drawings shall be submitted as a single complete package for any operating system and shall include all items of equipment and any mechanical units involved or necessary for the functioning of such system. Where applicable, the submittal shall include elementary wiring diagrams showing circuit functioning and necessary interconnection wiring diagrams for construction.

g. ALL SUBMITTALS SHALL BE THOROUGHLY CHECKED BY THE CONTRACTOR FOR ACCURACY AND CONFORMANCE TO THE INTENT OF THE CONTRACT DOCUMENTS BEFORE BEING SUBMITTED TO THE ENGINEER AND SHALL BEAR THE CONTRACTOR'S STAMP OF APPROVAL CERTIFYING THAT THEY HAVE BEEN SO CHECKED. SUBMITTALS WITHOUT THE CONTRACTOR'S STAMP OF APPROVAL WILL NOT BE REVIEWED BY THE ENGINEER AND WILL BE RETURNED TO THE CONTRACTOR.

h. If the submittals contain any departures from the Contract Documents, specific mention thereof shall be made in the Contractor's letter of transmittal. Otherwise, the review of such submittals shall not constitute approval of the departure.

i. No materials or equipment shall be ordered, fabricated, shipped or any work performed until the Engineer returns to the Contractor the submittals, herein required, annotated "Furnish as Submitted", "Furnish as Corrected", or “Furnish as Corrected – Confirm.” If a submittal is returned “Furnish as Corrected – Confirm” the portions of work covered by the submittal that require confirmation by the Engineer shall not be ordered, fabricated, shipped, or any work

performed until those portions are approved in a subsequent submittal either "Furnish as Submitted" or "Furnish as Corrected".

j. Where errors, deviations, and/or omissions are discovered at a later date in any of the submittals, the Engineer's prior review of the submittals does not relieve the Contractor of the responsibility for correcting all errors, deviations, and/or omissions.

C. Operation and Maintenance Manuals

1. Two (2) preliminary copies of Operation and Maintenance Manuals, prepared specifically for this Project, shall be furnished for each item of equipment furnished under this Contract. The preliminary manuals shall be provided to the Engineer not less than 60 days prior to the start-up of the respective equipment.

2. The preliminary manuals shall be reviewed by the Engineer prior to the Contractor submitting final copies for distribution to the Owner. Following review of the preliminary copies of the Operation and Maintenance Manuals, one (1) copy will be returned to the Contractor with required revisions noted, or the acceptance of the Engineer noted.

3. Manuals shall contain complete information in connection with assembly, operation, lubrication, adjustment, wiring diagrams and schematics, maintenance, and repair, including detailed parts lists with drawings or photographs identifying the parts.

4. Manuals furnished shall be assembled and bound in separate volumes, by major equipment items or trades, and properly indexed to facilitate locating any required information. In addition, manuals should be labeled in the front cover with the project, name, equipment description, and manufacturer contract information.

5. Engineer and the Owner shall be the sole judge of the acceptability and completeness of the manuals and may reject any submittal for insufficient information included, incorrect references and/or the manner in which the material is assembled.

6. The Contractor shall furnish manuals for the various systems, as required by the Contract Documents. The manuals for each piece of equipment shall be a separate document with the following specific requirements:

a. Contents

Table of Contents and Index

Description of each system and components

Starting and stopping procedures

Special operating instructions

Routine maintenance procedures

Schedule for periodic servicing

Manufacturer's printed operating and maintenance instructions, parts list, illustrations, and diagrams

One copy of each wiring diagram

One approved copy of each shop drawing and each Contractor's working drawing

List of spare parts, manufacturer's price, and recommended quantity

Name, address and telephone number of nearest manufacturer's representative

b. Material

Loose leaf on 60 pound, punched paper

Holes reinforced with plastic cloth or metal

Page size, 8-1/2 inches by 11 inches

Diagrams and illustrations, attached foldouts as required

Of original quality, reproducible by dry copy method

Covers: Oil, moisture, and wear resistant

c. Submittals to the Engineer:

(1) Following the Engineer's review of the preliminary manuals, the Contractor shall submit five (5) paper copies and two (2) electronic copies of the final Operation and Maintenance Manuals to the Engineer. The manuals shall reflect the required revisions noted during the Engineer's review of the preliminary documents. Failure of the final manuals to reflect the required revisions noted by the Engineer during a review of the Preliminary documents will result in the manuals being returned to the Contractor. Acceptable final Operation and Maintenance Manuals shall be provided not less than two week prior to equipment start-up. See section 1100 paragraph I.C.4.a.

D. Record Drawings

1. The Contractor shall keep one record copy of all Contract Documents, reference documents, and all technical submittals at the site in good order and annotated to show all changes made during the construction process. Such annotations shall be kept current. These shall be available to the Engineer at all times during the life of the project.

2. At the completion of the project and before final payment is made, the Contractor shall furnish the Engineer one set of reproducible documents reflecting all changes herein described. Record drawings shall include changes made to locations or buried and exposed piping, equipment changes, substitutions, all variations from the Contract Documents, all accepted Working Drawings, including Shop Drawings, for equipment, piping, electrical work, heating system, ventilating system, air conditioning system, instrumentation system, plumbing system, structural, interconnection wiring diagrams, etc.. Specific requirements and additional drawings required for electrical and mechanical items are listed in the special provisions. Upon request, the county will provide one set of polyester film second generation reproducibles of the original contract drawings, at no cost to the Contractor.

E. Method of Construction

1. When so directed by the Engineer, the Contractor shall submit his proposed method of construction for specific portions of the work.

II and III not used.

IV. Measurement and Payment

A. Providing for and complying with requirements set forth in this section will not be measured for payment but the cost thereof will be considered incidental to the Contract.

STANDARD SPECIFICATIONS

SECTION 1700

SUBSTITUTIONS

I. General

A. Description:

This section includes requirements related to the contractor's responsibilities for substitutions.

B. Equivalent materials and equipment

1. Whenever a material or article is specified or described by using the name of a proprietary product or the name of a particular manufacturer(s) or vendor(s), followed by the phrase "or equal", the specific item mentioned shall be understood as establishing the type, function, dimension, appearance, and quality and is to be the basis upon which bids are to be prepared. Other manufacturer's products not named will be considered as substitutions required provided information is submitted in the manner set forth herein and provided substitutions will not require substantial revisions of the Contract Documents. If “or equal” is not listed following a vendor, or list of vendors names, then there shall be no substitution, and any submittal containing a substitution will bereturned with the appropriate status from Section 1200.

C. Submittal of list of proposed substitutions

1. Bidders shall submit their list of proposed substitutions and the proposed monetary changes associated therewith to the Engineer for approval together with the bids.

D. Upon written request from the Engineer, the following data shall be submitted in order for the substitutions to be considered:

1. Complete data substantiating compliance of proposed substitution with Contract Documents. Substitutions shall not change design intent.

2. For products:

a. Product identification, including manufacturer's name and address.

b. Manufacturer's literature, including but not necessarily limited to:

(1) Product description, performance and test data

(2) Reference samples

c. Samples where appropriate

d. Name and address of similar projects on which product was used, and date of installation.

3. For construction methods:

a. Detailed description of proposed method

b. Drawings illustrating methods

c. Name and address of similar projects on which method was used, and date of use.

4. Itemized comparison of proposed substitution with product or method specified. Different types of products and methods will be considered provided final performance is at least equal to that specified.

5. Data relating to impact on construction schedule occasioned by the proposed substitution.

6. Relation to separate contracts.

7. Accurate cost data on proposed substitution in comparison with product or method specified including costs of all redesigns required.

8. In making requests for substitution, bidder represents:

a. He has personally investigated proposed product or method, and determined that it is equal or superior in all respects to that specified. He will provide the same guarantee for substitution as for product or method specified.

b. He will coordinate installation of accepted substitution into work, making such design and construction changes as may be required for work to be completed in all respects.

E. Substitutions following award of Contract; requests for substitutions submitted after award of the Contract will not be considered unless evidence is submitted to the Engineer that the following circumstances exist:

1. Unavailability of specified product

a. The specified material is unavailable for reasons beyond the control of the Contractor. Such reasons consist of strikes, bankruptcy, discontinuance of manufacture, or acts of God.

b. The Contractor placed, or attempted to place, orders for the specified material within ten days after award of the Contract.

c. Request for substitution is made in writing to the Engineer within ten days of the date on which the Contractor ascertains that he cannot obtain the item specified.

d. Complete data as set forth hereinbefore to permit complete analysis of the proposed substitution are submitted with the request.

F. Rejection of proposed substitution

Substitutions will not be considered at any time if:

1. They are indicated or implied on shop drawings or project data submittals without formal requests submitted in accordance with this section.

2. Acceptance will require substantial revision of Contract Documents.

3. Acceptance will create problems in stocking of repair parts and in future maintenance by Frederick County.

G. The Engineer's decisions regarding evaluation of substitutions shall be considered final and binding. Request for time extensions and additional costs based on submission of, acceptance of, or rejection of substitutions will not be allowed. All approved substitutions will be incorporated into the Contract by change order.

II and III not used.

IV. Measurement and payment

A. Providing for and complying with requirements set forth in this section will not be measured for payment but the cost thereof shall be borne by the Contractor.

STANDARD SPECIFICATIONS

SECTION 1800

TEMPORARY FACILITIES AND ENVIRONMENTAL PROTECTION

I. General

A. Description

This section includes requirements to the Contractor's responsibility for Temporary Facilities and Environmental Protection.

B. Temporary Facilities

1. General

a. Temporary facilities and protective devices include but are not necessarily limited to the following items: temporary barricades, fences, and bridges, guards, temporary utilities, engineering office, steel plates over trenches, maintenance of traffic, project identification signs.

b. All materials used in construction of the above mentioned items of work shall be of such size shape and strength to be suitable for the use intended.

c. The Contractor shall conduct construction operations in such a manner as to cause as little inconvenience as possible to the general public and the County and its employees. Wherever required, the Contractor shall erect and maintain signs, fences, barricades and pedestrian bridges and provide guards and flag persons for the protection of the public.

d. The Contractor shall take positive measures to prevent at all times, entry to the site of the work and storage areas by children, animals and unauthorized adults.

e. Location of all temporary facilities shall be approved by the Engineer before they are transported to the construction site.

2. Furnish and construct temporary fencing as required to fence off excavation, storage and operating areas. All temporary fences erected by the Contractor shall be substantially constructed, neat in appearance and shall be approved by the Engineer. Unless otherwise indicated, fences shall be six feet high. The type of fence whether fixed or movable shall be as directed by the Engineer.

3. Barricade or close all openings in roadways, floors, walls or other parts of

structures or walkways while the openings are not in regular use. Barricades shall be substantial in character, neat in appearance, and be of size and arrangement approved by the Engineer.

4. In areas where removal of existing sidewalk is necessary, construct bridges for pedestrians of suitable materials in accordance with local or State requirements, and provide handrails or sides tightly boarded in accordance with said requirements. Pedestrian bridges shall have a minimum width of six feet or such greater minimum width as will accommodate the normal traffic flow at the particular location.

C. Temporary Utilities

1. Where County waterlines exist in close proximity to the project, the County will furnish metered water required during the entire construction period for the project to the Contractor. The metered water cost to the Contractor will be at the prevailing rates. The Contractor shall make the necessary arrangements for hook-up, shall provide all piping and appurtenances required, assure the availability of drinking water for his work force, and provide temporary pumps, tanks and compressors as necessary to produce the required pressures.

2. The Contractor shall make the necessary arrangements and provide all temporary electric service and lighting required during the entire construction period. The metered costs of electricity used shall be borne by the Contractor until the Conditional Acceptance.

   The electric service shall be of sufficient capacity and characteristics to provide the proper current for the various types of construction tools, motors, welding machines, lights, heating plant, pumps, and other work required. All necessary temporary wiring, panelboards, outlets, switches, lamps, fuses, controls and accessories shall be provided.

D. Temporary Light and Power

1. The temporary general lighting and small power requirements shall be serviced by 120/240 V, 1 phase, 3 wire temporary systems furnished and installed by the General Contractor. This service shall be furnished complete with main disconnect, overcurrent protection, meter outlet, branch circuit breakers, and wiring as required; including branch circuit breakers and wiring as required for furnishing temporary power to the various Contractor's field office service connections, all in accordance with the requirements of the servicing power company and applicable standards and codes. The meter for the temporary 120/240 V service for construction purposes shall be registered in the name of the General Contractor and all energy charges for furnishing this temporary electric power shall be borne by the General Contractor. Any Contractor with a need for power other than the 120/240 V, 1 phase, 3 wire shall provide such power at his own expense.

2. The General Contractor shall make all necessary arrangements, and pay for all permits, inspections, and power company charges for all temporary service installations. All temporary systems shall comply with and meet the approval of the local authorities having jurisdiction. All temporary electrical systems shall consist of wiring, switches, necessary insulated supports, poles, fixtures, sockets, receptacles, lamps, guards, cutouts, and fuses as required to complete such installations. The General Contractor shall furnish lamps and fuses for all temporary systems furnished by him and shall replace broken and burned out lamps, blown fuses, damaged wiring and as required to maintain these systems in adequate and safe operating condition. All such temporary light and power system shall be installed without interfering with the work of the other Contractors.

   When it is necessary during the progress of construction that a temporary electrical facility installed under this Division interferes with construction operations, the General Contractor shall relocate the temporary electrical facilities to maintain temporary power as required at no additional cost to the Owner. The General Contractor shall be responsible at all times for any damage or injury to equipment, materials, or personnel caused by improperly protected or installed temporary installations and equipment.

3. The various Contractors doing the work at the site shall be permitted to connect into the temporary general lighting system small hand tools, such as drills, hammers, and grinders, provided that:

   a. Equipment and tools are suitable for 120 V, single phase, 60 Hz operation and operating input does not exceed 1,500 volt-amperes.

   b. Tools are connected to outlets of the system with only one (1) unit connected to a single outlet.

   c. In case of overloading of circuits, the General Contractor will restrict use of equipment and tools as required for correct loading.

4. The General Contractor shall keep the temporary general lighting and power systems energized fifteen minutes before the time that the earliest trade starts in the morning and de-energized fifteen minutes after the time the latest trade stops. This applies to all weekdays, Monday through Friday, inclusive, which are established as regular working days.

   Any Contractor requiring temporary light and power before or after the hours set forth hereinbefore, or on a Saturday, Sunday, or holiday, shall pay for the additional cost of keeping the system energized and repaired. If more than one Contractor is involved, the charges shall be prorated, such amounts to be determined from the meter readings or other acceptable means previously agreed upon by the Contractors involved. If

it is necessary for any Contractor or his employees to be in any structure after regular working hours and the temporary general lighting system is not required for illumination, that Contractor shall provide such illumination required by means of flashlights, electric lanterns, or other devices not requiring use of electricity from the temporary general lighting system.

5. Each Contractor requiring additional power and lighting other than that specified herein (including power for temporary heating equipment to be provided by the General Contractor) shall furnish his own service complete with all fuses, cutouts, wiring and other material and equipment necessary for a complete system between the service point and the additional power consumers and shall install his own metering equipment in accordance with the requirements of the servicing power company.

6. The temporary general lighting system shall be installed progressively in structures as the various areas are enclosed or as lighting becomes necessary because of partial enclosure. Lighting intensities shall be not less than 10 foot candles.

7. The General Contractor shall provide a separate temporary night lighting circuit for construction security. This system shall be energized at the end of each normal working day and de-energized at the start of each normal working day by the General Contractor. The system is to be left energized over Saturdays, Sundays, and all holidays. Lighting intensities shall be not less than 2 foot candles.

8. Electrical welders provided by each trade used in the erection and fabrication of the buildings, structures and equipment shall be provided with an independent grounding cable connected directly to the structure on which the weld is being made rather than adjacent conduit piping, etc.

   Electricians and other tradesmen necessary for the required connections and operation of welding equipment and generator, standby generators and similar equipment shall be furnished by the individual Contractors. All costs for such labor and equipment shall be borne by the individual Contractors.

9. Upon completion of the work, but prior to acceptance by the Owner, the General Contractor shall remove all temporary services, security lighting systems, temporary general lighting systems and all temporary electrical work from the premises.

E. Temporary Sanitary Service

1. Sanitary conveniences, in sufficient numbers, for the use of all persons employed on the work and properly screened from public observation, shall be provided and maintained at suitable locations by the General Contractor, all as prescribed by State Labor Regulations and local

ordinances. Toilet facilities shall be the prefabricated chemical type unless otherwise indicated. The contents of same shall be removed and disposed of in a manner consistent with local and state regulations, as the occasion requires. Each Contractor shall rigorously prohibit the committing of nuisances within, on, or about the work. Sanitary facilities shall be removed from the site when no longer required.

F. Temporary Heating

1. The Contractor shall be responsible for provisions of temporary heating, including all costs of equipment and installation (except for permanent plant), fuel and attendance, whenever and for such periods as such heating may be required, either because of general weather conditions to prevent freezing, to provide suitable working conditions, or to ensure progress of the operation within the established scheduled time for curing of concrete.

2. The General Contractor shall provide temporary heating, ventilation coverings and enclosures necessary to properly protect all work and materials against damage by dampness and cold, to dry out the work and to facilitate work in all structures.

3. The equipment, fuel, materials, operating personnel and methods used shall be at all times satisfactory and adequate to maintain critical installation temperatures and ventilation for all work in those areas where the same is required.

4. After any structure is enclosed, the minimum temperature to be maintained is 50°F, unless otherwise specified, where work is actually being performed.

5. Before and during the application of interior finishing, painting, etc., the General Contractor shall provide sufficient heat to maintain a temperature of not less than 65°F.

6. Any work damaged by dampness or insufficient or abnormal heating shall be replaced by the General Contractor at no additional cost to the Owner.

G. Resident Representative's Field Office

1. The General Contractor shall provide and maintain a field office for the exclusive use of the Engineer. The facilities shall be available for his use during the entire life of the Project, and shall not be disturbed, moved, or interrupted without the Engineer's approval. The office shall be a separate structure containing at least 720 square feet of floor area, sealed from the weather, completed and ready for occupancy within thirty (30) days following the Notice to Proceed with the Project. The office shall be erected on a location approved by the Engineer. The Contractor

shall arrange for the office to be cleaned at least three (3) times every week in a manner satisfactory to the Engineer. a mobile field office trailer a minimum of 12 feet wide and 60 feet long is acceptable if it contains the required facilities.

2. All doors and windows shall be equipped with locking devices to prevent unauthorized entry, and all keys to the door locks shall be loaned to the Engineer for his use during the life of the project. Main entrance to office shall have a 72 square foot minimum covered porch with a separate roof and rainproof seal to the main structure. The office shall contain adequate heating, air conditioning, and ventilating facilities. Adequate electric lights shall be provided with a wall receptacle on each of the four walls. Functional, totally enclosed water closet and lavatory shall be provided. An individual, direct-line telephone service with outside bell shall be located as directed for the exclusive use of the Engineer. Telephone service for all calls relation to the work including long distance, all heat, light, water and sanitary facilities shall be furnished and paid for by the Contractor.

   a. The office shall be set up, equipped and made ready for use prior to the beginning of other work on the project, and shall remain until all field records pertinent to the project have been completed. It shall be maintained in good condition and appearance by the Contractor for the duration of the project and shall then be removed and disposed by him and the site cleaned up and left in a neat and acceptable condition.

   b. It shall be attractively painted on the outside and provided with a sign at least four (4) feet long and one (1) foot high lettered to read as follows: -- FIELD OFFICE --. The letters not less than 3 inches high, shall be white on black background and the sign shall have a white border at least 1-1/2 inches wide around it.

   c. All doors shall be equipped with locks.

   d. Windows, to furnish natural light, shall be constructed so as to open and close and shall have latches.

   e. Screens shall be provided for all windows and exterior doors, and the building shall be generally fly-tight. The screen doors shall be equipped with springs and latches.

   f. The office shall be supplied with satisfactory artificial lighting and lighting service plus a telephone with a telephone answering machine for the County's use, for the duration of the project. Electrical lights and current shall be supplied and at least two duplex convenience outlets shall be installed in each room.

g. If work is in progress during cold weather the office shall be heated to at least 68 degrees Fahrenheit by means of approved type heaters. If work is in progress during warm weather the office shall be cooled to at least 78 degrees Fahrenheit by means of an approved type air conditioning unit. Current or fuel, as required, shall be supplied by the Contractor.

h. All offices shall be provided with neat, sanitary toilet and handwashing accommodations for the use of the County employees and such facilities shall meet the requirements of the State Department of Health or other authorities having jurisdiction.

i. The office shall be furnished with the equipment as noted herein and as listed in the tabulation which follows:

2	Flat top desks, 2-1/2 x 5 feet, with drawers at each end
1	Plywood drawing table, 3 feet x 6 feet tilt top with drafting stool
10	Straight chairs
4	Four-drawer, legal size steel filing cabinets with lock and key
2	Large metal waste baskets
1	Rack from which to hang drawings, including related appurtenances
2	Fire extinguisher - Dry Chemical, Multi-purpose ABC (minimum size, 10 pounds) equipped with a visual air pressure gauge. The fire extinguisher shall be checked monthly for stored pressure, etc,; also checked and tagged
1	Electric water cooler with bottle water supply and disposable drink cups
6	Metal office folding tables 30 inches x 60 inches (minimum)
4	Bookcases with 3 shelves, 3 feet long
2	18 inch wide by 6 feet tall lockers
1	First Aid Kit equivalent to 24-unit first aid kit described on page 193 of First Edition, 1973, of "Standard First Aid & Personal Safety" -- The American National Red Cross. The first aid kit shall be checked monthly and replenished to full complement.

3 Tilt/swivel type desk chairs

1 Printing calculator with an instruction manual

1 Telephone with local and long distance service

1 Automatic telephone message recorder

1 4 cu. ft. capacity refrigerator

1 Laser copying, scanner, and printer, with local service contract

2 Access points with DSL or cable internet access with local service contract and wireless internet for entire trailer. Internet hot spot cards for individual laptops will not be accepted.

j. By the time the field office is made available to County personnel, the Contractor shall furnish the Engineer with evidence that insurance has been obtained and is in effect, and which will protect the County to the extent of $3,000 (non-deductible) against any loss of its property in the field office as a result of fire, theft, vandalism, wind, storm or flood. The insurance coverage will also include losses and damages to property of the County's employees stored in the office for use in the performance of their duties.

This insurance must be kept in effect until the date of completion of the project and evidence of renewal of the policy , as necessary, must be forwarded to the Engineer.

D. Project Sign

1. The Contractor shall furnish and erect identification signs for the project in accordance with the standard detail for Identification Sign. Number and spacing of signs shall be directed by the Engineer. The sign shall be erected in place before commencement of work on the Project.

E. Maintenance of Traffic

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1. The Contractor shall be responsible for maintaining a normal through traffic flow. He shall submit his maintenance of traffic plan to the Engineer for approval at the preconstruction meeting. Maintenance of traffic shall be in accordance with jurisdictional requirements and requirements set forth in permits acquired for this Contract and with the Manual on Uniform Traffic Control Devices. Safety measures shall be in accordance with Maryland State Highway Administration Specifications Article 10.07 and applicable jurisdictional requirements.

2. The Contractor shall be responsible for coordination of his operations with the appropriate jurisdictional agencies. In the absence of jurisdictional requirements, roads shall be considered secondary unless otherwise indicated, and the following criteria shall govern:

   a. General: Provide special personnel to whom no other duties shall be assigned to direct traffic at all times at roadways that are blocked to any extent by construction equipment or operations. These personnel shall wear red or orange safety garments and shall be equipped with signal paddles. Provide red lights and reflectorized safety garments during periods of darkness.

   b. Primary roads where indicated: Roadway space shall not be utilized for storage of earth and other materials. Excavations shall be closed at the end of each work day by backfilling or by means of steel plates marked in advance with warning signs or other accepted materials, and the work area shall be left free from obstacles during off-work hours.

   c. Secondary Roads: One-way traffic shall be maintained during working hours. Clean up area of the Work at the end of each work day so as to provide maximum use of the roadway during off work hours.

3. The Contractor shall provide temporary facilities as required for pedestrian and vehicular access to properties adjacent to or contiguous with the Project. Should it be necessary to temporarily interrupt access, the Contractor shall so notify the Engineer, and after securing the Engineer's approval, the Contractor shall notify all affected parties of the time, extent and duration of the interruption.

F. Environmental Protection

1. The Contractor shall be responsible for furnishing all necessary items for fulfilling the work described herein for Environmental Protection including prevention and control of erosion and sedimentation that results directly or indirectly from the Project.

2. Prevention of Water Pollution

a. The Contractor shall take all precautions in the conduct of his operations as may be necessary to avoid contaminating the water in adjacent watercourses or water storage areas including wells whether natural or man-made.

b. All earthwork, moving of equipment, water control of excavations, and other operations likely to create silting, shall be conducted so as to minimize pollution of watercourses or water storage areas.

c. Water used during the Contract Work which has become contaminated with oil, bitumens, harmful or objectionable chemicals, sewage or other pollutants shall be disposed of so as to avoid affecting all nearby waters and lands. Under no circumstances shall the Contractor discharge pollutants into any watercourse or water storage area. Water used in aggregate processing, concrete curing, foundation and concrete lift cleanup or any other waste shall not be allowed to re-enter a stream. When water from adjacent natural sources is used in the Contract Work, intake methods shall be such as to avoid contaminating the source of supply or becoming a source of erosion.

3. Noises and Air Pollution Control

a. The Contractor shall conduct his operations so as not to violate any applicable ordinances, regulations rules and laws in effect in the area pertaining to noise and air pollution and shall be required to conform to all provisions as set forth in the Rules and Regulations Governing the Control of Air Pollution in the State of Maryland, 10.03.35, and Rules and Regulations Governing the Control of Air Pollution an Area IV, 10.03.39 and subsequent amendments thereto, Maryland Department of Health and Mental Hygiene, Chapter 3, and Rules and Regulations Governing the Control of Noise Pollution in the State of Maryland, 10.03.45, Maryland State Department of Health and Mental Hygiene.

4. Plant Pest Control

a. All soil moving or handling equipment that has operated in or will operate in regulated areas shall be subject to plant quarantine regulations. In general, these regulations require the through cleaning of soil from equipment before such equipment is moved from regulated areas to uninfested areas. Complete information may be obtained from the regional office of the Plant Pest Control Division of the U.S. Department of Agriculture.

5. Preservation of Natural Resources

a. All construction operations, Contract work, clean-up and the condition of the adjacent terrain upon completion of the Work shall

fully comply with all applicable regulations and laws concerning the preservation of natural resources.

6. Dust Control

a. Throughout the entire construction period, dust control shall be maintained by use of water sprinklers or chemical dust control binder as may be approved by the Engineer.

b. Contractor shall take all necessary measures to control dust from his operations, and to prevent spillage of excavated materials on public roads.

c. Contractor shall remove all spillage of excavated materials, debris or dust from public roads by methods approved by the Engineer.

d. Contractor shall sprinkle water at locations and in such quantities and at such frequencies as may be required by the Engineer to control dust and prevent it from becoming a nuisance to the surrounding area.

e. Dust control and cleaning measures shall be provided at no additional cost to the Owner.

7. Erosion and Sediment Control

a. Land Disturbance is defined as any earth movement and land changes which may result in soil erosion from wind and water and the movement of sediment into State waters or onto State lands, including but not limited to tilling, clearing, grading, excavating, stripping, filling and related activities and the covering of land with an impermeable material.

b. All work shall comply with requirements and standards of the Maryland Soil Conservation Service Standards and Specifications for Soil Erosion and Sediment Control in Developing Areas, as modified by these Specifications, with specific jurisdictional requirements, and with information shown on the Plans and Sediment Control Permit and shall consist of the application of measures throughout the life of the Project to control erosion and to minimize the siltation of rivers and adjacent lands and streams. Such measures shall include, but not be limited to, the use of berms, dikes, sediment traps, gravel or crushed stone filters, mulch, grasses, slope drains and other methods approved by the County. Provide sediment control devices to contain surface drainage from within the construction site, borrow, waste and storage areas where deemed necessary by the Engineer. Erosion and sediment control measures shall be coordinated with

construction of the permanent drainage facilities wherever encountered.

c. The Contractor shall be responsible for securing any permits such as sediment control permits, grading permits and State environmental permits. In the County, all land disturbance greater than two foot of cut or fill will require a grading permit issued by the Department of Permits and Inspections, Winchester Hall, Frederick, Maryland 21701.

d. All arrangements shall be secured by the Contractor in writing and shall contain a clause to the effect that requirements and standards of restabilization and restoration standards for the right-of-way. A copy of the final access agreement and a copy of any additional required State or County permits shall be sent to the Engineer, prior to the Contractor beginning work in any areas outside of the right-of-way.

e. The Contractor shall notify the Sediment and Erosion Control Office of the County at least 24 hours before commencing construction of the Project. The site, work, materials, plans, specifications and permits shall be available at all times during work hours for inspection by the representative of the County.

f. Seed, sod, mulches, fertilizer, topsoil, soil conditioner and other materials for seeding and sodding shall be as specified in Section 2800. All other sediment control materials and devices shall be in accordance with the Maryland soil and Conservation Service Standards and Specifications. Other materials as required shall be as approved by the Engineer.

g. Requirements

(1) Clear only those areas that are so designated and where possible maintain vegetative buffer zone between the disturbed working area and any watercourse. If a twenty five foot minimum buffer with heavy vegetation (75 percent of the soil surface covered by plant life) cannot be maintained for any reason, a straw bale berm with gravel filter shall be constructed in its place and maintained until final restabilization is complete.

(2) Protect excavated material from being eroded into any waters or onto any adjacent lands. Stockpile excavated material on the high side of the trench.

(3) When sediment control devices are designated on the plans or by the Sediment Control Inspector, install during the initial grading and clearing operations and complete their installation before trenching operations begin.

Maintain until final restabilization and restoration or when directed by the Sediment Control Inspector to remove them.

(4) Critical areas, disturbed areas with a surface gradient exceeding ten percent, shall be immediately stabilized with vegetation after backfilling operations. Those areas that cannot be planted shall be adequately covered with straw mulch, wood chips, or stone mulch, MSHA gradation 6. Those disturbed areas that are less than ten percent in surface gradient shall be considered critical after exposure of more than thirty calendar days. Divert runoff from flowing onto critical areas.

(5) Provide erosion control measures such as straw bale, earth berm, or dike channels and other diversion devices that will safely convey runoff through disturbed areas to prevent scour or gully erosion. When possible, runoff shall be diverted in a safe manner around disturbed areas using pipes with headwalls and protected outlets.

(6) Provide a stone entrance device in accordance with SCS Standards and Specifications, at all points of egress onto public thoroughfares.

(7) Streams with base flow shall be crossed by one of the following methods:

(a) Fluming of water around construction.

(b) Pumping of water around construction.

(c) Temporary stream diversion within the confines of the existing channel.

(d) Tunneling of the stream.

(8) When utilizing a stream diversion or flume, within a large stream that requires a working area to be constructed in the stream, the initial diversion shall be constructed of non-erodible materials such as stone, sandbags or wood planking, or soil protected with stone or sandbags, shall be placed upstream prior to constructing the working area. All soil used in the stream crossing shall be protected from the forces of the water in the channel with non-erodible materials approved by the Engineer. After completing the crossing, remove all materials associated with the construction from the confines of the stream

(9) All existing sediment control devices that are disturbed during the construction operations shall be fully repaired by the end of that working day.

(10) Construct all sediment and erosion control devices in accordance with SCS Standards and Specifications for Soil Erosion and Sediment Control in developing areas. These devices or any of the above requirements can be modified only with the prior approval of the Sediment and Erosion Control Office.

h. Construction shall comply with requirements set forth herein and indicated on the Plans. Violation of jurisdictional codes and rules and regulations will result in suspension of the Work. Suspension of Work will not be lifted until the Contractor has received approval of his written reapplication for the revoked permit. Time extensions requested as a result of delays occasioned by such suspensions will not be granted. Field inspection in the County will be conducted by County sediment and erosion control personnel.

i. Should conditions arise in the field that render the Plans in adequate or inappropriate in this section, the Contractor shall immediately notify the Engineer. Additional plans or modifications where necessary will be furnished by the County and will become part and condition of the Sediment Control Permit.

II and III not used.

IV. Measurement and Payment

A. Providing for and complying with requirements set forth in this section will not be measured for payment but the cost thereof will be considered incidental to the Contract.

V. Special Provisions

A. ENGINEER'S OFFICE

1. The Contractor shall provide and maintain, in accordance with Section 1800, Temporary Facilities and Environmental Protection, Part I. Paragraph C, Temporary Utilities, Sub-paragraph 5 of the Standard Specifications, an office and facilities for the duration of the contract, and remove said office on completion thereof. The office may not be considered a bid item, the cost thereof shall be included in the prices for the various scheduled items in the bid. unless it is specifically included in the items listed in the proposal.

STANDARD SPECIFICATIONS

SECTION 1900

PROJECT CLEAN UP, RESTABILIZATION AND RESTORATION

I. General

A. Description

This section includes clean up, restabilization and restoration as required to prevent accidents to personnel, public, and County employees, to protect all work in place, restabilize and restore all disturbed areas, removal of all evidence of construction activities, and to effect completion of the project in an orderly manner.

1.Separate agreements between the Contractor and property owner for clean up, grading, seeding, sodding, tree repair, removal or replacement shall be submitted in writing to the Engineer for approval prior to commencement of the work. See section 2100.

B. Clean-up:

1. Construction clean-up shall proceed as construction progresses and shall consist of the removal of all mud, oil, grease, soil, stone, trash, scrap, debris, and excess materials that are unsightly or may cause accidents to persons or equipment. Remove water from floor areas where electrical power tools are to be used and prevent stains on concrete which will be exposed in the finished work. All cleaning materials and equipment used shall be selected and employed with care to avoid scratching, marring, defacing, staining, or discoloring the surfaces cleaned.

2. Immediately prior to the Contractor's written request for final inspection of the project or any portion thereof, perform final clean-up.

3. In addition to the normal "broom clean" requirements, the exposed surfaces of the following materials shall be cleaned as listed herein:

Glass:	Wash and Polish
Painted Surfaces:	Remove marks, stains, fingerprints, and dirt.
Exposed Slabs:	Wash, scrape and scrub using a detergent as necessary to remove bond breaker, dirt and discolorations.
Asphalt Paving:	Remove mud, dirt and trash and hose down as required.

Aluminum: Clean as directed.

Other Surfaces: Remove all trash, debris and surplus excavation material.

4. No items shall be left or discarded elsewhere on the site. Items that are to be discarded shall be removed to authorized dumping areas. Leave premises "broom clean".

C. Restoration and Restabilization

1. All areas disturbed by the Contractor's operations, including staging and stockpiling areas, construction strips, access roads, stream crossing sites and areas within the acquired right of way shall be restored and restabilized as specified herein.

2. Final restoration and restabilization including seeding sodding and paving when season permits, shall proceed immediately after construction activity is completed in a given area. The Contractor shall tear down and remove all temporary construction facilities constructed by them and leave the site in an orderly condition.

3. Public and private signs, markers, guard rails and fences shall be preserved and maintained in their original condition unless written permission is obtained for their removal and replacement. Such items which conflict with grading operations shall be removed and stored in a manner to keep them clean and dry. Re-erect items at such new locations to prevent damage to underground or overhead public utility structures. Damaged items shall be replaced at no cost to the County.

4. Restabilization of turf areas shall be performed in accordance with Section 2800.

5. Tree protection, repair and replacement shall be performed in accordance with Section 2100.

6. Stone surface and shoulders shall be restored to original condition. Shoulder material contaminated by foreign material shall not be reused, but shall be replaced by new material of same quantity and gradation. Materials and methods of construction shall be in accordance with jurisdictional requirements and with applicable permits secured for this contract.

7. Pavement, curbs, other paved areas and sidewalks shall be restored in accordance with requirements set forth elsewhere in the Contract Documents.

D. Storage of Excess Material

1. Any surplus excavated material not used for backfilling or embankment suitable for reuse shall be deposited on-site in the disposal area indicated on the Drawings or as directed by the Engineer. Approved disposal areas may also be used by the Contractor for spreading and drying any excavated material suitable as select fill that is too wet for use immediately after being excavated. The Contractor shall maintain the earth surfaces of the disposal area, both during the work and until the completion of all seeding and mulching or other erosion control measures specified, in a manner which will effectively control erosion and sedimentation. If necessary, the Contractor shall clear and grub the disposal site prior to any excavation work.

    a. Earth waste shall be shaped to contours which are comparable to and blend in with the adjacent topography where practical, but in no case will slopes steeper than 3 horizontal to 1 vertical be permitted.

    b. Seeding and mulching shall be performed over all the earth waste area. The work of seeding and mulching shall be performed in accordance with Section 02910 - Final Grading and Landscaping.

    c. The Engineer shall have the authority to establish whatever additional requirements may be necessary to insure the satisfactory appearance of the completed work.

E. Disposal of Waste Materials

1. Construction waste materials shall be disposed of in an authorized County disposal area or in an area covered by a current grading or sediment control permit, See Section 1000. Furnish three copies of grading permits to the Engineer.

2. The Contractor shall remove and dispose of off-site all unsuitable materials.

3. All unsuitable materials shall be disposed of in locations and under conditions that comply with federal, state and local laws and regulations.

4. The Contractor shall obtain an off-site disposal area prior to beginning demolition or excavation operations.

5. All excess and unsuitable materials shall be hauled in trucks of sufficient capacity and tight construction to prevent spillage. Trucks shall be covered to prevent the propagation of dust.

6. Waste material disposed of in an unauthorized area shall be removed by the Contractor and the area shall be restored to its original condition at no

cost to the County.

7. Human waste shall be disposed of in the special sites designated therefor.

F. Removal of Condemned Material

1. Material brought upon the ground or selected for use in the work which has been determined by the Engineer to be unsuitable or not in conformity with the Contract Documents shall be removed from the vicinity of the work without delay and disposed of in an approved area.

2. If the Contractor fails to remove condemned material within 48 hours after the receipt of notice, the condemned materials may be removed by the County and the cost of said removal shall be deducted from any monies due to the Contractor.

II and III not used.

IV. Measurement and Payment

A. Providing for and complying with requirements set forth in this section will not be measured for payment but the cost thereof will be considered incidental to the Contract.

STANDARD SPECIFICATIONS

SECTION 2100

CLEARING AND GRUBBING

I. General

A. Description

This section includes clearing and grubbing of areas within the Contract limits of right of way and other areas indicated, including work designated in permits and other areas indicated, including work designated in permits and other agreements, in accordance with the Contract Documents.

B. Definitions

1. Clearing is the removal, within the designated areas, of trees, brush, shrubs, down timber, decayed wood, other vegetation, and rubbish as well as the removal of fences and incidental structures.

2. Grubbing is removing from the ground all stumps, roots, stubs, brush, organic materials and debris.

II. Not used.

III. Execution

A. Disposition of Trees on Private Property.

1. General.

a. Trees and shrubs within the limits of the right of way shall be cleared and grubbed unless otherwise indicated in the Contract Documents.

b. Do not cut or damage trees outside the right of way unless so indicated or unless written permission has been obtained from the affected property owner. Three copies of such permission shall be furnished to the Engineer before removal operations commence. Request by property owners to stockpile cut logs shall be submitted to the County for approval.

2. Trees and shrubs to be removed.

a. Remove trees and shrubs in such a manner to avoid damage to trees and shrubs designated to remain. Trees felled outside of the immediate trench excavation or other excavation area shall have their stumps cut to ground level unless otherwise directed by the Engineer. Trees felled within the immediate vicinity of the trench or other excavation shall have their stumps removed and disposed of in and authorized permitted disposal site as specified in Section 1000.

3. Trees and Shrubs to be Saved.

a. Protect all other trees and shrubs from defacement, injury and destruction. Preserve trees within the right of way or construction strip that are so delineated on the plans or are marked in the field by red paint.

b. Do not cut roots unnecessarily; handwork or otherwise prevent damage to roots which extend into grading limits or limits of excavation. Disturb roots as little as possible when tunneling under trees. Backfilling around tree roots shall be done immediately after completion of construction in the vicinity around the trees.

c. The Contractor shall be responsible for the protection of all vegetation from damage resulting from emissions from motorized equipment.

d. During working operation, protect the trunk, foliage, and root system of all trees to be saved with boards or other guards placed as shown and as required to prevent damage, injury and defacement. Do not pile excavated materials adjacent tot eh base of any trees. Do not allow runoff to accumulate around base of trees. Do not fasten or attach ropes, cables, or guy wires to trees without permission of the Engineer. When such permission is granted, protect the tree before making fastening or attachments by providing burlap wrapping and softwood cleats. The Contractor shall be held responsible for damage resulting from these actions, Use of axes or climbing spurs for trimming will not be permitted. Provide climbing ropes during trimming.

e. Remove shrubs to be saved, taking a sufficient earth ball at the root to maintain the shrub. Temporarily replant if required and replace at the completion of construction in condition equaling the original.

f. Boxing and protecting all trees, shrubs, lawns and the like within areas to be preserved. Relocating trees and shrubs, so indicated on the Drawings, to designated areas.

g. Repairing all injury to trees, shrubs, and other plants caused by site preparation operations shall be repaired immediately. Work shall be done by qualified personnel in accordance with standard horticultural practice and as approved by the Engineer.

h. Tree and shrub repair where required shall be performed by a tree surgeon properly licensed by the State of Maryland.

B. Disposition of Trees and Shrubs in a Dedicated Public Space.

1. All disturbance or removal of trees and shrubs in public space in Frederick County is controlled by the Maryland Forest Service via the Roadside Tree Permit. All work including replacement shall conform to the Maryland Forest Service standards and requirements set forth in the permits for this Contract.

C. Disposition of trees and shrubs in park property (MPS and NPS)

1. Remove trees and shrubs within the designated construction strip as shown and as specified hereinabove this section. Trees within the working area which are marked with yellow, orange, or whit paint or are noted as to be saved and protected from damage.

2. Protect trees and shrubs outside the designated work strip on park property from defacement, injury and damage. Transplant all Dogwoods as directed by the park authorities.

3. The par authorities will, in some cases, designate the final location of trees when not shown on the plans, within park property including replacements.

D. Disposition of cut logs on private property.

1. When the Contract Documents or special agreements require that felled trees are to be trimmed and cut into selected lengths and stored on site, the Contractor shall adhere to the following regulations:

a. The logs shall be stockpiled along the edge of the right of way or in areas requested by the property owner or agent and approved by the permits and/or the County.

b. The area chosen shall not be within the 100 year floodplain.

2. When not required in the Contract Documents or special agreements, the Contractor is responsible for the removal and disposal of all material.

E. Protection:

1. Protect property pipes, stones and monuments. Replacement, if

required, shall be by a registered surveyor at no cost to the County.

2. Remove fences, curb, gutter, and flagstone, when required, and replace in original position or as indicated. Replace damaged facilities in kind at no cost to the County.

3. Protect other plants and existing improvements and facilities from damage.

F. Clearing and grubbing:

1. Clear all items specified herein to the limits indicated and remove cleared and grubbed material from the site. Do not start earthwork operations in areas where clearing and grubbing is not complete except that stumps and large roots may be removed concurrent with excavation. Comply with erosion, sediment control and stormwater management facilities measures specified elsewhere.

2. Clear and grub areas to be excavated and receiving less than three feet of fill and areas upon which structures are to be constructed, and remove imbedded stumps and roots to a depth of not less than one foot below the subgrade or slope surfaces. Refill depressions made below subgrade or slope surfaces by the removal of stumps or roots with materials suitable for backfill.

3. Do not burn without written permission from the County Health Department. If perishable material is burned, burn under constant care of competent watchmen at such times and in such manner that anything designated to remain on the property or other adjacent property will not be jeopardized. Comply with all applicable laws and ordinances.

4. Grubbing shall consist of the removal and disposal of all stumps, roots, logs, sticks and other perishable materials to a depth of at least 6-inches below ground surfaces.

5. Large stumps located in areas to be excavated may be removed during grading operations, subject to the approval of the Engineer.

G. Topsoil

Strip existing topsoil from areas where excavation or grading is to be performed prior to commencement of grading or excavation. Place in well drained stockpiles in locations approved by the Engineer.

H. DISPOSAL OF MATERIAL

1. All trees, stumps, roots, bushes and refuse shall be disposed of by burning or shall be removed from the site and disposed of by the Contractor. Heavy oils, asphaltic materials, items containing natural or

synthetic rubber or any material other than plant growth shall not be burned. On-site and off-site disposal areas are subject to approval by the Engineer. Ashes and residue from burning operations shall be removed from the site and disposed of by the Contractor.

2. All materials to be burned shall be piled neatly and burned when in suitable condition, so that all are reduced to ashes. Piling for burning shall be done in such a manner and in such locations as to cause the least fire risk with a minimum of 1,000 feet to the nearest dwelling. No burning shall commence before 9:00 a.m. or after 3:00 p.m. The Contractor shall take special precautionary measures as may be necessary to maintain proper control of such fires. Prevailing winds at the time of the burning shall be away from any city, or town or built-up area. The Contractor shall also obtain all of the required permits for his burning operations.

IV. Measurement and Payment

A. Clearing and Grubbing will not be measured for payment individually but the cost thereof will be considered as incidental to the Contract.

STANDARD SPECIFICATIONS

SECTION 2200

EARTHWORK

I. General

A. Description

This Section includes excavation, backfill, grading and related items in accordance with the Contract Documents.

1. Definitions

a. Fill material is material used for trench backfill, structural fill and backfill and embankment.

b. Filled areas are areas which have received trench backfill, structural fill or embankment materials, placed and compacted as specified herein.

c. Structural fill and backfill area upon or within which a structure is to be constructed.

d. Paved areas are areas over which paving exists, or is to be placed under this Contract, or areas designated on the plans to receive future paving.

e. Open areas are all areas other than the following: paved areas, areas within the public right-of-way of Frederick County, areas upon which structures are to be constructed, and improved grassed areas.

f. Improved grassed areas are areas so designated on the Plans.

g. Borrow fill and borrow trench backfill are suitable materials meeting requirements specified herein, and excavated off-site due to unsuitability of site excavated material.

h. Controlled blasting is excavation of rock in which the various elements of the blast (hole size, depth, spacing, burden, charge size, explosive charge weight per delay, distribution, delay sequence) are carefully balanced and controlled to provide a distribution of charge that will excavate the rock to the desired contours to minimize overbreak and fracturing of the rock beyond the contour line. Smooth wall blasting, pre-splitting, cushion blasting and line drill are examples of operations included in the term "controlled blasting".

i. Volume by Average End Areas method for solid rock excavation is figured using the assumption that the volume between successive cross sections (stations) is the average of their areas multiplied by the distance between them (usually five foot stations).

B. Quality Assurance

1. The Contractor shall furnish a guarantee that filled areas will not suffer from pending or settlement in excess of the following limitations for a period of one (1) year from the date of conditional acceptance.

a. Type I: (Paved areas and areas within five (5) feet of structures) 0.05 foot.

b. Type 11: (unimproved areas) 0.05 foot, sloped to provide positive drainage.

c. Type III: (all other areas) 0.10 foot.

Fill material which settles in excess of the above limitations shall be removed and replace with suitable material at no cost to the County. Structures, paving, landscaping and other site improvements damaged by settlement, shall be removed and replaced at no cost to the County.

2. Inspection and Testing

a. Place, fill material and perform earthwork under continuous monitoring of the Inspector. The Contractor. at his expense, shall have field density tests performed on the compaction of each layer of fill in accordance with one of the following: ASTM D1556; ASTM D2922; or ASTM D2617. After completion of each layer of fill in a designated area, the Contractor shall provide equipment to cut out smooth surfaced spot locations designated by the Inspector on which to perform the test. Copies of the test results shall be given to the inspector for his files. When the tests indicate that density or moisture content does not meet requirements specified herein, the particular layer or portion thereof, when directed by the Inspector, shall be reworked by rolling or by scarifying, wetting or drying and recompacting until the required density has been obtained.

b. Waiver of Test. The testing as required in paragraph 2.a can be waived if the total trench line, full width, is hydro hammered, meaning full effort, prior to testing of the utilities line.

C. Submittals

1. Blasting Data and Reports

a. Where indicated and when directed by the Engineer: Engage the services of a qualified, independent professional blasting vibration consultant satisfactory to the Engineer to design, review, evaluate, and modify the blasting operations. Have a blasting vibration consultant design in conjunction with the Contractor the initial test blasts, so that maximum explosive charge weights per delay period and blasting patterns can be determined for future blasts which will maintain the vibration effects at existing structures below the specified level. Have the consultant periodically or when requested by the Engineer, review the blasting operations and seismographic data and direct such changes in the blasting operation as are required to produce a controlled blasting operation meeting the requirements of this Specifications.

II. Materials

A. Fill Material

1. General Requirements for all Fill Material

a. All fill material shall be free of refuse and vegetable matter, frozen material and other objectionable material.

b. Excavated materials meeting these requirements and the requirements stipulated below for the appropriate type of placement shall be used when approved by the Engineer. Otherwise, the Contractor shall excavate haul and place material from other approved sources off site.

c. Soils from the excavations meeting requirements stipulated herein with the exceptions of topsoil and organic material may be used as select fill for backfilling, constructing embankments, reconstructing existing embankments, and as structural subgrade support.

2. Trench Backfill

a. Fill material for trenches in open areas shall have a maximum density not less than 100 pounds per cubic foot as determined by AASHTO T99, Method A. The top 12 inches of backfill material shall contain no rocks larger than one inch in the greatest dimension. Material from two feet above pipes to 12 inches below surface shall contain no more than 25 percent rocks, none being larger than four inches in the greatest dimension. Material placed lower than two feet above the top of the pipe shall contain no rocks.

b. Select fill used for backfilling shall either be material as described in Paragraph B above or a granular soil material with a Maximum Plasticity Index (PI) of 6.

c. Fill material for trenches under paved areas and areas to be paved in Frederick County shall conform to requirements for fill material for trenches in open areas up to the top 12 inches below the pavement base course. The top 12 inches of backfill shall meet one of the following materials requirements:

(1) Soil having a maximum density not less than 105 pounds per cubic foot as determined by AASHTO T99, Method A, with a liquid limit not exceeding 30; a plasticity index not exceeding 6; containing no stones larger than three inches in the greatest dimension.

(2) Special backfill, crushed stone or bank run having a maximum dry weight not less than 115 pounds per cubic foot as determined by AASHTO T99, Method A, with a liquid limit not exceeding 30; a plasticity index not exceeding 6; conforming to MSHA gradation CR 6, or gravel SB II.

d. Borrow Trench Backfill shall meet materials requirements listed under 2b above or the following:

(1) Dry concrete sand meeting requirements ASTM C33, placed up to one foot below finished grade and topped with earth meeting requirements of 2b(1) in non-paved areas, and with materials meeting requirements of 2b(2) in paved areas.

e. Where excavated material does not meet requirements for select fill, Contractor shall furnish off-site borrow material meeting the specified requirements herein. When the excavated material from required excavations is suitable for use as backfill, bedding, or embankments, but is replaced with off-site borrow material for the Contractor's convenience, the costs associated with such work and material shall be borne by the Contractor.

f. Do not change type of borrow materials used between manholes.

3. Structural Fill and Embankment

a. Fill material for structural fill and embankments less than four feet high shall have a maximum density not less than 100 pounds per cubic foot as determined by AASHTO T99, Method A, and shall contain no more than 25 percent rocks, none being

larger than four inches in the greatest dimension. Liquid limit shall not exceed 40 and plasticity shall not exceed 25.

b. Fill material for structural fill and embankments higher than four feet shall have a maximum density not less than 100 pounds per cubit foot as determined by AASHTA T99, Method A, and shall contain no more than 25 percent rocks, none being larger than four inches in the greatest dimension. Liquid limit shall not exceed 25 and plasticity shall not exceed 6.

c. Select fill used for embankment construction shall be a silty or clayey soil material with a Maximum Liquid Limit (LL) of 50 and a Plasticity Index (PI) between 7 and 20.

B. Bedding and Haunching for Pipe and Pipe Structures

1. Bedding for copper tubing shall be silica sand meeting requirements specified hereinabove or earth free of all stone.

2. Ductile iron pipe through 24 inches in diameter does not require granular bedding or haunching.

3. Bedding and haunching for all other pipe shall be 1/2" to 3/4" size stone granular material.

4. Bedding for manholes and vaults shall be 1/2" to 3/4" size stone granular material.

C. Granular Backfill Below Subgrade

1. Granular backfill below subgrade, replacement for unsuitable material shall be 1/2" to 1-1/2" size stone granular material.

D. Granular Base for On-Grade Slabs

1. Granular base for on-grade slabs, where indicated, shall be 1/2" to 1-1/2" size stone granular material.

E. Sheeting and Shoring

1. Sheeting, shoring and bracing materials shall be timber or steel, designed to retain the earth around structures to prevent cave-in and settlements, and to fulfill all safety requirements.

a. Timber shall be structural grade with minimum working stress of 1100 psi.

b. Steelsheet piling shall conform to requirements of ASTM A328, continuous interlocking type.

III. Execution

A. Topsoil

1. Removal, Storage, and Protection

a. Prior to blasting or excavation, the topsoil shall be removed, stored and protected. all topsoil within the work area shall be removed unless otherwise directed. The topsoil shall be stored on well drained land approved by the Engineer.

b. In all areas to be excavated, filled, paved, or graveled the topsoil shall be stripped to its full depth and shall be deposited in storage piles on the site, at locations designated by the Engineer, for subsequent reuse. Topsoil shall be kept separated from other excavated materials and shall be piled free of roots and other undesirable materials.

B. Excavation

1. General

a. All material excavated, regardless of its nature or composition, shall be classified as UNCLASSIFIED EXCAVATION. Excavation shall include the removal of all soil, rock, weathered rock, rocks of all types, boulders, conduits, pipe, and all other obstacles encountered and shown to be removed within the limits of excavation shown on the Drawings or specified herein. The cost of excavation shall be included in the Lump Sum Bid Price and no additional payment will be made for the removal of obstacles encountered within the excavation limits shown on the Drawings and specified herein.

b. Excavation for on-grade slabs and pavements shall be sufficient to allow for tills, base and waterproofing materials where indicated and required. Excavation for planting areas shall allow for topsoil. Excavation for formed concrete shall be sufficient to allow for convenient construction and removal of forms, and to allow for application of waterproofing and curing materials where indicated.

2. Test Pit Excavation

a. Test pit excavation shall be performed with extreme caution and in such a manner that no damage occurs to the facility being test pitted. See special requirements in Sections 2550 and 2570.

3. Rock Excavation

a. Whether or not a rock is shown on the plans, the Contractor is responsible for making his own investigation to determine if rock is present. The presence of rock and the furnishing and placing of suitable backfill material shall not entitle the contractor to additional compensation above and beyond the unit price for either sanitary sewer or water line installation, which included disposal off-site of all rock excavated.

b. Unless otherwise directed, rock shall be fully taken out at least 25 feet in advance of the laying of main line pipe and 10 feet past the end of all laterals, to a point directly under the pipe, six inches below the outer bottom, and to the width over the outside of the pipe, (exclusive of bells) on each side, as shown on the Standard Detail. Rock shall be removed sufficiently at joints so that they may be properly made. The space below the outer bottom of the pipe shall be filled with a six inch minimum of approved granular bedding. At bell holes the four inch minimum clearance must be held.

c. Rock appearing in miscellaneous excavations tunnels, or where future pipes are to connect with those laid under the Contract, shall be excavated in accordance with the directions; and to the line prescribed by the Engineer.

d. Blasting shall be performed only with the approval of the Engineer and after approval of blasting data as specified hereinbefore. Control fly rock and material so as to prevent damage to persons or structures when directed by the Engineer, use blasting mats in areas where overburden has been removed prior to blasting. Equipment used for drilling of holes shall have a positive means of dust control subject to the Engineer's approval.

e. Blasting shall be performed no closer than ten feet to existing water, gas, sewer or conduit until such facilities have been completely exposed and then backfilled prior to the intersection with the area to be blasted. In any case, blasting shall be no closer than two feet from exposed existing utilities ten inches or less in diameter and no closer than five feet from exposed existing utilities larger than ten inches.

   Before blasting within 50 feet of cured concrete, submit and obtain approval of a plan showing the relative positions of the concrete, the area to be blasted and the blasting technique to be employed.

f. Use controlled blasting techniques. Modify the blasting round as necessary to achieve the best obtainable results and to keep the

air blast over pressure, vibrations and noise within the limits herein specified. Exercise all possible care in drilling and blasting operations to minimize overbreak and blast damage of adjacent unexcavated ground. It shall be the Contractor's responsibility to produce a satisfactory excavated surface by determining the proper relationships of the factors of burden, spacing, depth of charge, amount and type of explosive, hole size and delay pattern, and other necessary considerations to achieve required results.

g. Vibration and Air Blast Control

(1) Control Operations so that:

(a) Peak particle velocity will not exceed two inches per second measured adjacent to any structure in the vicinity of the blasting operations or the following limits for concrete:

Inches Per Second	Age of Concrete
0.25	12-24 hours
0.5	24-48 hours
1.0	48 hours-5 days
2.0	5-7 days

(b) Impact or Impulsive noise from blasting operations will not exceed 140 dB peak sound pressure level measured at the nearest structure or property line.

(2) Peak particle velocity is defined as the maximum of the three velocity components of a vibration measured at any point in three mutually perpendicular directions by a seismograph approved by the Engineer, capable of producing a permanent record and capable of internal dynamic calibration.

c. Furnish qualified personnel to operate instruments and interpret results.

d. Record air blast over pressure with a peak impact recording instrument having linear frequency response.

h. The Contractor shall provide for repair or replacement of facilities damaged by blasting operations at no cost to the County.

4. Removal of Unsuitable Material

a. Where material not meeting the requirements of fill material and

deemed unsuitable by the Engineer is encountered contiguous to or within the proposed limits of excavation shown, the Engineer may direct its removal. Depth of removal will be determined by the Engineer.

b. The Contractor shall remove and dispose of off-site all unsuitable materials,

c. All unsuitable materials shall be disposed of in locations and under conditions that comply with federal, state and local laws and regulations.

d. The Contractor shall obtain an off-site disposal area prior to beginning demolition or excavation operations.

e. All excess and unsuitable materials shall be hauled in trucks of sufficient capacity and tight construction to prevent spillage. Trucks shall be covered to prevent the propagation of dust.

5. Unauthorized Excavation

a. Where unauthorized excavations are made below indicated elevations under slabs, footings, pipes or structures, restore to proper elevations with fill materials as specified hereinbefore and as directed by the Engineer at no cost to the County.

6. Sheeting, Shoring and Bracing

a. Sheeting, shoring and bracing shall be placed so as not to interfere with the construction work and shall be entirely independent of all footings and structures.

b. Remove sheeting, shoring, bracing and all wood forms unless otherwise directed by the Engineer in writing concurrently with backfilling operations in a manner that precludes settlement of the backfill excavation.

c. Place and remove sheeting and shoring as required to assure safe working conditions and prevent accidents and cave-ins.

7. Trench Excavation

a. The Contractor shall furnish, place, and maintain such excavation support which may be required to support sides of excavation or to protect pipes and structures from possible damage and to provide safe working conditions. If the Engineer is of the opinion that at any point sufficient or proper supports have not been provided, he may order additional supports put in at the expense of the Contractor. The Contractor shall be

responsible for the adequacy of all supports used and for all damage resulting from failure of support system or from placing, maintaining and removing it.

b. Excavate trenches so the width and depth indicated on the Standard Details and on the Plans. Provide uniform and continuous bearing and support for pipe or structure on granular bedding. Remove rock, when encountered, to a minimum depth of six inches below the pipe, and the same depth below the bell. If the external shape of the trench cannot be preserved or the trench varies from the shape of the structures, the space between the desired trench dimensions and the bottom of the excavation as made, shall be filled with granular backfill as specified hereinbefore allowing for placement of granular bedding where specified. Material deemed unsuitable by the Engineer in the bottom of the trench shall be removed and replaced with granular backfill. Depth and width of removal shall be as directed by the Engineer. Perform excavation in the immediate vicinity of adjacent and contiguous facilities by means that will not damage the facility. Damage caused to existing facilities by the Contractor's operations shall be repaired at no expense to the County.

c. Trench excavation shall proceed no more than 75 feet in advance of the placing of backfill unless otherwise authorized by the Engineer, to the widths and depths shown on the Standard Details. The Engineer may require backfilling and subsequent re-excavation on trenches left open an unreasonable amount of time in advance of laying pipe, at no expense to the County. Trenches left open overnight, or during periods when the Contractor's forces are not present shall be so protected or enclosed and marked as to cause no danger to the public or others.

d. Sides of trenches in approved public rights of way and adjacent to other structures shall be practically plumb. Where permitted by the Engineer, sides of trenches in other areas may be sloped from a point two feet above the top of the pipe to grade. Such slopes shall be at no additional cost to the County. Slopes will be such as will not allow displacement of material or danger to personnel.

(1) Bell holes shall be excavated in the bottoms of trenches wherever necessary to permit the proper making of joints.

e. Trench Sheeting

(1) Trench Sheeting shall conform to requirements specified hereinbefore and the following:

(2) Where sheeting is used, the trench width as shown on the Standard Details shall be applied between the interior faces of the sheeting as driven.

(3) Remove sheeting as backfilling progresses. Compact contiguous areas concurrent with removal of sheeting. Leave sheeting in place only when so directed by the Engineer in writing. Trim such sheeting to a minimum of 1-1/2 feet below grade.

C. Backfill Operations

1. General

a. Do not place, spread or compact fill material while it is frozen or thawing or place upon or adjacent to frozen or thawing ground or during unfavorable weather conditions. When the work is interrupted by rain, fill operations shall not be resumed until field tests indicate that the moisture content and density of the fill are within the limits specified. Any compacted layer which has been frozen shall be removed before the next layer is placed upon it .

b. Moisture content of fill material shall be within two percent of the optimum for the material as determined by AASHTO T99, Method A. Prior to commencing compaction, fills shall be brought to specified water content by either aerating the material if it is too wet, or spraying the material with water if it is to dry. Thoroughly mix each lift before compaction to assure uniform distribution of water content. Distribute rocks of permissible sizes through the fill material and fill and compact to eliminate all voids.

c. All structures and pipes shall be backfilled with the type of materials shown on the Drawings and specified herein. Select fill shall be deposited in successive, uniform, approximately horizontal layers not exceeding 8-inches in compacted depth for the full width. Stones or fragmentary rock larger than 4-inches in their greatest dimension will not be allowed within the top 6-inches of the ground nor within 6 inches of pipes. No stone or fragmentary rock larger than 12-inches in their greatest dimension will be allowed for any portion of backfill. Compaction shall be in accordance with the requirements of Paragraph 3.09, COMPACTION.

d. Where excavation support is used, the Contractor shall take all reasonable measures to prevent loss of support beneath and adjacent to pipes and existing structures when supports are removed. If significant volumes of soil cannot be prevented from

clinging to the extracted supports, the voids shall be continuously backfilled as rapidly as possible. The Contractor shall thereafter limit the depth below subgrade that supports will be installed in similar soil conditions or employ other appropriate means to prevent loss of support.

2. Preparation

a. Before depositing fills, remove all vegetative matter, mud, muck and otherwise unsuitable soils from the surfaces upon which fill materials are to be placed and fill irregularities and cavities.

b. Completely fill boring voids and test pit excavations within the limits of excavation with sand, lean concrete or crushed stone up to the level of the proposed subgrade, as directed by the Engineer.

3. Placing Fill Material for Structural Fills and Embankments

a. Compact the surface upon which the fill material is to be deposited to the density specified hereinafter for compaction of fill.

b. Where embankments are made on hillsides or slopes, step or bank the slope of the original ground upon which the fill is to be placed when so directed by the Engineer.

c. Place fill material in uniform lifts of not more than eight inches in uncompacted thickness. Spread each layer uniformly and evenly. Perform compaction using compaction rollers, pneumatic or vibratory compactors or other equipment and methods approved by the Engineer. Jetting or puddling of backfill will not be allowed without permission of the Engineer.

d. Compact each eight inch layer to not less than the following percents of maximum densities at a moisture content within two percent optimum for the material as determined by the listed AASHTO method.

(1) Under Frederick County Flexible Pavement: 95 percent except for top foot which shall be 100 percent per AASHTO T99

(2) Under State Highway Pavement: top one foot, 95 percent AASHTO T180; remainder, 92 percent AASHTO T 180.

(3) In areas other than existing paved street rights-of-way, future street rights-of-way or in any traveled road way,

from a point two feet above the top of the pipe to the bottom of the topsoil, the backfill shall be placed in one foot lifts and solidly compacted by the use of a roller, or other mechanical device. The density of this backfill shall be not less than 90 percent per AASHTO T99.

e. Continue filling operation until the fill has been brought to the finished slopes and grades shown on the Contract Drawings, making proper allowances for thickness of topsoil, pavement slabs. Construct fill so that surface will be sloped to drain at all times and deposit fills so as to prevent excessive moisture accumulation from rain water.

f. Compaction by rollers or heavy equipment will not be permitted within a five foot strip adjacent to structures.

4. Placing Trench Backfill

a. Placing trench backfill shall conform to requirement specified hereinbefore for placing structural fills and embankments, modified as follows.

b. Place granular bedding and haunching in accordance with the Standard Details.

c. Compact up two feet above top of pipe by mechanical tampers in maximum six inch layers.

d. Complete backfill and compaction in not more than one foot lifts as hereinbefore specified under III.C.3. utilizing such compaction equipment as will not damage the pipe and pipe joints. Pipe and pipe joints damaged by the Contractor's operations shall be removed and replaced at no cost to the County.

e. When borrow trench backfill material meeting requirements specified elsewhere herein is utilized lift height requirements will be determined in the field based on test sections and tests prescribed and observed by the Engineer and based on type of compaction equipment.

f. In new subdivision work where water and sewer house connections are to be placed in the same trench, backfill above the sewer house connection as hereinbefore specified up to a point four feet below proposed finished grade. Provide temporary backfill above this point to the surface until laying of water house connection is commenced. At this time reexcavate as required to lay water line as hereinbefore specified.

g. Do not backfill around pipe, connections or fittings until

measurements and locations are completed by the Engineer or Inspector.

D. Finish Grading

1. Perform grading operations so that the excavation will be well drained at all times. Maintain drainage ditches and keep them open and free from soil, debris, and leaves until final acceptance of the work. Finish all grading on neat, regular lines conforming to the sections, lines, grades and contours shown on the plans or if not shown in accordance with the criteria set forth hereinafter. Perform grading work in proper sequence with all other associated operations.

2. Structures and pavement; bring finished subgrade to the elevation as shown on the drawings. Bring entire areas to the finished subgrade elevation before excavating for footings.

3. Grading criteria for structures greater than 20 feet in maximum dimension; perform grading in accordance with the following requirements if not indicated otherwise in the Contract Documents.

   a. Place fill at a minimum slope of two percent for a minimum of ten feet beyond the exterior wall or exterior face of the structure. From the edge of the ten foot extension, slope to existing grade at a maximum slope of 1:2.5.

4. Uniformly grade all areas disturbed by the project, at trench locations, excavated and fill areas and adjacent transition areas so that finished surfaces are at the proposed grade or are approximately at preexisting grades, adjusted as required to provide positive drainage.

E. Material Storage

1. Deposit excess excavated material and unsuitable material offsite. See Section 1000. Topsoil shall be stockpiled in a location approved by the Engineer.

F. Dewatering and Drainage

1. If water is encountered in excavation, provide pumps of sufficient capacity to remove the water while the excavations are being made and until the concrete footings have been poured, the foundation walls or other structures erected up to grade or until the excavation has been backfilled. Do not allow sediment laden water to flow into any watercourse or drainage way or overland without first filtering it through an approved desilting device. Use of woven and non-woven fiber material will be allowed when approved by the Engineer. See Section 1800.

2. Provide all necessary temporary surface drainage and keep the same operating to the satisfaction of the Engineer until permanent drainage or finish grading has been completed. Do not allow damming or ponding of water in gutters or storm drains.

G. Restoration of Surface Facilities

1. The Contractor shall restore and restabilize surface features and facilities damaged or destroyed during construction to at least the condition existing before construction, in accordance with Section 1900 and other applicable sections of the Specifications.

IV. Measurement and Payment

A. Excavation and Backfill for Utility Structures and Trench Excavation and Backfill

1. Excavation and backfill for utility structures ad trench excavation and backfill with approved material excavated from the bottom of the trench or the lower level of the granular bedding where indicated, will not be measured separately for payment but the cost thereof will be included in the unit prices bid for the particular utility facility.

2. Excavation and backfill for utility structures and trench excavation and backfill in excess of the limits described above will not be paid for except as authorized in writing by the Engineer.

B. Borrow Trench Backfill, Borrow Structural Fill and Borrow Embankment

1. Borrow trench backfill, borrow structural fill and borrow embankment will be measured by the compacted volume in cubic yards actually placed, as determined from the locations indicated on the Plans and indicated in the Special Provisions.

Payment for borrow structural fill, borrow embankment and borrow trench backfill will be made for the quantities measured for the type required in the unit prices per cubic yard listed in the Bid Schedule.

2. Payment will include disposal off-site of unsuitable material.

C. Granular Bedding

1. Granular bedding for pipe and structures will not be measured for payment but the cost thereof shall be included in the unit price per linear foot in the bid schedule for pipe, specified under other sections, and in the unit price for structures where required.

D. Granular Backfill Below Subgrade

1. Excavation of unsuitable material and replacement with granular backfill

below subgrade at the direction of the Engineer will be measured by the cubic yard actually replaced, measured by the volumes by Average End method in the trench pay width as shown on Standard Detail.

Payment will be made for the quantities measured by at the fixed contingent unit price per cubic yard listed in the bid schedule.

2. Payment will include disposal off-site of unsuitable material.

E. Sheeting Left in Place

1. Sheeting left in place at the direction of the Engineer will be measured by the thousand board foot of sheeting actually placed, regardless of material, and payment will be made for the quantity measured at the fixed contingent unit price per MBF listed in the Bid Schedule.

   a. Payment will include cost of additional granular bedding material required due to the use of sheeting.

F. Test Pits

1. Test pits in the numbers, at the locations and to the limits directed by the Engineer shall be measured by the cubic yard of excavated material removed. Those portions of test pits not backfilled but used as trench excavation shall be included in pipe prices bid.

   Payment will be made for the quantities measured at the fixed contingent unit prices per cubic yard listed in the Bid Schedule.

2. Payment will include backfill and material as specified hereinbefore.

G. Non-Payment Items

1. The following items of work will not be measured for payment but will be considered as incidental to the Contract:

   a. dewatering, watering

   b. finish grading

   c. preparation of subgrade

   d. compaction

   e. sheeting and shoring, for the convenience of the Contractor or for compliance to the safety regulations

   f. blasting

g. removal of excess material

h. granular base under slabs and pipe bedding.

i. placing structural fill and embankment using suitable materials available on site.

j. rock excavation, including disposal off-site of all rock excavated plus placing suitable backfill material.

IV. Special Provisions

A. EARTHWORK

1. The Contractor's attention is directed to the revision herein of Standard Specification, Section 2200 Earthwork, Part III, Paragraph B-la, Excavation, General: all material excavated shall be unclassified. No additional compensation will be made for Rock Excavation. Excavation shall be carried out to the lines and grades indicated on the plans.

STANDARD SPECIFICATIONS

SECTION 2230

CONCRETE AND STONE SLOPE AND CHANNEL PROTECTION

I. General

A. Description.

This section includes providing concrete and stone protection for slopes, ditches and channels to the configurations and extents indicated in the Contract Documents.

B. Submittals

1. Submit test list reports as specified in Section 1100 before delivery of materials, for the items listed below:

a. Aggregate and Stone

b. Plastic filter cloth & Fasteners

c. Wire for gabion baskets

d. Concrete Materials

2. Provide certified delivery tickets for rip-rap stone guaranteeing compliance with specified gradation requirements.

II. Materials

A. Concrete for ditches, channels and slope protection shall be concrete Mix #1 reinforced with welded wire fabric meeting requirements of ASTM A185, 6 x 6, W 2.9 x W 2.9. Concrete and appurtenant materials shall be in accordance with requirements specified in Section 3300.

B. Stone for Slope Protection

1. Stone for rip-rap and gabion shall be hard, durable, angular in shape; resistant to weathering and to water action; free from overburden, spoil, shale, slate and organic material, and shall meet the size requirements specified. The maximum dimension shall not exceed four times the minimum dimension.

2. Stone shall meet the following test requirements in accordance with AASHTO T85 and T104:

a. Minimum apparent specific gravity 2.5%

Maximum absorption	3.0%
Maximum sodium sulfate loss in 5 cycles in 2 1/2 - 1 ½ inch size, for class I, II and III stone	20%
All others	12%

vii. Stone shall meet the following gradation requirements:

a. Class I:

Pounds	% of Total Weight Smaller Than Size Listed
150	100%
100 or less	10% maximum

b. Class II - minimum thickness 12 inches

Pounds	% of Total Weight Smaller Than Size Listed
700	100%
20	10% maximum

c. Class II - well graded stone conforming to the following requirements:

Pounds	% of Total Weight Smaller Than Size Listed
2,000	100%
40	10% maximum

d. Class IV

For 6 " gabions; 3"-5" stone
For 9" gabions; 4"-7" stone

e. Class V

For 9" gabions; 4"-7" stone
For 12" gabions; 4"-7" stone
For 18" gabions; 4"-7" stone
For 36" gabions and larger; stone 4"-12" size

viii. Filter material shall consist of sand , grave or crushed rock with

gradation as specified in the Special Provisions. Materials shall be composed of tough durable particles, reasonably free of thin, flat and elongated pieces, and shall contain no organic materials nor soft friable particles.

C. Mortar shall meet the following requirements:

Sand; ASTM C-144
Portland Cement; ASTM C-150

D. Plastic Filter Cloth

1. Woven filter cloth shall be composed of polypropylene monofilament yarns woven into sheets of approximately sixteen mills thickness. The tensile strength of the cloth shall be as determined by ASTM D1682. Designated tests shall be 350 pounds per inch in fill or greater. The weave of the filter cloth shall be dense and tight so that in plain view the opening can only barely be seen. Test results shall indicate that the filter cloth can effectively retain particles coarser than the opening of U.S. sieve mesh 140 for all conditions of flow employed in the investigation and can retain much smaller particles when employed with soils subjected to laminar flow. Tests shall also demonstrate that the filter permeability is between 3.3 and 3.8 x 10 to the minus 2 power centimeters per second.

2. Nonwoven filter material shall be composed of strong continuous filament rot proof polymeric fibers oriented into a stable network in such a manner that the fibers retain their relative positions with respect to each other. The fabric shall be free of chemical treatment or coating, and shall have no flaws or defects which significantly alter its physical properties. The following fabric physical property requirements shall be met:

a.	Water Permeability	10 minus 2 cm/sec min.
b.	Average pore size	0.15 mm (100 sieve)
c.	Grab strength (ASTM D1682)	90 lbs min.
d.	Grab elongation (ASTM D1682)	75% min.
e.	Fabric toughness (GS x GE)*	9,000 min.

*Grab strength tests shall be run on wet samples soaked 24 hours in ambient temperatures.

E. Wire Baskets for Gabions

1. General.

   a. Wire baskets for gabions are compartmented rectangular containers of galvanized steel hexagonal wire mesh, with or without protective coating, and filled with stone for slope or channel protection. Wire baskets used for slope protection shall be as indicated.

2. Dimensions and Fabrication.

   a. Wire baskets for slope and channel protection shall comply with the requirements of Table 2230-1. All dimensions noted in the table are subject to a tolerance of ± three percent of the manufacturer's stated size.

3. Basket Compartments.

   a. These units shall be subdivided into units of the required minimum length extending over the full width of the basket by inserting partition of the same mesh as the basket. The partitions shall be secured in proper position to the base.

4. Fabrication

   a. Wire basket units shall be fabricated in such a manner that the base sides and lids can be assembled at the construction site into a rectangular unit of the specified size. The basket units shall be manufactured such that the base, lids, ends and sides shall be either woven into a single unit or one edge of these members shall be connected to the base of the basket unit in a manner such that the strength and flexibility at the point of connection is at least equal to that of the mesh. All perimeter edges of the mesh forming the basket unit shall be securely selvaged or bound so that the joints formed by tying the selvages have at least the same strength as the body of the mesh. See Table #2230-1

   b. Prefabricated wire ties or connecting wire shall be supplied in sufficient quantity to fasten securely all edges of basket and partitions. The wire ties or connecting wire shall meet or exceed the same specifications as the wire used in the mesh, except that the diameter of the core shall be of U.S. Steel Wire size No. WO.5, minimum for channel protection baskets.

5. Wire and Wire Mesh

   a. The wire mesh shall be made of galvanized coated steel wire with a minimum size of U.S. Steel Wire size No. WO.5, for slope

mats and No. W1.0 (core only) for channel mats.

The tensile strength shall be from 60,000 to 85,000 psi as determined by ASTM A392, B Fabrication.

b. Elongation

The wire mesh shall have sufficient elasticity to prevent elongation of the mesh equivalent to a minimum of ten percent of the length of the section of the mesh under test without reducing the gauge or tensile strength of individual wires to valves less than those for similar wire one gauge smaller in diameter.

c. Elasticity

A section of the mesh six feet long and not less than three feet wide, after first being subjected to the elongation test described above, shall withstand a load test of 6,000 pounds being applied to an area of on square foot approximately in the center of the section under test. The details of this test are as follows:

An uncut section of mesh six feet long, not less than three feet wide and including all selvage bindings shall have the ends securely clamped for three feet along the width of the sample. When the width of the sample under test exceeds three feet, the clamps will be placed in the middle portion of the width and the excess width will be allowed to fall free on each side of the clamped section. The sample shall then be subjected to sufficient tension to cause ten percent elongation of the sample section between the clamps. After elongation and while clamped as described above and otherwise unsupported, the section shall be subject to a load applied to an area of one square foot located approximately in the center of the sample section between the clamps, and in a direction perpendicular to the direction of the tension force. The sample shall withstand without rupture of any wire, or opening of any mesh fastening, an actual load, so applied, equaling or exceeding 6,000 pounds. The ram head used in the test shall be circular with its edges beveled or rounded to prevent cutting of the wires.

d. Single Strand Cut

The wire mesh shall be fabricated in such a manner as to be non-raveling. This is defined as the ability to resist pulling apart at any of the twists or connections forming the mesh when a single wire in a section of mesh is cut and the section is then subject to the load test described in the elasticity test above.

e. Zinc Coating

The minimum zinc coating shall be 0.80 ounces per square foot as determined by ASTM A90.

f. P.V.C. Coating

Where indicated, galvanized steel wire shall be additionally coated with a minimum of .4 mm (.0157) of black P.V.C., which shall be suitable to resist destructive effects of immersion in acidic salt, or prolonged exposure to ultraviolet light and abrasion and retain these characteristics after a period of not less than 3,000 hours under test in accordance with ASTM E42.

G. Wooden Anchor Stakes

1. Wooden anchor stakes shall be approximately two inches square and 3 1/2 feet long, and shall be approved by the Engineer.

III. Execution

A. Concrete Channels, Ditches, and Slope Protection

1. Concrete construction is specified in Section 3300. Grade, trim, tamp and prepare surface to receive concrete to the elevations required by the Plans. Protect work exposed to 40 degrees or lower weather for a minimum of four days after placing with one foot of straw, hay or mulch covered with polyethylene securely anchored.

2. Place concrete in accordance with the details and to the limits shown on the Plans. Provide joints as indicated in true alignment. Finish edges and all joints with an approved edging tool with a 1/4 inch radius. Provide 1/2 inch expansion joint material and sealer at the expansion joints and where concrete abuts existing and other materials. Screed top surface with a wooden screed and finish with a wooden float.

3. Construct slope protection in alternate strips with construction joints all in one direction perpendicular to weakened plane joints resulting in a pattern of squares from three to five feet wide. Construct curved slope protection with construction joints horizontal and plane joints vertical.

B. Ungrouted rip-rap

1. Class I Rip-Rap Stone (placed rip-rap)

Remove unsuitable material and replace with suitable material as specified in Section 2200 when directed by the Engineer. Excavate footing trench along the toe of slope where indicated on the Plans. Place larger rock in the footing trench. Place rocks with their longitudinal axis normal to the embankments face and arrange so that

each rock above the foundation course has a three point bearing above on the underlying rock layer. Place rip-rap to provide a minimum of voids. Bearing on smaller rocks which may be used for chinking voids will not be permitted. Local surface irregularities of the slope protection shall not vary from the planned slope by more than six inches measured at right angles to the slope.

2. Class II Rip-Rap Stone (placed or dumped rip-rap)

Remove unsuitable material and replace with suitable material as specified in Section 2200 when directed by the Engineer. Excavate footing trench along the toe of slope as indicated for placed rip-rap. Place larger rocks on the footing trench and on the outside surface of the slope protection. Place rocks to provide a minimum of voids. Rock may be placed as specified by dumping hereinafter and may then be spread in layers by bulldozers or other suitable equipment. Local surface irregularities of the slope protection shall not vary from the planned slope by more than one foot measured at right angles to the slope.

3. Class III Rip-Rap (dumped rip-rap)

Remove unsuitable material and replace with suitable material as specified in Section 2200 when directed by the Engineer. Excavate footing trench along toe of slope where indicated and rough grade to the limits indicated on the Plans.

a. Where plastic filter cloth is indicated proceed as follows:

a. Place sand where indicated at the thickness and to the extent indicated on the Plans.

b. Place plastic filter cloth loosely laid over the filter sand. Lap strips a minimum of 12 inches. Place strips parallel to the flow of the slope. Anchor sheets with securing pins inserted through the cloth along but not closer than two inches to each edge and at laps as required to prevent displacement before or during construction. Where filter cloth is required below water line, alternate methods of anchorage will be considered upon submittal to the Engineer. Provide minimum six inch horizontal laps. Stagger vertical laps a minimum of five feet. Filter cloth damaged or displaced before, during or after placement shall be replaced and repaired by the Contractor at no cost to the County.

c. Place stone filter material, gradation as specified elsewhere, to the depths indicated, where required.

b. Place rip-rap on subgrade or gravel filter material to its full specified thickness and to the extent shown on the Standard Details in one operation in such a manner as not to disturb underlying material. Placing in layers and dumping in chutes will not be permitted.

c. The larger stones shall be well distributed and compact. Hand placing or rearranging of individual stones by mechanical equipment may be required to secure the required results. Local surface irregularities shall not vary from the planned slope by more than one foot measured at right angles to the slope.

d. Where rip-rap and filter material are dumped under water, thickness of layers shall be increased as indicated on the Plans and methods shall be employed that minimize segregation.

C. Grouted Rip-Rap

1. Use Class 1 rip-rap stone unless otherwise indicated. Excavate footing trench along the toe of slope as indicated on the Plans. Remove unsuitable material and replace with suitable material as specified in Section 2200 when directed by the Engineer. Place larger rock in the footing trench. Place rocks with their longitudinal axis normal to the embankment face. Place stones with joints as close as practicable, and fill the spaces between the larger stones with stone of suitable size, leaving the surface reasonably smooth and tight, and conforming to the required section. Take care to keep earth or sand from filling the spaces between the stones. After the stones have been place, fill the spaces between the stones with grout consisting of one part Portland cement to three parts sand. When the grout has partially hardened, sweep the surface with stiff broom to remove grout extending above the surface of the rip-rap, as well as grout that has covered the surface of the stone.

D. Gabions

1. Class IV stone filled gabion slope protection

a. Form slopes and other areas to the neat lines and subgrade indicated. Remove unsuitable material and replace with suitable material as specified in Section 2200, when directed by the Engineer. Cover compacted subgrade with plastic filter cloth as specified hereinabove. Cut holes the size of wooden anchor stakes through filter cloth and drive wooden anchor stakes to anchor gabion units in place.

b. Assemble each gabion unit by binding together all vertical edges with wire ties on approximately three inch spacing or by a continuous piece of connection wire looped around the vertical

edges with a roll approximately every three inches.

c. Set empty units to line and grade indicated on the Plans. Secure units together in the same manner as described for assembling. After setting gabions to line and grade stretch to remove any kinks from the mesh and to hold alignment. A standard fence stretcher, chain fall or iron rods may be used for this operation.

d. Fill gabion units with stone placed by hand or machine, to produce a minimum of voids between stone and avoid bulging of mesh. Do not drop stone from height of more than 36 inches into units. Place a minimum of two courses of stone.

e. After filling a gabion unit, bend lid over until it meets the ends of the unit. Secure lid to the sides and ends with wire ties or connecting wires in the manner described previously for assembling.

f. Cut gabion units to fit when directed by the Engineer.

2. Class V stone filled gabion channel protection.

a. Provide class V stone filled gabion channel protection as specified herein for class IV stone filled gabion slope protection except as modified below.

b. Delete plastic filter cloth. Cut , shape and fit the wire basket units at existing box culverts and end walls, and place on prepared subgrade.

E. Sodded Ditches

1. Sodded ditches are specified in Section 2800.

F. Maintenance

1. The Contractor shall maintain rip-rap, gabion, and concrete slope protection until completion of the Project. Damage before the completion from any cause shall be repaired or replaced at no cost to the County.

IV. Measurement and Payment

A. Concrete Ditches, Channel and Slope Protection

1. Concrete ditches, channel and slope protection shall be measured by the square yard of finished surface completed in place measured parallel to the surface.

Payment will be made for the quantities measured at the full price per square yard listed in the Bid Schedule.

2. Payment will include subgrade preparation, reinforcing joint treatment and all incidentals necessary to produce the finished products.

B. Rip-rap and gabion channel and slope protection

1. Rip-rap and gabion channel and slope protection shall be measured by the square yard of finished surface completed in place for the various types and classes of stone.

   Payment will be made for the quantities measured at the unit price per square yard of the various types and classes of stone listed in the Bid Schedule.

2. Payment will include subgrade preparation, filter materials, wire baskets and grout and all incidentals necessary to produce the finished product.

Description	Length (Multiple of Feet)	Min. Horiz. Width of Each Unit (All Baskets of Uniform Size) Feet	Wire Woven into Triple Twisted Hexagonal Mesh		Min Length of invidual Compart-ments Feet
			PVC Coating	Opening	
Class IV Rip-rap	2	6	Required for 9" Mat	(2.25" ± .25") by (3" ± .25")	2
Class V Rip-rap	3-3.25	3	Required	(3" ± .25") by (4" ± .25")	3

STANDARD SPECIFICATIONS

SECTION 2550

WATER SYSTEM

I. General

A. Description

1. This section includes construction, testing and disinfecting of permanent water supply, fire protection and distribution piping to the limits indicated in accordance with the Contract Documents.

B. Quality Assurance

1. Chlorination and Field Tests

a. The Contractor without extra compensation shall chlorinate and field test all new main installation before connecting them to the existing system. The Engineer shall determine the amount of main to be chlorinated and tested at any one time and reserves the right to separate the installation into several test sections, in the event of long extensions, or installation of pipe designed for different head conditions, or for other reasons.

b. The Contractor shall cap and buttress the new main between the sections of the existing pipe.

c. The Contractor shall furnish at his own cost and expense all necessary bulkheads, caps, plugs or other fittings required to stop off, temporarily, the main for test purposes.

d. After the main is satisfactorily tested according to the requirements of the specifications, the Contractor shall remove the buttresses and caps and connect the new main with the existing main by means of mechanical joint sleeve and 3 3/4" wide ductile iron spacer or other Engineer approved method.

e. Use continuous feed method or slug method for chlorination as outlined in AWWA C651, Section 5 for disinfecting water mains. All chlorine shall be introduced in solution and feed at a constant rate using a force pump. At the end of the 24 hour period, the treated water shall contain no less than 10 mg/L (10 parts per million) chlorine throughout the main.”

f. Test restrictions.

Test pressure shall not be less than 1.5 times the working

pressure at the highest point along the test section or more than 200 PSI at the low point.

Test pressure shall not exceed pipe or thrust-restrain design pressures.

The hydrostatic test shall be of at least 2-hour duration.

Test pressure shall not vary by more than 5 psi (35 KPa or 0.35 bar) for the duration of the test.

Valves shall not be operated in either direction at differential pressure exceeding the rated valve working pressure. (Use of a test pressure greater than the rated valve pressure can result in trapped test pressure between the gates of a double-disc gate valve. For tests at these pressures, the test setup should include provision, independent of the valve, to reduce the line pressure to the rated valve pressure on completion of the test. The valve can then be opened enough to equalize the trapped pressure with the line pressure, or fully opened if desired.)

Test pressure shall not exceed the rated pressure of the valves when the pressure boundary of the test section includes closed, resilient-seated gate valves or butterfly valves.

g. Pressurization.

After the pipe has been laid, all newly laid pipe or any test section thereof shall be subjected to a hydrostatic pressure of at least 1.5 times the working pressure at the point of testing. Each test section of pipe shall be slowly filled with water, and the specified test pressure, based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the owner. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure. It is good practice to allow the system to stabilize at the test pressure before conducting the leakage test. [Formula for calculating head pressure is 2.3' head = 1 psi/1' head = 0.43 psi]

h. Air removal.

Before applying the specified test pressure, air shall be expelled completely from the pipe, valves and hydrants. If permanent air vents are not located at all high points, the contractor shall install corporation cocks at such points so the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure

applied. At the conclusion of the pressure test, the corporation cocks shall be removed and plugged with approved brass plugs.

i. Examination.

Any exposed pipe, fittings, valves. hydrants and joints shall be examined carefully during the test. Any damaged or defective pipe, fittings, repaired or replaced with sound material, and the test shall be repeated until it is satisfactory to the Construction Manager.

j. Leakage defined.

Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe or any valved section thereof to maintain pressure within 5 psi (35 MPa . or 0.35 bar) of the specified test pressure after the pipe has been filled with water and the air has been expelled. Leakage shall not be measured by a drop in pressure in a test section over a period of time.

k. Allowable leakage.

No Pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{S \times D \times \sqrt{P}}{133000}$$

Where:

L = allowable leakage, in gallons per hour
S = length of pipe tested, in feet
D = nominal diameter of the pipe, in inches
P = average test pressure during the leakage test, in pounds per square inch (gauge)

a) This formula is based on an allowable leakage of 11.65 gpd/mi/in of nominal diameter ai a pressure of 150 psi.

a.I.) Allowable leakage at various pressures is shown on Table 1:

Table 1. Allowable leakage per 1000 ft (305m) of Pipeline* gph

Nominal Pipe Diameter -- in.

Ave. Test Pressure psi (bar)	3	4	6	8	10	12	14	16	18	20	24	30	36	42	48	54
450(31)	0.48	0.64	0.95	1.27	1.59	1.91	2.23	2.55	2.87	3.18	3.82	4.78	5.73	6.69	7.64	

8.60															
400(28)	0.45	0.60	0.90	1.20	1.50	1.80	2.10	2.40	2.70	3.00	3.60	4.50	5.41	6.31	7.21
8.11															
350(24)	0.42	0.56	0.84	1.12	1.40	1.69	1.97	2.25	2.53	2.81	3.37	4.21	5.06	5.90	6.74
7.58															
300(21)	0.39	0.52	0.78	1.04	1.30	1.56	1.82	2.08	2.31	2.60	3.12	3.90	4.68	5.46	6.24
7.02															
275(19)	0.37	0.50	0.75	1.00	1.24	1.49	1.74	1.99	2.24	2.49	2.99	3.73	4.48	5.23	5.98
6.72															
250(17)	0.36	0.47	0.71	0.95	1.19	1.42	1.66	1.90	2.14	2.37	2.85	3.56	4.27	4.99	5.70
6.41															
225(16)	0.34	0.45	0.68	0.90	1.13	1.35	1.58	1.80	2.03	2.25	2.70	3.38	4.05	1.73	5.41
6.03															
200(14)	0.32	0.43	0.64	0.85	1.06	1.28	1.48	1.70	1.91	2.12	2.55	3.19	3.82	4.46	5.09
5.73															
175(12)	0.30	0.40	0.59	0.80	0.99	1.19	1.39	1.59	1.79	1.98	2.38	2.98	3.58	4.17	4.77
5.36															
150(10)	0.28	0.37	0.55	0.74	0.92	1.10	1.29	1.47	1.66	1.84	2.21	2.76	3.31	3.86	4.41
4.97															
125(9)	0.25	0.34	0.50	0.67	0.34	1.01	1,18	1.34	1.51	1.68	2,01	2.52	3.02	3.53	4.03	4.53
100(7)	0.23	0.30	0.45	0.60	0.75	0.90	1.05	1.20	1.35	1.50	1.80	2.25	2.70	3.15	3.60	4.05

* If the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.

To obtain leakage in liters/hour, multiply the values in the table by 3,785.

a-2.) No testing is allowed against closed metal-seated valve. but can be allowed against resilent seated valve if written approval is received from the inspector.

a-3.) When hydrants are in the test section, the test shall be made against closed hydrant valves.

h) The newly installed main shall be disinfected in accordance with the AWWA C651. Following chlorination and testing, the main should be flushed as soon as possible (within 24 hours), since prolonged exposure to high concentration of chlorine might damage the asphaltic seal coating.

i) The procedure for testing should not be applied to air-pressure testing because of the safety hazards involved.

2. Quality assurance for precast concrete utility structures is specified in Section 3360.

C. Submittals

1. Submit certified test reports and certificates of compliance before delivery of materials as specified in Section 1100 for all pipe furnished by the Contractor under this Section. Certifications shall include Contract Number, job location, Contractor's name, types, classes and strengths of pipe and pipe manufacturer's name.

2. Submit certificates of compliance for all material furnished by the Contractor under this Section, in accordance with Section 1100.

3. A packing list shall accompany every shipment and shall contain the following information: contract number, truck number, kind and class of pipe, fittings and valves and appurtenances, length of pipe and other pertinent information.

4. Submit shop drawings in accordance with Section 1200 and Section 3360 where applicable.

5. Submit manufacturer's certified drawings of the valve including valve operators, gear ratios and design flows and pressure differential, performance charts and parts list. Furnish manufacturer's certified test reports for all tests specified in the referenced standards and all tests performed on valve operators. Submit a manufacturer's affidavit stating that valves furnished comply with all applicable provisions of the referenced standards and modifications thereto described herein.

6. Fittings shall be marked with weight, manufacturer's mark, year, month, and date cast, and number of lot. Couplings shall be marked in accordance with MSS SP-25 Standard Marking System for Valves, Fittings, Flanges and Unions.

D. Inspection

1. All items furnished by the Contractor under this section shall be inspected by the County personnel before installation. Notify the Engineer three working days before proposed inspection, as specified in Section 1100

II. Materials

A. General

1. The Contractor shall furnish all pipe, fittings, fire hydrants, valves, valve boxes, meter yokes and vaults, and manhole or vault frames, covers and steps and all glands, gaskets, nuts and bolts for mechanical joint pipe and all other necessary materials for proper completion of the work.

2. The County will furnish all meters.

B. Materials Requirements

1. Pipe and fittings

a. General- all pipe of the same material and size shall be furnished by the same manufacturer. Each pipe length and fitting shall be clearly marked with the manufacturer's name and trademark.

b. Ductile iron pipe shall meet the requirements of AWWA C151 with mechanical joint or push on joint conforming to the requirements of AWWA C111. Pipe shall be bituminous coated outside and cement lined with double thickness inside in accordance with AWWA C104. Cure cement lining with a bituminous seal coat.

c. All pipe and fittings, with the exception of glass lined pipe and sleeves, shall be cement mortar lined. Linings shall conform to American Standard Specifications for Cement Mortar Lining for Cast Iron Pipe and Ductile Iron Pipe and Fittings, ANSI A21.4 (AWWA C104) and shall be standard thickness. The mortar lining shall be protected with the bituminous seal coat. All buried DIP and fittings shall have a bituminous coating on the exterior surfaces in accordance with ANSI A21.51 (AWWA C151). All exposed DIP and fittings shall have a shop applied prime coat.

(1) 3" through 6” size pipe shall be class 54

(2) 8" and larger size pipe shall be class 50

(3) Thickness class of large diameter (24” and larger) transmission mains shall be approved by the Engineer on a case-by-case basis. Ductile iron fittings shall meet the requirements of AWWA C153.

(4) Fittings for use with ductile iron pipe shall be Class 250 gray cast iron conforming to AWWA C110 and C151, or Class 350 ductile iron. Ductile iron shall conform to ASTM A536, minimum grade 70-50-05. Nominal thickness of DI fittings shall be equal to or exceed Class 53 ductile iron pipe thickness. Radii of curvatures shall conform to AWWA C110. Provide accessories as required to connect with plain end of slip joint pipe or cut pipe. Bolts shall be of the size and length called for and in accordance with the "American Standard" and comply with the requirements of the ANSI/AWWA Standards. The bolts for flanged joints shall be a minimum ASTM A307; Grade B carbon steel and be in accordance with ANSI A21.10, (AWWA C110). The bolts shall have hexagonal heads and nuts, no washers shall be used. Gaskets shall be the "Ring Gasket" type, 1/8-inch minimum thickness, cloth inserted rubber, red rubber or neoprene and shall be suitable for the service intended. Gaskets for glass lined pipe shall be

TORUSEAL flange gasket, or equal.

(5) Fittings shall be of uniform quality, true to pattern, strong, tough , of even grain, sound, smooth, without cold shuts, swells, scabs, blisters and sand holes, cracks or other defects. Plugs, filled holes and welds will not be allowed. Fittings shall be clean and entirely free from grease and oil, substantially free of blacking, dirt, sand, rust, slag and fluxing. Remove rough spots in sockets or on plain ends or walls before lining and coating.

(6) Fittings shall be bituminous coated outside and cement lined with double thickness inside in accordance with AWWA C104.

(7) Flanges shall be cast integrally with body and shall have the same thickness over their entire circumference. Faces shall be perpendicular to axis of pipe.

d. Flanged joints and fittings shall have a minimum pressure rating of 250 psi with 125 lb. American Standard flanges. All flanges and fittings shall conform to the requirements of ANSI B16.1. Flanges shall be ductile iron and shall be of the threaded or screw on type. The face of the flanges shall be machined after installation of the flange to the pipe. No raised surface shall be allowed on flanges. Flanged pipe shall conform to the requirements of ANSI Specification A21.15, (AWWA C115). Pipe lengths shall be fabricated to meet the requirements of the Drawings.

e. Bolt holes in fitting flanges shall straddle the vertical centerline when the fitting is positioned to change the fluid flow in a horizontal direction. Drill or core bolt holes completely through flanges so as to be free of sand and projections. Gage to assure dimensional bolt circle control, location and size of holes and concentricity with the socket or gland lip.

d. Copper pipe shall be seamless, type K and meet requirements of ASTM B88. No “K” soft copper larger then 1” inch shall be allowed. Fittings shall be copper meeting requirements of ASTM B62, free and injurious blowholes, porosity, shrinkage, cracks or other injurious defects, smooth and well cleaned, and shall meet requirements of AWWA C800 and the following:

(1) Corporation Stops and Couplings:

Copper tube outlets of all corporation stops shall be of the flare or pack joint type and shall be fitted with a coupling

nut threaded according to AWWA C-800, which shall have a machine bearing in the skirt part equal to or greater than the outside diameter of the corresponding size type K copper pipe, in inches. Protect inlet threads with a plastic coating in shipment.

The corporation stops and coupling size 3/4" thru 1" shall be Mueller catalog number H15000, or H15050; Ford No. F600 or F1000. Test certificates shall be furnished by the Contractor certifying that all corporation stops have been subjected to a production line test by the manufacturer of 85 PSIG air pressure while submerged in water, in both open and closed position of the key, and shall show no leakage. Period of observation shall be 10 second minimum. Stops shall be subjected to a 300 PSIG hydrostatic test and shall not leak top or bottom and shall not show signs of structural failure.

(2) Curb Stops:

The curb stops shall be of the type having an inverted key, with copper couplings for the inlet and outlet. The curb stops and couplings shall be suitable for use with Type "K" Copper Tubing, Soft Temper.

Inlets and outlets of all curb stops shall be of the flare or pack joint type and shall be fitted with a coupling nut threaded according to AWWA Specification C-800, which shall have a machined bearing in the skirt part equal to or greater in length than the outside diameter of the corresponding size type K copper pipe, in inches.

The curb stops shall be suitable for installation in conjunction with the Buffalo Type, two-piece screw type curb boxes.

The curb stops shall be :

Flare type : MUELLER CATALOG NO. H-15201 of Ford Series No. B22

Pack Joint Type: MUELLER NO. H1504-2 or Ford Series No. 244

Test certificates shall be furnished by the Contractor certifying that all curb stops and couplings have been subjected to a production line test by the manufacturer of 85 PSIG air pressure while submerged in water, in both open and closed position of the key, and shall show no

leakage. Period of observation shall be 10 second minimum. Stops shall be subjected to a 300 PSIG hydrostatic test and shall not leak top or bottom and shall not show signs of structural failure.

(3) Couplings:

The copper to copper couplings shall be those known as the three part type consisting of a tubing connection coupling nut. The copper tube end of the couplings shall be the flare or pack joint type for connecting to type K copper service pipe. The opposite end and all coupling nuts shall be threaded in accordance with AWWA C-800.

The iron pipe end of all copper to iron pipe fittings shall be threaded in accordance with the National Bureau of Standards Handbook H-28 Standard for American National Pipe Threads.

The copper line couplings shall be one of the following manufacturer's or equal.

CATALOG NUMBERS

DESCRIPTION	MUELLER	FORD
3 Prt. Cu. to Cu.	H-15400	C22 Series
Cu. to M. IPT	H-15425	C28 Series
Cu. to Fem. IPT	H-15450	C22 Series
Straight Pack Joint		C44 Series

(4) Meter Yokes and Fittings

FORD METER BOX CO. OR EQUAL

Serv.	Yoke	Expans. Connect.	Inlet Valve	Outlet Valve	Coupling	Idl.
3/4"	#Y502	#EC-23	#AV94-323	#AV94-323		#2
1"	#Y504	#EC-4	#AV94-444	#AV94-444	#C28-44	#4
			#AV94-444	#AV94-444	#C84-44	

Note: Double 3/4" services need #2-CV-2 or #UV43-42 Branch valve assemblies in lieu of the Inlet Valve plus two each of remaining items for single service.

d. Pipe for meter housing, including for 3/4" and 1" meters for house connections shall be concrete fabricated in accordance with ASTM C14, lightweight aggregate concrete having a 28-day strength of not less than 3500 PSI.

Pipes shall have a diameter of 18 or 24 inches and a length of 30 inches. One end shall be notched at two points 180 degrees apart, with notch 4 inches high by 3 wide, so as to accommodate 3/4" or 1" copper pipe when the pipe is set up on its notched end with its axis vertical.

2. Concrete buttresses and anchors shall meet requirements of Section 3300 and shall be of the strength indicated on the Plans and Standard Details.

3. Masonry work shall meet requirements of Section 4200.

4. Precast concrete shall meet requirements of sections 3300 and 3360.

ix. Granular Bedding is specified in Section 2200 Earthwork.

x. Steel for connections shall meet requirements of ASTM A36 and ASTM A301.

xi. Joint Material.

Mechanical Joints shall conform to requirements of AWWA. Push on joints shall conform to requirements of AWWA C111.

Flanged joints shall conform to requirements of AWWA C110.

Mechanical couplings shall be as indicated, manufactured by Dresser, Smith Blair or equal.

xii. Valves

Gate valves 4-inch through 16-inch shall be iron body, bronze mechanical joint, resilient seat with non-rising stem and a 2-inch open left square operating nut conforming to AWWA C509. "Gate valves 16-inch and larger shall be built and tested in accordance with AWWA C500 and shall be iron body, bronze mounted, parallel seat, double disc gate valves with non-rising stems and a standard 2-inch open left operating nut and of ample strength to withstand and operate under the following working pressures. Valves 12 Inches in diameter and smaller shall meet a working pressure of 200 psi. Valves larger than 12-inch diameter shall meet 150 psi plus the water hammer.

Gearing and bypass are not required on smaller than 16-inch diameter valves. Double disc valves 16-inch diameter and larger shall be equipped with bypass and bevel gearing enclosed in a grease filled gear case, tracks and scrapers for horizontal or spur gearing for vertical installation. Unless otherwise specified. or indicated, all valves shall be mechanical joint. Flanged ends shall be specified if the valves are to be placed in valve vaults. ' furnish valves complete with required joint materials. Extension stems shall be provided for valves where operating nut is more than 4 feet below finished grade.

a. Butterfly valves, if specified on contract documents, 72-inch and smaller shall be Class 150B and shall conform to the requirements of AWWA C504. Ground level indicators with extension stems are required on all butterfly valves.

b. All internal ferrous components and surfaces of the valves, with the exception of stainless steel and finished or bearing surfaces, shall be shop painted with two coats (10 mils min. dry film thickness) of the manufacturer's premium epoxy for corrosion resistance. Damaged surfaces shall be repaired in accordance with the manufacturer's recommendations.

c. Air release valves shall be two inch, universal, with surface diameter 1/4 inch, range of working pressure from 0 to 165 pounds, stainless steel float, resilient seat and screwed connection; Crispin Model U-20, Apco combination air release valve model 145-C, or equal.

d. Pressure relief valves 1 inch and under shall have bronze bodies and above 1 inch shall have cast iron bodies, bronze fitted with grey iron diaphragm base and straight chamber and phosphorus

bronze diaphragm. The ratio of the diaphragm area to the seat area shall be adequate to overcome sticking. The seat disc shall be of non-corrodible, non-sticking material capable of withstanding extreme temperatures. Valves shall permit dismantling for repairs and cleaning without being removed from the line. Valves shall conform to the ASME Boiler Construction Code as approved by both the Underwriters Lab., and the National Board of Boiler Pressure Vessel Inspectors. All valves shall be designed for a minimum working pressure at least equal to the working pressure of the corresponding pipeline and shall have adjustment over a range of at least 20 percent above or below the required setting pressure of the installation.

1. Pressure relief valves (non-potable water service) shall be diaphragm activated, single seat, pilot operated and shall maintain a constant upstream pressure by relieving excess pressure. The valve shall be normally closed and shall open to maintain the required back pressure when the valve inlet pressure reaches the pilot control set point. The initial pilot control setting shall be 78 psi. The stem shall be stainless steel and shall be guided through the center for 100% of the stem travel. The main valve throttling plug shall be provided with V-port sections to insure precise control at low flow rates. All internal metal parts shall be bronze or stainless steel. The control pilot shall be direct acting, spring loaded, and adjustable with bronze body and stainless steel trim. The diaphragm and seat disc shall be BUNA-N. The valve shall be of the angle or globe pattern as shown on the Drawings and shall be fully repairable in the line. The pressure relief valve shall be the Model 428CP as manufactured by Bailey, Fresno, California, or equal.

2. Sewage air and vacuum/pressure air release valve assemblies shall be installed at all the locations specified herein or indicated on the Drawings and shall be installed complete with all appurtenant piping and valves as required for a complete and operable installation. The valves shall be constructed of cast iron with stainless steel float, and all working parts shall be bronze, brass, stainless steel, or other corrosion resistant material. The valves shall be designed for a minimum working pressure of 150 psi and a test pressure of 300 psi. The valves shall include isolation valve and backflushing attachments which shall consist of blow-off valves, quick disconnect couplings, and a minimum of 5 feet of rubber hose suitable for backflushing without dismantling the valve. All air and vacuum valves shall be provided with "soft seating" material to provide drip tight closure at 1 to 65 psig. The

exhaust from the valve shall be piped to a suitable disposal point. All valves 1-inch diameter and larger shall have a 1/4-inch min. diameter drain plug.

3. The pressure air release valve (potable water only) shall be constructed of cast iron with stainless steel trim and stainless steel float, and all working parts shall be bronze, brass, stainless steel, or other corrosion resistant material. The valves shall be designed for a minimum working pressure of 150 psi and a test pressure of 300 psi. All valves shall be provided with "soft seating" material to provide drip-tight closure at 1 to 65 psig. All valves shall be provided with a vacuum check.

e. All internal and external ferrous components and surfaces of the valves, with the exception of stainless steel and finished or bearing surfaces, shall be shop painted with two coats (10 mils min. dry film thickness) of the manufacturer's premium epoxy for corrosion resistance. Damaged surfaces shall be repaired in accordance with the manufacturer's recommendations.

f. Globe valves shall be two inches, Class B meeting requirements of FS WW-51A, 150 lbs screwed.Globe valves (service/compressed air) shall be bronze body and bonnet with brass stem and stainless steel regrindable disc plug. Valves shall be Jenkins Valve Fig. 546-P, Crane Co., or equal with minimum 300 psi non-shock cold water pressure rating and screwed ends.

g. Backflow preventer shall be the size shown on the Drawings and shall be of the double check valve principle. Backflow preventer installation shall include isolation valves and four test cocks, furnished as an assembly. Valve body shall be galvanized cast iron with bronze working parts and springs, plastic coated carbon steel valve discs, neoprene coated cotton duck diaphragm. For backflow preventers less than 2-1/2", the installation assembly also shall include a strainer. Isolation valves for backflow preventers shall be ball valves, except for size 2-1/2" and larger which shall be resilient seat gate valves. Test cocks shall be located as recommended by the manufacturer to facilitate functional testing of the assembly.

Valve shall be designed to suction a maximum working pressure of 175 psi and a hydrostatic test pressure of 350 psi.

Valve shall be Hershey Products, Inc., Model Bosco, Cla-Vel Co., or equal.

h. Valve boxes shall be of cast iron or combination of cast iron and PVC, complete with cover marked WATER. Valve boxes shall be extension type, with screw adjustment, and with flared base. The boxes shall be of such length to permit adjustment in both directions, to the depth of cover required over the pipe at the valve location. Boxes shall not be set so as to transmit surface loads to the valve. (See Standard Detail)

i. All valve boxes shall be placed so as not to transmit shock or stress to the valve and shall be centered and plumb over the operating nut of the valve. The ground in the trench upon which the valve boxes rest shall be thoroughly compacted to prevent settlement. The boxes shall be fitted together securely and set so that the cover is recessed ¼-1/2" below the final grade of the adjacent material per detail 114.1.

xiii. Fire hydrants shall be Mueller, Model No. A0423, Dresser M&H Style 929, American Model #B-62-B, or Kennedy Model K81, 3-way, dry top, compression type with safety flange, painted safety yellow, conforming to AWWA C502. Each hydrant shall have one 4 1/2 inch diameter pumper (steamer) nozzle and two 2 1/2 inch hose nozzles, nozzle gaskets, 5 1/4 inch valve, 1 1/2 inch pentagonal operating nut, open left. Both the hose nozzles and pumper (steamer) nozzle shall have National Standard Thread. Hydrants shall be designed for 4 1/2 foot bury and six (6) inch mechanical joint inlet. Fire hydrants installed during the contract, but no yet accepted into the County's system shall be flagged as out of service. Taping a dark colored plastic bag over the hydrant will indicate that these hydrants are out of service.

a. Indicate depth of bury by the following methods:

a. Raised figures on the barrel to show depth in feet. the figure shall be on the barrel, just below the swivel flange so that it is visible when installed. The figure shall be raised at least 1/8 inch above the barrel and surface and the height of the figure shall be at least one inch and shall be integrally cast with the barrel.

b. The inlet connection shall be a 6-inch, Class 250, mechanical joint bell and shall meet the general requirements for Standard Mechanical Joint Cast Iron Pipe and Fittings, furnished with necessary accessories for each such mechanical joint. The bolts shall be made of low alloy steel such as Corten or Usalloy. The gaskets shall be made of rubber. Glands shall be made of high strength cast iron consistent in design and strength with the elbows with which they are to be used. Elbow or inlet connection shall be shipped assembled with hydrant.

c. The outside of the hydrant above the finished ground line to a height just above the hydrant nozzles (or to the hydrant bonnet if so construed) shall be thoroughly cleaned, primed and then painted with two coats of Rhinamel Gray No. 202-31-00 paint as manufactured by the Grow Chemical Coating Corp., Tropical Plant Div., or equal. Top section of hydrant above the nozzles (on the hydrant bonnet, if so construed) shall be likewise cleaned and then painted with two coats of safety yellow as manufactured by the previously mentioned vendor, or Derusto #AO-40 or equal. Proposed paint substitution shall be presented to the Engineering Department with complete details, painting design, paint color chips and at least one pint of the proposed paint.

Paint the inside and the outside of the barrel below the ground line and the cast iron elbow inside and outside with bituminous coating; ANSI A-21.10 for potable water.

The bituminous coating shall be of such composition as to make a smooth, tough and tenacious coating, neither so soft as to flow when exposed to the sun nor so brittle as to crack and scale off when exposed to temperature below freezing.

The Bituminous coating may be applied hot or cold either by brushing, dipping or by spraying. The coating materials may be subjected to chemical and physical testing to confirm its uniformity and quality.

At no time shall there be any evidence of general peeling or scaling of the coating. Any serious damage to the coating because of rough handling in shipment or hauling shall be repaired to its original condition by the manufacturer at no cost to the Engineering Department.

d. External operating and cap nuts shall be of pentagonal shape. The pentagon shall measure 1-1/2 inches from point to flat at the base of the nut and 1-7/16 inches at the top.

Hydrant shall be open by turning operating nut left (counter clockwise). Direction of opening shall be indicated on the top of operating nut by means of a raised arrow.

e. Stuffing box packing shall be the "O" ring seal.

f. The following parts are to be bronze as specified in AWWA C-502.

Drain Valve, Valve Seats or Seat Rings Stuffing Box (Bronze-brushed Cast Iron) Stuffing Box Parts Hold Down Nut Threaded Stem Nut (sleeve).

g. The barrel of the hydrant shall be in two cast iron or ductile iron sections, designed to break at or near the finished grade; the cast iron shall conform to American Standard Specifications ANSI-A21.-51. The nozzle section shall be attached to the lower barrel section by means of a tapered flange ring held in place by suitable "hydrant head" bolts and nuts. The flange and flange rings shall be so designed that the top or upper barrel section, including the bonnet and operating nut, may be revolved 360 degrees for facing without disturbing the bottom section of the barrel. (The use of a split bronze insert ring will not be permitted).

h. Fire hydrant connection appurtenances shall be as follows:

(1) Anchor coupling shall be from 12 to 13 inches long, weighing approximately 70 pounds, double thickness cement lined, and bituminous sealed as per AWWA C104, six inch cast iron mechanical joint, class 250, with integrally cast standard mechanical joint gland on one end and one loose end rotable ductile iron gland on the other end. The plain end shall be of sufficient dimension to form a mechanical joint with a six inch mechanical joint bell.

(2) Straps, bolts and nuts shall meet requirements of ASTM A36 and A301, as specified in Section 5500.

8. Castings shall be grey iron as specified in Section 5500.

9. Bituminous coatings shall be coal tar epoxy conforming to requirements of MIL P 23236 P, class 2. Coatings on contact with potable water shall meet the requirements of AWWA C203 and jurisdictional Health Department requirements.

10. Connection Appurtenances

a. Tapping sleeves shall be mechanical joint, furnished complete with sealing gaskets shall be "O" ring type, high quality molded rubber having an approximate seventy durometer hardness, placed into a groove on the curved surface of the tapping saddles., mechanical joint accessories, or armored tipped, and suitable for use on Ductile iron pressure pipe. Hub sleeves shall fit Class "D" pipe with maximum allowance for outside diameter. Connecting flange joint between sleeve and valve shall conform to MSS (Manufacturers Standardization Society of the Valve and Fittings Industry) Standard SP60, for pipe up to 12 inches in diameter. Outlet flanges for pipe larger than 12 inches shall be designed to receive the valves furnished. Ship complete with rings, gaskets, bolts in place and ends of sleeves covered. Mechanical joint tapping valves shall have inlet flanges by the

mechanical joint outlets, be subjected to a test pressure of 300 psi, be designed for working pressure 200 psi, and shall meet other requirements specified hereinbefore for gate valves.

b. Tapping saddles may be used on mains sixteen (16) inches and larger where the required tap size does not exceed one-half the size of the main (i.e. 8-inch tapping saddle for use on a 16-inch main). Tapping saddles shall be manufactured of ductile iron providing a factor of safety of at least 2.5 at a working pressure of 250 psi. Saddles shall be equipped with a standard AWWA C-110-77 flange connection on the branch. Sealing gaskets shall be "O" ring type, high quality molded rubber having an approximate seventy durometer hardness, placed into a groove on the curved surface of the tapping saddles. Straps shall be of alloy steel. The tapping saddle shall be the American tapping saddle, U.S. Pipe tapping saddle, or equal. All taps shall be machine cut, no burned taps will be allowed.

c. Tapping assemblies, saddles, and clamps shall be as per Interpace, Adams, Mueller or equal. Provided threaded outlet as required.

d. Service clamps shall be double strap galvanized with corporation stop thread of appropriate size, neoprene gasket cemented in place, cadmium plated nuts and straps (for ductile iron pipe) and shall be the diameter required. Clamps shall be as manufactured by Mueller, Skinner, Dresser or equal.

e. Service saddle for installation on Class 150 pressure pipe as shall be cast iron with AWWA threads sized as required, furnished with neoprene gaskets. Size shall be as required. Saddles shall be as manufactured by General Engineering Co., or equal. Use mastic supplied by, or approved by, the manufacturer.

f. Uniflange shall be manufactured from Ductile Iron ASTM A 536 Grade 65-45-12. Drilling to ANSI B16.1 125 Lb. design. The gasket supplied with the flange shall be suitable for water usage and be SBR (BUNA-S) with a temperature range of -65º to 212 º F. The flange shall be capable of handling a working pressure of 200 psi and a test of 600 psi. The Uniflange shall be manufactured by Uniflange Corporation, Nortboro, Massachusetts, or equal.

III. Execution

A. Laying Pipe

1. A minimum of 3'6" cover shall be maintained over all mains.

2. Lay pipe to a true uniform line and grade as indicated on plans and as recorded on cut sheets.

3. Trench excavation and backfill and test pits shall be specified in Section 2200. Excavate test pits as specified in Section 2200 sufficiently in advance of trench construction so that reasonable changes in line and grade can be made where the location of existing structures varies from that shown. The Contractor shall adjust pipeline profile as required at connections to existing mains subject to the approval of the Engineer. Completely excavate sufficient trench to assure that no unforeseen obstructions exist before commencing pipe installation. Work occasioned by failure to take such precautions shall be performed at no cost to the County.

4. Only proper and suitable tools and appliances for the safe and convenient handling and laying of pipes and fittings shall be used. Pipe, fittings and valves shall be carefully handled and lowered into the trench. Under no circumstances should any pipe or fitting be dumped or rolled into the trench or be allowed to drop against the pipe or fitting already in the trench. Great care shall be taken to prevent the pipe lining and coating from being damaged, and any lining of coating damaged in any way shall be repaired by the Contractor to the satisfaction of the Engineer.

5. The pipe and fittings shall be thoroughly cleaned before they are laid and shall be kept clean until the acceptance of the completed work. Just before being lowered into the trench, each length of pipe or fitting shall be well swabbed with a water and chlorine solution to insure the removal of any dirt or foreign matter therefrom. After being placed in the trench, and prior to joining one tablespoon of HTH or Perchloron, shall be placed in each length of pipe or fitting. After the pipe has been "homed", the end shall be kept covered until the next length is laid. At the close of work each day the end of the pipe line shall be tightly closed with an expansion type stopper so that no dirt or foreign substance may enter the line and this stopper shall be kept in place until pipe laying is again resumed.

   a. As an alternate, the pipe can be cleaned by flushing with chlorinated water with a high pressure hose. After cleaning the end of the pipe shall be closed or plugged until use for protection.

6. Installation

   a. Align pipe so that no shoulder or unevenness results on the inside of the mains. Cutting where required to fit onto the line or to bring into the required location, shall be done in a satisfactory manner with an approved cutting tool or tools which will leave a smooth edge and at right angles to the axis of the pipe and not otherwise damage the pipe or lining. Such cuts shall be made at no cost to the County.

b. Joint deflection of mechanical joint and tyton joint pipe shall be as indicated on Standard Details and the Plans, unless otherwise approved by the Engineer.

c. Special care shall be taken to ensure that the pipes are well bedded on a solid foundation in accordance with Standard Details and Section 2200. Any defects due to settlement shall be made good by the Contractor at no expense to the County. Bell holes shall be dug sufficiently large to ensure the making of proper joints.

d. Springing of pipe to replace any section will not be allowed, except by permission of the Engineer.

e. Pipe fittings and valves shall be secured in place by concrete foundation or thrust blocks or by strapping as shown on the plans and in accordance with the Standard Details. As an alternate to securing by the use of concrete foundations and thrush blocks or strapping the contractor can use mechanical joint restrain glands meeting the flange requirements of AWWA C110 or C153 installed in accordance with AWWA C600.

B. Joints

1. Mechanical Joints

a. Mechanical joints consist of rubber gaskets, cast iron gland rings, bolts, and hexagonal nuts. Prior to assembling joint, both pipe sections to be in contact with the gasket shall be cleared with a wire brush so as to obtain a clean, smooth surface free of rust and foreign materials.

b. Mechanical joints shall be made up with gaskets, glands and bolts. When a joint is to be made up, the bell or socket and plain end shall be cleaned and washed with a solution of mild soap in water; the gland and gasket shall be slid onto the plain end and the end then entered into the socket until it is fully "home" on the centering ring. The gasket shall then be painted with soapy water and slid into position, followed by the gland. All bolts shall be inserted and made up hand tight and then tightened alternately to bring the gland into position evenly. Excessive tightening of the bolts shall be avoided. All nuts shall be pulled up using a torque wrench which will not permit unequal stresses in the bolts. Torque shall not exceed the recommendations of the manufacturer of the pipe and bolts for the various sizes. Care shall be taken to assure that the pipe remains fully "home" while the joint is being made. Joints shall conform to the applicable AWWA Specifications.

c. Assemble joints in accordance with AWWA C111 and C600 and as specified herein. Clean with soapy water and lubricate contact surfaces with vegetable oil soap. Slip the gasket over the spigot end in the bell. Complete the joint by alternate tightening of proper number, size, and length bolts 180 degrees apart with a torque wrench set at the range listed in the chart below, so that the gland and face of the flange present parallel faces during the procedure. The first bolt to be tightened shall be at the bottom of joint. Second shall be at the top of the joint, etc.

TORQUE RANGE

4" to 6"	50 to 60 foot pounds
8"	60 to 70 foot pounds
12"	70 to 80 foot pounds
Larger than 12"	75 to 90 foot pounds

d. Where satisfactory sealing of the joint is not attained at the maximum permissible torque, disassemble, reclean, and reassemble the joint with a new gasket.

2. Push-on joints

a. Push-on joints consist of a circular rubber gasket which fits into a specially designed bell or socket end of the pipe and over the spigot end of the pipe using the manufacturer's recommended lubricant. File or grind the spigot on field cut pipe lengths to resemble the pipe as manufactured so that the spigot end will slip into the socket intact without hindrance or gasket damage. Place an identifying mark on pipe that is not furnished with a depth mark on the spigot to show the depth of the socket.

b. Assemble joints in accordance with AWWA C600 and as specified herein. Clean with soapy water the inside of the socket and outside of the spigot and the pipes to be jointed to obtain clean, smooth surfaces free of foreign materials. Apply a thin film of gasket lubricant furnished by the joint manufacturer to the inside surface of the gasket and to the outside surface of the spigot. Enter the spigot into the socket up to the depth mark, using equipment designed for the purpose.

C. Fittings and Valves

1. Install fittings and valves where indicated on the plans. Set fittings and valves and join to pipe as hereinbefore specified. Where valves occur on the end of a pipeline, place a cast iron plug or blind flange and secure in the exposed bell before backfilling the trench.

2. Provide a valve box and extension stem where required for the following:

nut operated valves; valves on which the operating mechanism is enclosed in a grease case; valves 16 inch and larger in diameter; valves with exposed gearing or operating mechanism; air valves.

3. Set valve box at right angle to the water main, centered and plumb over the operating nut of the valve extension stem with nut from three to four feet below top of cover with the box cover flush with the surface of the finished grade, or set to the elevation shown on the drawings. Support as required to maintain nut in position. Before installation, ascertain that valves are in proper working order. If valves are not operating properly, notify the Engineer immediately. Backfill and compact under and around valve boxes to insure no vertical loads are transmitted to the valve operators. The flange at the bottom of the bottom section shall rest upon bricks as shown on the Standard Detail.

D. Hydrants

1. Install fire hydrants where indicated on the Plans in accordance with the Standard Details. Set plumb at the elevation directed by the Engineer. Place the steamer outlet normal tot he street line. Strap fire hydrant to main as shown on the Standard Details.

2. The hydrant shall be firmly set on a solid concrete block and a minimum of 1/3 cubic yard of 1/2" to 3/4" size stone granular material which shall extend to a point approximately 4 inches above the waste opening in accordance with the Standard Details.

3. Lay fire hydrant connections level, in the manner specified hereinbefore for laying pipe.

E. Water House Connections

1. Provide water house connections from the water mains to property lines with one continuous piece of "K" copper pipe at the elevation indicated on the Plans, Standard Details, or directed by the Engineer. Install corporation stops, curb stops, and/or meter vaults where indicated. Mark the location of the end of the water connection pipe at the property line with a 2 x 4 pressure treated timber painted blue, placed vertically from the bottom of the trench and extending two feet above grade.

2. Except where otherwise specified herein tapping of the water main and insertion of the corporation stops shall be performed by qualified personnel. No tapping for these services shall be performed prior to the testing and acceptance of the main.

a. Direct tap 3-inch through 6-inch cast iron or, ductile iron pipe for ¾-inch corporations. 1-inch services require the use of ¾-inch by 1-inch corporations. For services larger than 1-inch the use of tapped tees is required. The use of saddles require the approval

of the Engineer. Maintain a minimum of 18 inches from tap to the bell end of the pipe. After making the connection and completing the installation, open and leave open the corporation stop.

b. Do not tap dry unless directed by the Engineer. If so directed, make the tap as specified herein and leave the trench open at the tap until the water main has been placed in service and the taps have been inspected.

3. Install house connections with outside meters per Standard Detail.

4. Idler shall be installed in the meter yoke by the Contractor.

F. Corporation Stop for Chlorination Purposes

1. Provide one-inch corporation stop and coupling in water mains for chlorination purposes where directed by the Engineer. The corporation stop shall be removed after testing and the contractor shall install a standard corporation stop threaded brass plug per AWWA C800.

G. Valve Vaults and Manholes

1. Provide valve vaults and manholes where indicated on the Plans in accordance with Section 3360 of the Specifications and Standard Details. Do not complete to final grade until grading is complete and proper alignment is insured. Set frames to grade using brick as indicated on the Standard Details. Space steps as indicated on the Standard Details and the Plans.

H. Buttresses, Anchorage & Harnessing

1. Provide buttresses, anchorages and harnessing where indicated on the Plans or directed by the Engineer in accordance with the Standard Details. The Engineer will inspect and approve excavations before buttresses and anchorages are placed. The entire face of the excavation against which buttresses will bear shall be firm bearing, flat and at proper angle to the pipe connections. The concrete shall be cured seven days between placing concrete and pressurizing mains.

I. Connections to Existing Lines

1. Before the start of construction, dig test pits on all connections to existing work. The Engineer will examine test pits and establish line and grade and determine material required at connections.

2. Notify the Engineer at least three working days prior to proposed connection construction. Make connections at such time and in such manner as the Engineer directs.

3. The County will notify the consumers and operate or have DPW personnel operate all valves necessary to shut off the mains. The County will make every reasonable effort to have tight shut offs, but does not warrant that the mains will be dry. Complete the connections with the greatest possible speed.

4. Certain information is shown on the drawings relative to existing pipe and other construction. This information was transferred from existing records and is deemed to be reliable but the County does not warrant or guarantee that either the locations, the dimensions or the type of material are exactly as shown.

5. Water House Connection Renewals

a. Unless otherwise directed, utilize existing tap at main line water.

b. Where directed by the Engineer, abandon the existing tap and retap the main line water pipe.

c. Furnishing material for and tapping main line water pipe shall be performed by experienced personnel.

d. Provide corporation stops and couplings and curb stops or meter vaults at each house connection in accordance with the Standard Details. Stops shall turned to "off" position prior to installation.

e. Where directed by the Engineer, provide meter housing and meter yokes and valves in accordance with the Standard Details.

IV. Measurement and Payment

A. Pipe furnished by the Contractor

1. Furnishing and installing pipe shall be measured for payment by the linear foot of the various types and sizes provided, measured as recorded on cut sheets. No deductions will be made for the length of the fittings, connections or valves.

Payment will be made for the quantities measured for each size at the unit price per linear foot listed in the Bid Schedule.

2. Payment will include provision of fittings, branch connections, and connections to new and existing facilities and corporation stops and couplings for chlorination.

3. Payment will include excavation, backfill, and bedding as specified in Section 2200.

B. House Connections

1. Furnishing and installing house connections will be measured for payment by each of the various types and sizes installed complete in place indicated on the plans or as directed by the Engineer.

Payment will be made on a unit price per each size on the Bid Schedule.

2. Payment will include installation of fittings, curb stops, corporation stops, valves, valve boxes, and connections to new and existing facilities.

3. Payment will include excavation, backfill, and bedding as specified in Section 2200.

C. House Connection with Outside Meters

1. Furnishing and installing house connection with outside meter will be measured for payment by each of the various types and sizes installed complete in place indicated on the plans or as directed by the Engineer in accordance with the Standard Detail.

   Payment will be made on a unit price per each size on the Bid Schedule.

2. Payment will include installation of fittings, corporation stops, meter yokes, meter idlers, branch pieces if applicable, meter housings, meter box covers and connections to new and existing facilities. Contractor is responsible for the adjustment to water meter vault to bring the cover to the finish grade within the one (1) year warranty period.

3. Payment will include excavation, backfill and bedding as specified in Section 2200.

D. Fire Hydrants, Standard and Dewatering Types

1. Installing fire hydrants of either type will be measured for payment by each type installed complete in place, per plans, including parts of connections as shown on the Standard Details, strapping and blocking, and buttresses, and incidental appurtenances. The fire hydrant valve and valve box shall be included with this pay item.

   Payment will be made for the quantities measured at the unit price per each type listed in the Bid Schedule.

2. Payment will include excavation, backfill and bedding as specified in Section 2200.

E. Compound and Detector Meter

1. Providing compound and detector will be measured for payment by each of the various types and sizes installed complete in place indicated on the plans or as directed by the Engineer in accordance with the Standard Details.

   Payment will be made for the quantities measured for payment by each of the various types and sizes as listed in the Bid Schedule.

2. Payment will include excavation and backfill as specified in Section 2200, installation of lead pipe from main tee and connection to meter vault with standard frame and cover, and installation of valve and valve box where it occurs.

F. Air Release Valve

1. Providing and installing air release valve in manhole will be measured for payment by each of the various sizes installed complete in place indicated on the plans or as directed by the Engineer in accordance with the Standard Detail.

   Payment will be made on a unit price per each size on the Bid Schedule.

2. Payment will include excavation, backfill and bedding, as specified in Section 2200.

G. Cap and Blow-Off or Blow-Off

1. Providing and installing cap and blow-off will be measured for payment by each of the various types and sizes installed complete in place as indicated on the plans or as directed by the Engineer in accordance with the Standard Detail.

   Payment will be made on a unit price per each type and size on the Bid Schedule.

2. Payment will include excavation, backfill and bedding as specified in Section 2200, furnishing and installing all fittings, pipe, valve and valve boxes.

H. Furnishing Pipe in Tunnels and Borings

1. Furnishing and installing pipe in tunnels and borings for water lines are measured and paid for under Section 2950 or 2951.

I. Structures

1. Structures including valve vaults, meter housings, blowoffs, and valve manholes are measured and paid for under other items of this section.

J. Non-Payment Items

1. The following items will not be measured for payment but the cost thereof will be considered as incidental to the contract.

   a. Removal of existing facilities that interfere with the project.

   b. Abandonment, plugging, blocking or bricking shut and disposal of

existing facilities.

c. Restoration and restabilization of disturbed areas.

d. Erosion checks

e. Concrete anchors

f. Harnessing and Blocking

g. Testing

h. Chlorination

i. Timber marking house connections

j. Replacement of various appurtenant connections and devices required for watertight installations.

k. Valves

1. Providing and installing valves will be measured for payment by each of the various types and sizes installed complete in place as indicated on the plans or as directed by the Engineer in accordance with the Standard Detail.

   Payment will be made on a unit price per each type and size on the Bid Schedule.

2. Payment will include provision of extension stems, ground lever indicator, valve boxes, strapping, etc.

3. Payment will include excavation, backfill, and bedding, as specified in Section 2200.

STANDARD SPECIFICATIONS

SECTION 2570

SANITARY SEWER SYSTEMS

I. General

A. Description

This section includes all work necessary to provide sanitary sewer systems complete in place in accordance with the Contract Documents.

B. Quality Assurance

1. Sanitary Sewer Field Tests

a. Sanitary Sewers shall be tested under low air pressures listed an Table 1 after completion of backfill and approval of compaction. Inspect sewers and manholes prior to testing and eliminate discernable water leaks and debris. The Contractor may perform preliminary tests at his own discretion for his information, without the presence of the Engineer at no cost to the County. The Contractor shall schedule the proposed final test with the Engineer which shall be performed in the presence of the Engineer or his duly authorized representative. All material, equipment and labor required shall be provided by the Contractor. Sewers shall be tested from manhole to manhole or from manhole to terminal manhole.

b. Test shall be conducted as follows: Test plug shall be provided at each manhole and be securely braced. A suitable means of determining depth of groundwater level above the invert immediately before testing shall be provided and gauge pressures shall be increased accordingly. Air pressure shall be slowly added to the portion of the pipe being tested until the internal air pressure of 4 psi above the invert or above the groundwater table whichever is greater. No personnel shall be allowed to remain in the manhole after the air pressure has been increased. If in the opinion of the Engineer there is any indication of leakage in the test plug, the pressure shall be relieved before taking steps to eliminate the leak. Test pressure shall be maintained for a minimum of two minutes after which time the supply of air shall be disconnected. If pressure decreases to 3.5 psi, record the time required for the pressure to drop one psi from 3.5 to 2.5 psi. Pipes failing to maintain minimum acceptable holding times calculated from the table included herein will not be accepted.

Air Test Table

TABLE I Minimum Test Time for Various Pipe Sizes

Nominal Pipe Size, in.	T (Time) min/100 ft.	Nominal Pipe Size, in.	T (Time) min/100 ft.
3	0.2	21	3.0
4	0.3	24	3.6
6	0.7	27	4.2
8	1.2	30	4.8
10	1.5	33	5.4
12	1.8	36	6.0
15	2.1	39	6.6
18	2.4	42	7.3

Test Time (Info)

a. Table 1 shows the required test time, T, in minutes /100 ft. of pipe for each nominal pipe size. Test times are for a 1.0 psi (7-kPa) pressure drop from 3.5 to 2.5 psi (24 to 17 kPa).

b. If the section of line to be tested includes more than one pipe size, calculate the test time for each size and add the test times to arrive at the total test time for the section.

c. It is not necessary to hold the test for the whole period when it is clearly evident that the rate of air loss is less than the allowable.

c. Contractor's Option- Water Test

(1) Leakage Test, Completed Sewers: Leakage, whether infiltration or exfiltration shall not exceed a rate of one hundred gallons per inch of diameter per mile of sewer per twenty-four hours in any section of piping between successive manholes.

(2) Infiltration testing shall take place when the natural ground water table is above the crown of the piping at the higher end of the Test Section. The amount of leakage shall be measured by a suitable weir or other devices as directed. Exfiltration tests shall be made on each section as directed.

(3) A section of sewer line shall be prepared for testing by

plugging the upper side of the downstream manhole and all openings in the next upstream manhole except the downstream opening. The maximum head on any section under test will not exceed ten feet for clay pipe and thirty feet for ABS or PVC Pipe. Branch sewers running from Y-branches on the MAINS shall be plugged at the upper end (C.O. location) if the test head would cause them to overflow.

d. A section of sewer line prepared as above shall be tested by filling with water to an elevation of one foot above top of the pipe in the upstream manhole, in mains without laterals or the test head must exceed the highest house service elevation, whichever is greater. The water shall be introduced into the test section at least four hours in advance of the official test period to allow the pipe and joint material to become saturated with water. All entrapped material shall be removed prior to performance of test.

e. At the beginning of test the water in the upper manhole shall be carefully measured from a point near the water level such as a manhole rung and the loss of water during test period calculated. Sewer sections showing leakage of that allowed shall be repaired or reconstructed as necessary then retested.

2. Manhole Field Test

a. When air testing of lines is required by the Engineer, manholes shall be tested separately from the sewers. All sewers connecting to each manhole to be tested shall be plugged and the manhole filled with water to cover the bottom of the rim.

b. The test duration shall be twenty-four hours and the allowable leakage for this duration shall be 1 gallon per foot of vertical depth of the manhole tested.

c. As an alternate to water testing the manhole can be vacuum tested in accordance with the following procedure.

1) Each manhole shall be tested after backfilling. (Preliminary unofficial test may be performed by the contractor prior to backfilling.)

2) All lift holes shall be plugged with an approved non-shrink grout.

3) All pipes entering the manhole shall be plugged, taking care to

securely brace the plugs from being drawn into the manhole.

4) The test shall be placed inside the manhole frame and the seal inflated in accordance with the manufacturer's recommendation.

5) A vacuum of l0 inches of mercury shall be drawn and the vacuum pump shut off. With the valves closed, the time shall be measured for the vacuum to the drop to 9 inches. The manhole shall pass if the time is greater than 60 seconds for a 48" diameter manhole, 75 seconds for 60" and 90 seconds for 72".

6) If the manhole fails the initial test, necessary repairs shall be made. Retesting shall proceed until a satisfactory test is obtained or the manhole shall be tested in accordance with the standard exfiltration test and rated accordingly.

7) If the manhole joint mastic is pulled out during the vacuum test, the mastic shall be replaced

3. Pressure Tests for Force Mains

a. The Contractor shall provide equipment for and conduct pressure tests under pressures indicated on the Plans. Pressure recorder, charts and water meters for testing will be furnished by the County. Set up testing equipment in accordance with Standard Detail for testing water mains. Tests conducted on ductile iron pipe shall meet requirements of AWWA C-600. Tests conducted on concrete pipe shall meet requirements if AWWA C-600 modified as per AWWA Manual M II.

(1) Test pipe after completion of backfill operations in lengths directed by the Engineer. Close ends of test sections with valves or plugs where possible, or provide test plugs.

(2) Fill the length of force main under test with water and subject it to the maximum of 100 psi sustained internal pressure plus water hammer, at the low point, as indicated in the Contract Documents. Maintain pressure for a minimum of two hours. County personnel will operate all valves in the test section during this portion of the test.

(3) Should test results show any visible leakage, displacement or damage, the Contractor shall repair the leakage, displacement or damage and retest until specified conditions are met, to the satisfaction of the Engineer, at no cost to the County.

b. The maximum allowable leakage shall be determined from the following formula:

$$L = \frac{25\ DM}{24}$$

L= allowed leakage in gallons per hour

D= nominal diameter of pipe in inches

M= miles of pipe

4. Inspection and Testing of Pipe

a. The Engineer may inspect and test all pipe, fittings and joint material upon delivery to the site or at the factory. The pipe manufacturer or supplier shall furnish materials to be tested and labor as required to assist the Engineer with tests.

b. Manufacturer or supplier shall provide ample space between rows of stockpiled pipe to facilitate adequate inspection.

c. The pipe manufacturer or supplier shall provide to the Engineer prior to commencing inspection of pipe for an order, with the complete contract number, contractor's name, the pipe diameters, classes and designs and footage of pipe needed to fill the order.

d. The pipe manufacturer or supplier shall provide evidence to the Engineer prior to inspection, that there is an adequate quantity of pipe available of the required diameters, classes and designs for inspection.

e. The pipe manufacturer or supplier shall provide facilities for conducting load bearing test.

f. The pipe manufacturer or supplier shall provide competent personnel for the preparation and conducting or hydrostatic and load bearing tests. The Engineer and/or Inspector has the right to be present during all phases of testing.

g. For reinforced concrete pipe furnished under this Section, provide test specimens selected at random for production pipe by the Engineer.

Provide up to 1/2 of one percent of the number of pipes to be furnished for each size, but no less than two test specimens for each size and class for the load bearing test. Where hydrostatic tests are required, conduct such tests concurrent with the load bearing tests, using two pieces of pipe jointed together, of the

same size, class and production run, load bearing test specimens will not be accepted for incorporation into the work.

h. Deflection test, PVC Pipe

(1) The Contractor shall conduct the tests under the observation of the Engineer and shall furnish all test equipment and labor for conducting the tests. Deflections of five percent (5%) or greater of the inside pipe diameter shall be considered unacceptable and such pipe shall be replaced by the Contractor at his expense. The deflection shall be checked by pulling a cylinder, sphere, or measuring device through the pipe. After hydrohammering the trench lines and prior to conditional acceptance, sewer lines shall be checked for deflection. This deflection test shall be required on all lines unless waived by the Inspector.

5. Precast concrete manhole requirements are specified in Section 3360.

C. Submittals

1. Submit shop drawings as specified in Section 1200 for the following:

a. Reinforced concrete pipe; show strength, details of special fittings, reinforcing dimensions and details and joint and gasket dimensions.

(1) For pipe designated in the Plans by D loads, furnish calculations signed by a Professional Engineer registered in the State of Maryland, or an officer, or a duly authorized representative of the pipe manufacturer for pipe designs required by ASTM C655.

b. Furnish laying schedules for all curved and beveled pipe and where indicated.

(1) Joint openings specified in the laying schedule for sanitary sewers shall not exceed one-half inch.

(2) Limit bevels to 4 1/2 degrees for all beveled pipe.

c. Precast concrete manholes are specified in Section 3360.

d. Shop drawing requirements for concrete pipe and manholes will be waived when the pipe manufacturer has on file with the County a certified standard shop drawing containing the above mentioned information, which has been approved by the Engineer.

2. Submit certified test reports before delivery of materials as specified in Section 1100 for all materials furnished under this Section. Certifications shall include contract number, job location, contractor's name, types, classes and strengths of pipe, and pipe manufacturer's name.

3. At the option of the Engineer, the Contractor shall, in addition to or in lieu of the above specified certified test reports, furnish certificates of compliance as specified in Section 1100 from the manufacturer.

4. A packing list or invoice shall accompany every shipment and shall contain the following information: contract number, kind and class of pipe, length and other pertinent information.

D. Materials Test Criteria

1. Ductile iron pipe shall withstand pressures as set forth in the applicable referenced specifications referred to herein.

2. Acceptance of reinforced concrete pipe will be based on the Plant Load-Bearing Tests, Material Tests, and Inspection of Manufactured Pipe for Visual Defects and Imperfections, and stipulations as set forth in appropriate ASTM specification and modified herein.

3. Polyvinyl chloride (PVC) pipe 6 inches through 27 inches in diameter shall be tested in accordance with requirements of ASTM D 3034, ASTM F 789 and/or ASTM F679 as modified herein.

4. Acrylonitrile-Butadiene-Styrene (ABS) pipe; 6 inches diameter solid wall pipe shall be tested in accordance with requirements of ASTM D 2751 and the 8 inches - 15 inches diameter composition wall diameter shall be tested in accordance with requirements of ASTM D 2680 as modified herein.

II. Materials

A. General

1. The Contractor shall furnish and lay all reinforced concrete, ABS, ABS Composition, PVC and ductile iron pipe sewers, including excavation and refill and all appurtenances, such as manholes, and house connections as shown on the Drawings and/or as specified.

a. For house connections from the main line connection to the cleanout furnish either PVC pipe, Type PSM, wall thickness classifications SD5-35 or Type PS 46; or ABS solid wall pipe, wall thickness classification SDR-35.

b. For main line sewers less than 18 inches in diameter, unless otherwise indicated furnish either PVC pipe, type PSM, wall thickness classification SDR-35 or Type PS 46; ABS Composition pipe; or ductile iron pipe.

c. For main line sewers 18 inches through 27 inches in diameter furnish either PVC pipe, reinforced concrete pipe, or ductile iron pipe.

d. For main line sewers 27 inches in diameter and larger furnish reinforced concrete pipe, or ductile iron pipe.

B. Materials Requirements

1. Pipe and Fittings

a. General- all pipe between structures shall be of the same size and material and shall be furnished by the same manufacturer. Each pipe length and all fittings shall be clearly marked with the manufacturer's name or trademark and pipe type or strength.

b. Polyvinyl chloride pipe and fittings 4 inches through 15 inches in diameter shall meet requirements of ASTM D 3034 or ASTM F 789 and pipe fitting 18 inches through 27" in diameter shall meet requirements of ASTM F679 as modified herein. Pipe with blisters, bubbles, cuts or scrapes on inside or outside surfaces, which appreciably damage the wall thickness, or other imperfections which impair the performance or life of the pipe, will be rejected.

(1) Joints shall be elastometric gasket joints resulting in watertight seals.

(2) PVC pipe shall be legibly marked as follows at intervals of five feet maximum; manufacturer's name or trademark, pipe size, PVC cell classification, appropriate legend such as PSM SDR-35 PVC Sewer Pipe, ASTM D 3034, manufacturer's lot number, date of manufacture and point of origin. Pipe not marked as indicated herein may be rejected.

(3) PVC fittings shall be legibly marked as follows: Manufacturer's name or trademark, normal size, PVC, ASTM D 3034, ASTM F 679 or ASTM F 789.

c. Acrylonitrile-Butadiene-Styrene (ABS) pipe shall meet the requirements of ASTM D 2680 for composite sewer piping, or ASTM D 2751 for solid wall SDR-35 piping. Use of composite sewer piping shall be limited to 8 inches thru 15 inches diameter

pipe and the use of solid wall piping shall be limited to 6 inches diameter only as modified herein. Pipe with blisters, bubbles, cuts or scrapes on the inside or outside surfaces, which appreciably damage the wall thickness or other imperfections which impair the performance or life of the pipe, will be rejected.

(1) Joints shall be solvent-cemented joints resulting in watertight seals.

(2) ABS pipe shall be legibly marked as follows at intervals of five feet maximum; manufacturer's name or trademark, pipe size, appropriate legend such as ABS Sewer Pipe, ASTM 2680, or SDR 35 ABS Sewer Pipe ASTM 2571, manufacturer's lot number, date of manufacture and point of origin. Pipe not marked as indicated herein may be rejected.

(3) ABS fittings may be legibly marked as follows; manufacturer's name or trademark, nominal size, ABS, ASTM D 2751.

d. Circular reinforced concrete pipe and fittings shall meet requirements of ASTM C76 as modified herein.

(1) Pipe shall be substantially free of surface roughness. The interior walls shall be substantially a smooth surface and be free from noticeable and harmful ridges, corrugations, elevations and depressions. The finished surface shall also be free of any material which is not an integral part of the compacted concrete, such as loose aggregate, cementitious slurry coats, silts, cement and non-required markings.

(2) Pipe shall be tested to the 0.01 inch crack and to the specified ultimate load.

(3) In pipes with belled ends, extend longitudinal steel so as to form supports for holding circumferential steel in place, and so formed as to provide bell reinforcement with adequate concrete cover.

(4) Pipe for sanitary sewers shall have bell and spigot ends with rubber gasket joints meeting requirements of ASTM C361. Lifting hooks will not be permitted.

(5) Non-float concrete pipe shall meet the requirements specified above and the following:

Outside diameter shall be increased so that the pipe contains sufficient concrete to resist floatation with the pipe empty and uncovered. Increased thickness shall be homogeneous or heterogeneous of same concrete f,c (f prime c) as contiguous pipe and reinforced as required to prevent shrinkage and temperature cracks.

Joints shall be interchangeable with those of the contiguous sewer pipe.

e. Vitrified clay pipe and fittings for under drains shall meet requirements of ASTM C700, standard strength and shall be furnished in lengths from two to five feet.

f. Reinforced concrete pipe designated on the plans by D loads shall meet requirements of ASTM C655 as modified herein.

(1) Pipe shall be tested to the 0.01 inch crack load and then to the ultimate load specified.

(2) Perform absorption tests as specified in ASTM C76.

(3) In addition to causes for rejection set forth in ASTM C655, pipe shall be subject to rejection for the following causes:

Surface defects indicating honeycombing.

(4) Joint for sanitary sewers shall meet requirements specified elsewhere herein.

(5) Pipe stronger than that designated may be furnished provided such pipe meets or exceeds in all other respects the requirements specified herein.

g. Ductile iron pipe for force mains or sewer mains shall meet requirements set forth in Section 2550, except the pipe shall have no cement lining.

2. Cast in place concrete shall be as specified in Section 3300, class as indicated on the Standard Details and on the Plans.

3. Connection and Appurtenances

a. Thimble for connection to 12 inch and larger unreinforced concrete and asbestos cement pipe shall be as manufactured by smith and loveless or equal. At connection to PVC house connection to main of another material, provide approved coupling or adaptor as required for watertight seal and as directed by the Engineer.

b. Cast iron saddles for connection of 6 inch through 10 inch house connections to main line sewer shall be as manufactured by General Engineering or equal. Use mastic approved by saddle manufacturer. Gasket shall be as manufactured by Fernco or equal. Connect to existing PVC main with rubber gasketed tee and straps as indicated on the Standard Detail. Provide approved adaptor or coupling and Fernco gasket where required for watertight seal and as directed by the Engineer. Provide watertight plug on PVC house connection at property line.

c. Manhole Adapters

(1) Flexible gasket type adapter for connection of PVC or ABS pipe to sewer manhole shall be "CMA" gasket manufactured by Fernco or equal.

(2) Rigid type adapter for connection of PVC or ABS pipe to sewer manhole shall be "CT" Adapter made from asbestos-cement and manufactured by General Engrg. Co., or equal.

d. Stoppers

(1) Stoppers for concrete sewers 18 inches and larger shall be concrete as described elsewhere herein or metal. Provide brick bulkheads when directed by the Engineer.

(2) Stoppers for all types of pipe shall be watertight and of an approved design as furnished by the pipe manufacturer.

4. Granular bedding material is specified in Section 2200.

5. Precast concrete manholes are specified in Section 3360.

6. Miscellaneous metal connectors and appurtenances shall be in accordance with requirements set forth in Section 5500 and the Standard Details and plans.

7. Masonry work shall be as specified in Section 4200.

8. Asphalt based waterproof coating for exterior of manholes shall be mineral filled solvent type meeting requirements of MIL-C-82052.

9. Quick setting non-shrink grout shall conform to requirements of Corp of Engineers CRD-588, octocrete, speedcrete or equal.

10. Flexible plastic rubber gasket between manhold and manhole frame shall be type B, in accordance with AASHTO M-198, Kent-seal # 2 joint sealant distributed by General Engineering, or equal, and conform to Standard Detail.

III. Execution

A. Preparation

1. Trench excavation and backfill shall be as specified in Section 2200. Before commencing excavation at each location, dig test pits as directed by the Engineer. Excavate test pits a specified in Section 2200

sufficiently in advance of trench construction so that reasonable changes in line and grade can be made where the location of existing structures varies from that shown.

2. Provide granular bedding material under all sanitary sewer pipe and structures in accordance with the Standard Details and Section 2200. Provide encasement and/or concrete cradle where indicated on the Plans. Ensure that pipes are well bedded.

B. Laying Pipe

1. Lay pipe to a true uniform line and grade as indicated with continuous bearing of barrel on cradle of bedding material. Handle pipe and fittings with care so as to avoid damage. Where indicated, provide erosion checks or concrete anchors in accordance with the Standard Details.

2. Lay pipe up-grade with the bell or groove pointing in the direction of upstream. Lay each section of pipe in such a manner to form a close concentric joint with the adjoining section and to prevent sudden offsets in the flow line.

3. Construct mitered and curved bends where indicated in accordance with the Standard Details and the Plans. Curved bends shall have a uniform interior radius.

   a. Construct curves for sanitary sewers by use of beveled pipe, short lengths and by opening of joints in accordance with the following table:

PIPE SIZE	MAXIMUM JOINT OPENING
Thru 36"	1/2"
42" thru 60"	3/4"
66" thru 102"	1"
108" thru 144"	1 1/4"

   b. Construct curves for storm sewers by use of beveled pipe, short lengths, and joint openings not to exceed 1/3 the pipe joint depth.

4. Place sufficient backfill on each section of pipe, as it is laid to hold it firmly in place.

5. Place circular reinforced concrete pipe with elliptical reinforcement so that the mark which delineates the minor axis of the reinforcing is centered on the top of the pipe, and is easily visible from the top of the trench.

6. Clean out the interior of the pipe as the work progresses. Utilize a suitable swab or drag in small diameter pipe and pull forward past each joint immediately after the jointing has been completed.

7. Keep excavations and trenches free of water during construction and until final inspection. When the work is not in progress, securely close open ends of pipe and fittings to prevent trench water, earth or other substances from entering the pipes or fittings.

8. Provided a minimum of three feet of cover over polyvinyl chloride, ABS and concrete pipe.

C. Sewer House Connections

1. Provide sewer house connections and sewer drop house connections where indicated in accordance with the Standard Details.

2. Where sewer exceeds 9'0" in depth, drop house connections shall be used to meet a depth of 8'6" below pavement profile at the cleanout at the property line. Contractor may, if approved by the Construction Manager eliminate the drop house connections by installing a standard house connection with the stack extended to two (2) foot above the proposed grade.

3. Where possible place house connections simultaneously with construction of new main line sewer before backfilling main line sewer.

4. The center of the cleanout on the laterals shall be a minimum of 5 feet from any main.

5. Lay house connection pipe at a two percent grade, unless otherwise indicated on plan.

6. Mark the location of the end of the sewer connection at the property with a pressure treated timber, painted green, placed vertically from the bottom of the trench and extending two feet above grade. The depth from the top of clean-out concrete encasement in vertical feet to a designated line shall be marked on the timber.

D. Joints

1. Joints for Concrete Sanitary Sewer

a. Prior to joining pipe, liberally coat pipe joints with lubricant. Fit the bell or spigot with gasket according to manufacturers instructions. Join the pipes with equipment designed for the purpose. Before the joint is completely home, check the position of the gasket using a suitable gauge. If the gasket is found to be dislocated, repeat the entire joining process using a new gasket. The rubber gasket shall be the sole element relied upon for water tightness.

b. For pipe with steel end ring joints, after the joining has been

completed, completely fill the exterior joint spaces with mastic or mortar. Fill interior joint spaces of such pipes 30 inches and larger in diameter with mastic or mortar and remove excess material from the inside of the pipe.

2. Joints for ductile iron pipe for main line sewers shall be as specified in Section 2550.

3. Joints for polyvinyl chloride pipe shall be elastometric gasket joints assembled with the manufacturer's recommendations.

4. Joints for ABS pipe shall be solvent-cemented joint, type SC assembled in accordance with the manufacturer's recommendations.

E. Brick Construction

1. Perform brick construction as specified in Section 4200 for Utility Structures, in accordance with Standard Details and the plans.

F. Setting Manholes

1. Set manholes to a true uniform line and grade as indicated on the plans on bedding material.

2. Manholes shall be set or placed as pipe laying progresses and the Engineer may stop work entirely on laying pipe until the manhole just passed has been completed.

3. Construct manholes of precast sections in accordance with Standard Details and the Plans. Joints on the inside and outside of the manholes shall be struck with non-shrink grout and the outside joint shall be coated with asphalt based waterproof coating.

   Place axis of manholes directly over the centerlines of the pipe unless otherwise shown.

4. Construct appropriate flow channels in the bottom of manholes, as shown on the Standard Details and Plans and specified herein below.

   a. Channel shall be lined with brick or with cast-in-place concrete mix #1 using type II cement with silica sand and GP aggregate. Channel shall slope smoothly and evenly from the main pipe entering the manhole to the outlet pipe.

5. Drop Manhole

   a. Drop manholes shall be used when the invert of the inflow sewer is 1.75 feet or more above the manhole invert. When this difference in evaluation is less than 1.75 feet the manhole invert

shall be filleted to prevent solids desposition.

b. Drop manholes shall be constructed with outside drop connection. Due to the unequal earth pressure that would result from the backfilling operation in the vicinity of the manhole, the entire outside drop connection shall be encased in concrete per the Standard Detail.

6. Cut the pipe three inches from the inside face of the structures.

a. When installing ABS or PVC pipe one of the adapters, as described herein above for connection to manholes, shall be provided and installed per the Standard Detail or in accordance to manufacturer's procedure using quick setting non-shrink grout. All other pipe shall be directly mortared into the manhole opening with non-shrink grout.

7. Install additional manhole steps and cast iron watertight frame and cover for each manhole and adjust the frame and cover to proper grade by the use of brick.

a. Manhole tops in fields or unimproved area shall be set 1'0" above existing ground and an earth berm shall be placed all around, sloping away on a 4:1 slope, unless otherwise directed.

b. Manhole tops are to be set 1/4" lower than the finished grade of pavement.

c. Provide flexible plastic gasket as specified hereinbefore between the top of the manhole brick and the frame and cover.

d. Cement rubber gasket in watertight manholes requiring the inner cover in groove with a material not affected by water such as permatex or equal.

G. Sewer Vents

1. Provide sewer vent as shown on plans, in accordance with the Standard Detail.

2. Steel pipe and fitting for the sewer vent shall meet requirements set forth in Section 2550, and the Standard Detail.

H. Repair of Leaks in Sewers

1. Repairs of leaks in pipe 15 inches and less in diameter shall be made using a full circle repair clamp as indicated in the Standard Details or as directed by the Engineer.

2. Repair of leaks in pipe larger than 15 inches in diameter shall be as directed by the Engineer.

I. Sewer House Connection Renewals

1. Utilize existing tap at main line unless otherwise directed by the Engineer. Otherwise, abandon existing tap and retap utilizing proper sized saddle or thimble or cut in wye branch; or remove the existing tap and cut in an additional wye as determined by the Engineer; resulting in a watertight joint without jointing collars.

   a. Plug abandoned existing house connections and taps which have been replaced utilizing approved watertight plugs or cut out existing pipe with tap in main line and provide new pipe with sewer clamps in accordance with Standard Detail.

2. Retap the main line as follows:

   a. Tap all pipe with power operated Smith and Loveless tapping machine and cutter or equal, with a diamond tip cutter. Tapping shall be performed only by qualified personnel.

   b. Provide Smith and Loveless thimble when tapping 12 inch or larger RCP or VCPX and install in accordance with manufacturer's recommendations.

   c. Install General Engineering cast iron sewer saddles for tapping all pipe smaller than 12 inches in diameter. Use Fernco compression type gaskets at the joints between the saddle and pipe, in accordance with the Standard Details. Installation of General Engineering saddles shall be performed only by qualified personnel.

3. Where sewer house connection is of the same size as the existing sewer, cut in additional wye branch, as appropriate, using sewer repair clamps as shown on the Standard Details.

4. Where indicated or directed by the Engineer, tap directly into manholes for sewer house connections. See Section 3360.

5. Provide cleanouts installed one foot back of the property line or as indicated on the plans for all sewer connection renewals in accordance with the Standard Details.

IV. Measurement and Payment

A. Sewer Pipe

1. Furnishing and installing sewer pipe will be measured for payment by the

linear foot of the various types and sizes provided, measured as recorded on the cut sheet. No deductions will be made for the length of fittings or connections.

Payment will be made for the quantities measured at the unit price per linear foot for the various sizes listed in the Bid Schedule.

2. Payment will include provision of fittings, connections to new and existing facilities and Y branches, various size drop connections at manholes.

3. Payment will include excavation, backfill and bedding as specified in Section 2200.

B. House Connections

1. Furnishing and installing house connections will be measured by each complete in place.

Payment will be made for the quantities measured at the unit price listed for the various sizes and types in the Bid Schedule.

2. Payment includes provision of fittings, thimbles, drop house connections, and connections to new and existing facilities, pipes, concrete and installation of saddles.

3. Payment includes excavation, backfill and bedding as specified in Section 2200.

C. Manholes

1. Furnishing and installing manholes will be measured by each complete in place, including standard or watertight frame and cover as specified and pipe stub 24 inches or less in diameter.

Payment will be made for the quantities measured at the unit price per each listed in the Bid Schedule.

2. Payment includes channels, bricks, gaskets, coating, and other appurtenances where indicated. Contractor is responsible for adjustment to the manhole to set the frame and cover to finish grade within the one (1) year warrant period.

3. Payment will include excavation, backfill and bedding as specified in Section 2200.

D. Sewer Vents

1. Furnishing and installing sewer vents will be measured for payment by each complete in place.

Payment will be made for the quantities measured at the unit price per each listed in the Bid Schedule.

2. Payment will include excavation, backfill and bedding as specified in Section 2200.

3. Payment includes provision of fittings, pipes, concrete and the connection to the manhole.

E. Lampholes

1. Furnishing and installing lampholes will be measured for payment by each complete in place, including installation of frames and covers.

   Payment will be made for the quantities measured at the unit price per each listed in the Bid Schedule.

2. Payment will include excavation, backfill and bedding as specified in Section 2200.

3. Payment will include the appropriate size Y branch. Contractor is responsible for adjustment to the lamphole to set the frame and cover to finish grade within the one (1) year warranty period.

F. Furnishing Pipe to be installed in Tunnels or Borings

1. Furnishing and installing pipe in tunnels and borings for sanitary sewer systems are measured and paid for under Section 2950 or 2951 as applicable.

G. Concrete Encasement and Cradle

1. Constructing concrete encasement and cradles will be measured for payment per the Standard Detail.

   Payment will be made for the quantities measured at the unit price per cubic yard of concrete listed in the Bid Schedule.

2. Payment will include material required to anchor the pipe prior to pouring concrete, and the disposal off-site of all unsuitable material.

H. Non-Payment Items

1. The following items will not be measured for payment but the cost thereof will be considered as incidental to the Contract.

   a. Removal of existing facilities as necessary to complete the project.

b. Abandonment, plugging and disposal of existing facilities.

c. Restoration and restabilization of disturbed areas.

d. Stoppers, plugs and stubs.

e. Testing.

f. Timber marking house connections.

g. Replacement of various appurtenant connections and devices required for watertight construction.

h. Concrete anchors and erosion checks.

i. Adjustment of manhole frames and covers as indicated.

I. Manhole Drop

1. Furnishing and installing drop manholes will be measured for payment by each in place, regardless of the number of drops.

   Payment will be made for the quantities measured at the unit price per each listed in the bid schedule.

2. Payment includes provision of fittings, pipes, concrete and the connection(s) to the manhole.

3. Payment will include excavation, backfill and bedding as specified in Section 2200.

Special Provisions
SANITARY SEWERAGE NOTES

1. Manhole tops located in streets shall be constructed 1/4" lower than the finished grade of the pavement.

2. The use of clay pipe for sewer lines has been eliminated from Specification Section 2570. Sanitary Sewer System, Part II, Materials by the latest revision.

STANDARD SPECIFICATION

SECTION 2571

CLEANING AND TELEVISION INSPECTION OF EXISTING SANITARY SEWERS

I. GENERAL

A. Description

This section includes provision of cleaning operations, inspection and closed circuit television monitoring operations and all associated work for the sizes and lengths of sewers contained in the bid schedule.

1. All sewers to be inspected or chemically grouted shall be cleaned as hereinafter specified to permit inspection by closed circuit television, positioning of the grout equipment, proper application of the chemical grout, and inspection of the finished work after the grouting equipment has been moved from the break in the pipe joint.

2. It is not required that television inspection be provided by the Contractor during the cleaning operation. He may do so at his own expense. However, television inspection shall made prior to setting of the grout equipment at each joint and/or break in the pipe.

II. Materials

A. Equipment

1. Cleaning Equipment

a. The Contractor shall provide all equipment necessary for proper rodding, bucketing, brushing and flushing of the sewers in the sizes indicated in the bid schedule prior to television inspection or rehabilitation. The equipment used for cleaning shall be that of a heavy duty power rodding machine which is capable of rodding distances of up to 500 feet in one set-up. It shall have the ability to spin the rod either clockwise or counter-clockwise, be able to be pushed straight out or pulled back without rotating the machine. It shall also be capable of pulling pipe-size swabs or brushes backthrough the pipeline for cleaning and flushing purposes.

b. The Contractor shall also provide heavy-duty bucket machines, as necessary, for use on dragline work to clean the pipeline with buckets, brushes, scrapers, swabs or other similar devices in order to effectively remove the debris and provide a clean sewer

for the inspection and grouting. The equipment used will be subject to approval by the Engineer.

c. Satisfactory precautions shall be taken to protect the sewer lines from damage that might be inflicted by the improper use of cleaning equipment. Sewers damaged as a result of the Contractor's operations shall be promptly repaired by the Contractor at no cost to the County.

d. All equipment, devices, and tools required for this Contract shall be owned (or leased) and operated by the Contractor.

2. Television Equipment

The television camera used for the inspection shall be one specifically designed and constructed for such inspection. Lighting for the camera shall be suitable to allow a clear picture for the entire periphery of the pipe, acceptable to the contracting officer. The camera shall be operative in 100% humidity conditions and shall have a minimum of 600 line resolutions.

III. Execution

A. Cleaning Operations

1. Cleaning Sewers

a. Existing flows shall not be interrupted for periods longer than one hour. Sewage diverted during cleaning or grouting operations shall be returned to the sanitary system and not discharged into streams or storm drain system. Cleaning of these sewers by means of hydraulic high pressure jetting will be permitted.

b. Cleaning shall be performed in the 72-hour period immediately before closed circuit television inspection and/or chemical grouting.

c. Remove all sludge, dirt, sand and other materials from the pipe and collect and remove resulting debris from the downstream manhole of the sewer section. being cleaned. Passing .material from section to section which could be detrimental to pumping equipment or cause accumulations in wet wells will not be permitted. When necessary an approved dam or weir shall be constructed in the downstream manhole in such a manner that construction debris and solids will be trapped and retained.

2. Disposal of Debris

a. Under no circumstances shall sewage or solids be dumped onto

the ground surface, streets, or into ditches, catch basins or storm drains.

b. All solids or semi-solids resulting from the operations shall be removed from the site by the Contractor. Trucks hauling solids or semi-solids from the site shall be watertight so that no leakage or spillage will occur.

c. Disposal shall be at a suitable site selected by the Contractor and approved by the appropriate jurisdictional personnel.

3. Recleaning

If, in the opinion of the Engineer, a pipeline is found not to be properly cleaned, the television and grouting equipment shall be removed and the sewer recleaned at no expense to the County.

B. Inspection Operations

1. Camera Work

a. Where there is evidence of infiltration or other defects of the cleaned sewer sections between manholes, the sewer shall be visually inspected by means of closed circuit television. The inspection shall be done one sewer section at a time. The section being inspected shall be suitably isolated from the remainder of the sewer in a manner approved by the Engineer. Such method may include plugging the upstream flow, and/or bypassing the flow from the section. Secure plugs so as to remain in place and conduct operations so as to prevent backflow into residence.

b. The camera shall be moved through the line in either direction at a uniformly slow rate by means of power cable winches at each manhole.

2. Viewing

a. Telephones, or other suitable means of communication, shall be set-up between the two winches, the pumping unit and the monitor control. The Contractor shall provide a mobile trailer large enough to accommodate at least three people at any time for the purpose of viewing the monitor while the inspection is in progress.

3. Record Logs

a. The Contractor shall log and prepare data required for record purposes and shall provide all required measurement devices. Furnish copies of logs to the Engineer in triplicate.

b. Measurement for location of defects shall be at the ground level by means of a meter device. Marking on cable, or the like, which requires interpolation for depth of manhole, will not be allowed. Measurement meters shall be accurate to 0.2 foot, A measuring target (or the sealing packer) in front of the television shall be used as an exact measurement reference point, and the meter reading shall show the exact location of the measurement reference point.

c. The Contractor shall furnish all equipment for video tape recording and for taking photographs of the pictures observed on the monitor. In the course of the inspection, the Engineer will select sewer sections for video taping and specific locations for photos. Defects selected by the Engineer shall be recorded in photographs and video tape recordings, which shall be provided by the Contractor. Only those sewer sections with defects shall be retained on video tape and edited into a composite reel.

IV. Measurement and Payment

A. Cleaning and Inspection of Sewers

Cleaning and inspection of sewers will be measured for payment by the actual completed length of pipe cleaned for the various sizes of pipe measured along the center line of pipe from the inside face of manholes.

Payment will be made for the quantity measured at the unit price per linear foot for the various sizes listed in the bid Schedule.

B. Non-payment Items

1. The following items of work will not be measured for payment but the cost thereof will be considered as incidental to the Contract:

a. Records and Logs
b. Removal and Disposal of Debris
c. Monitoring and Viewing

2. The following item of work shall be performed at no cost to the County.

a. Recleaning

STANDARD SPECIFICATION
SECTION 2572
REPAIR OF SANITARY SEWERS ANDSTRUCTURES BY PRESSURE GROUTING

I. General

A. Description

This section includes repair of existing sanitary sewers and manholes by means of pressure grouting, applied from the interior of the pipe, and cement epoxy applied to structures for the range of sewer sizes and lengths contained in the bid schedule.

B . Testing

1. Joint Tests

a. At the direction of the Engineer, the Contractor shall air test each sanitary sewer line joint to determine if potential Joint leakage exists, and re-test after sealing.

b. Joint testing shall be performed by a void pressure monitoring system. This shall be accomplished by applying a positive air pressure to each joint, allowing time for the system to stabilize and measuring the amount of pressure drop over a given length of time.

Testing shall be accomplished by isolating the area to be tested with the packer or grouting rig and applying a positive pressure into the created, isolated void area. Continuous monitoring of the void pressure shall be maintained at all times by means of a pressure measuring system and a pressure meter located above-ground on the testing unit. The pressure meter sensing device shall be located within the void area and accurately transmit this pressure to a readout device located at the control panel. The system shall display gage pressure to the nearest tenth (1/10) psi and shall respond to and record any change in the void pressure, instantly. All pressure measurements shall be made at the void area. Systems which incorporate pressure gages on the air or material supply hoses for monitoring the pressures, or which have questionable accuracy will not be allowed.

c. Testing procedures shall consist of applying a 'pressure of 1/2 psi plus one to two psi per foot of depth into each void area created by the testing device. Once the specified pressure in the void area has been displayed on the meter above-ground, the application of pressure shall be stopped, and five-second stabilization period shall commence. The meter shall be observed for 15 seconds and should the pressure in the void area drop

more than 2 psi, the joint will have failed the test.

d. Any joint failing the test shall be sealed as specified herein and re-tested by the same void pressure method and procedures until the Joint passes the test. Additional sealing and re-testing after the initial sealing and re-testing shall be at no cost to the County.

II. Materials

A. Equipment

1. Television equipment shall be in accordance with Section 2571.

2. Chemical Grout Equipment

Equipment shall be remote controlled grout injection rig type with inflatable diaphragms or packers at each end, and other suitable approved devices which can be positioned to completely isolate each joint or break in the pipe and simultaneously permit sewage flow.

3. Cement epoxy equipment for brick manhole restoration.

a. The equipment shall consist of a high speed vortex material mixer, material pumps, material holding chambers and gun, all specifically designed for the purposes specified. All of the equipment shall be designed for total mobility and ease of operation

b. The material mixer shall be a top loading vortex type for mixing speeds and insure total integration of the material components. Material pumps used to transfer the mixed material from the mixer or material holding chambers to the gun shall be capable of delivering the material at rates 0 gpm up to three gpm without affecting the mixture. The gun shall be constructed in such a way that the operator has total control of the operation. The gun shall contain tips, hand controls and operator handles.

B. Grout materials for pipe and epoxy for manholes

1. Chemical sealing materials for pipe

a. Sealing materials shall be based on a two part chemical grout that is mixed within the isolated area formed by the grouting rig or packer. Approved materials are acrylamide gel such as AM-9 chemical grout, Q-seal, PWG or equal materials and shall have the following minimum properties: *

(1) A controllable reaction of from ten seconds to more than one hour.

(2) Viscosity that can be made near 1.5 centi-poise water and in no case exceed2.5 centi-poise.

(3) Viscosity to remain constant throughout the induction period.

(4) The ability to tolerate some dilution and react in moving water.

(5) The final reaction shall produce a continuous, irreversible, impermeable, non-porous still gel in pure form, or a stabilized soil in the ground that will not become rigid or brittle.

(6) Root inhibitors, such as Dichlobenil, shall be incorporated in the mix, when roots are present in the joints.

(7) The base compounds may be varied considerably by additives to increase the strength, adhesion, solution, density and viscosity.

(8) The material shall have a documented service of a satisfactory performance in similar usage with "in-place" locations of over five years.

b. The specified materials are considered toxic and irritants to skin and eyes. Therefore, mixing, handling, and pumping of the chemicals shall be done by personnel thoroughly familiar with the handling of the chemicals involved. Proper protective outerwear including eye protection and respirators for dust inhalation protection shall be used while mixing or when otherwise exposed to by close contact.

2. Cement epoxy for brick manholes.

The material used shall be a two component cement-epoxy type material capable of strength adhesive characteristics. Mixing, proportions, handling, etc., shall conform with the manufacturer's recommendations.

3. Non-shrink mortar for precast manholes.

a. The mortar used shall be of the "fast-set" type with "non-shrinking" characteristics.

III. Execution

A. Sewer Line Joint Sealing

a. The Contractor shall seal and test each pipe joint that fails the sewer line joint air test, all leaks, breaks, holes and other sources of possible groundwater infiltration as may be observed or recorded by television inspection in existing sanitary sewers of the size stated in the bid schedule, and as described herein.

b. All pipe joints and breaks found during television inspection operations in these sanitary sewers shall be sealed by an internal chemical grouting method. The method used shall not damage, break, move or cause settlement of sewer pipe or manhole structures, and shall be such that the original cross-sectional area and shape of the interior of the sewer shall not be permanently reduced or changed. Any sewers that the Engineer may deem damaged as a result of the Contractor's operations shall be promptly repaired to the Engineer's satisfaction at no expense to the County.

Sealing materials that set to a hard, rigid product capable of intrusion into the sewer line will not be acceptable. Areas of severely broken, crushed, eroded, misaligned, or otherwise damaged pipe or manholes which require excavation and replacement will be repaired by the County. However, their exact location shall be determined and recorded by the Contractor.

2. Monitoring Operations

a. The Contractor shall provide for monitoring by closed circuit television, sewers, 6 inches to 36 inches in diameter, in a manner which shall provide clear and visible pictures of the positioning of grout equipment as well as the finished joint. Size of pictures televised on the monitor, measured diagonally across the picture tube, shall be a minimum of 17 inches.

b. The Contractor shall provide a mobile trailer large enough to accommodate at least 3 people at any time for the purpose of viewing the monitor while the inspection is in progress. The Engineer shall have access to observe the television screen and all other operations at all times. The Contractor shall provide access for at least two County personnel simultaneously in the mobile trailer.

c. Suitable metering devices shall be attached to the internal inspection equipment so that the exact location of the equipment within the pipeline can be noted at all times.

3. Photographs

a. The Contractor shall furnish all equipment and film required to take polaroid photographs of the views which appear on the monitor. In the course of the inspection, the Engineer will indicate

the specific views which are to be photographed as a permanent record.

4. Records

a. For each section of sewer grouted, complete, accurate and legible records of the grouting operations shall be kept by the Contractor, and copies in triplicate furnished to the Engineer.

b. These records shall show the location of each operation or point of information relative to the centerline distance from adjacent manholes clearly defined. Measurement of location shall be readable at ground level by means of a measuring device. Marking on cable or the like will not be allowed. As each repair is accomplished, notations shall be made on the pertinent location record showing amount of grout solution used, and any other pertinent information relative to the repair.

5. Application of chemical grout

a. Provide chemical grouting of sewer joints, leaks and breaks in the pipe when directed by the Engineer by forcing sealing materials into and through every pipe line joint that failed to pass the sewer line joint air test, all leaks, breaks, or other sources of groundwater infiltration from within the sewer pipe. If grouting operations restrict or prevent simultaneous sewage flow passage, approved plug or by-pass pumping will be required as specified herein. Maximum interruption of existing flows shall be limited to one hour.

b. The grouting injection rig shall be positioned over the sewer Joint, leak, or break in the pipe by means of a closed circuit television camera in the line. Accurate measurement of the location of the joint to be sealed shall be made, using a portion of the grouting rig as a "datum" or measurement point. Such measurement or point shall also be used to record measurement of the repaired joint. The grouting device shall be an open ended cylindrical casing type of a size less than the pipe diameter with tow cables connected to both ends to pull it back and forth or positioning it in the line. Continuous air impervious inflatable sleeves shall be mounted front and back on the casing exterior with the ends of the sleeves sealed to -the casing. Devices that have sleeves which are not continuous and which might require extreme pressures to "seat" against the periphery of the pipe causing pipe fracture will not be allowed. The sleeves shall be constructed in such manner that they can be pneumatically expanded from the center to both ends. When in an inflated state, two widely spaced annular bladders shall have been formed, each of an elongated shape and producing an annular void around the center portion of the casing.

Expansion shall be regulated by precise pressure gauges and controls. No device which is expanded mechanically will be allowed. The pneumatically expanded sleeves shall seat against the inside periphery of the pipe in such a way as to form a void area completely isolated from the remainder of the line. Two conduits shall pass through one end of the casing and shall be adapted to supply the sealing material, under pressure, to the space at the center of the casing. Into this isolated area, through hose lines leading from above ground, the chemical sealants shall be . pumped with instant reading, metered flow controlled, proportioning pumps with pressures in excess of groundwater pressures.

c. The pumping and metering device shall be such that proportions and quantities of the materials being injected can be instantly regulated. The void pressure monitoring equipment described herein shall be operating during the sealing operations. The television pumping, grouting and air pressure monitoring equipment shall be integrated so that proportions, quantities, and void pressures for materials and sealing. can be instantly monitored and regulated in accordance with the type and size of the joint, break in the pipe or leak, void pressure changes and the rate of flow of the sealing solution in relation to the backpressures in order to effect a seal with a minimum amount of material.

d. In the event that large voids are encountered on, the outside of the sewer, including the possibility of "piping" holes to the ground surface which could cause excessive use of grout, the pipe shall be uncovered by digging and the repair or replacing of the damaged sections be made in accordance with Section 2570 of this specification.

e. Upon completion of the injection, the grouting rig shall be moved forward, wiping away the excess grout and allowing the television camera to move to a suitable position for inspection and/or air test. Each joint, cracks or holes shall then be again air tested as specified hereinbefore. Should any joint fail to pass the air test, it shall be re-sealed and re-tested until the test requirement can be met. If the repair or other break in the pipe or groundwater leak is deemed to be defective by the Engineer, the rig shall be moved back into position and the grouting process repeated, with possible modification of the grout composition, until proper sealing of the joint or break in the pipe has been obtained.

f. The excess grouting material removed from the joint or break by the grouting equipment shall be flushed or pushed forward to the next downstream manhole, removed from the sewer system and disposed of by the Contractor, as specified in Contract at no cost to the County. In no case shall, excess grout material from

succeeding sections be allowed to accumulate and be flushed down the sewer. The Contractor shall make a tight seal with his equipment at each joint or break to be grouted. If a tight seal is not secured, the Contractor shall remove the equipment and make such adjustments as are necessary to make a tight seal.

B. Precast Sewer Manhole Sealing

1. Application of grouting sealant

a. When directed by the Engineer, specific manholes shall be sealed as follows: at each leakage point, designated by the Engineer, within a manhole, a hole shall extend through the entire manhole wall. In cases where there are multiple leaks around the circumference of the manhole, fewer holes may be drilled, providing all leakage is stopped from these holes. Into these holes, a grouting device shall be placed in such a way that they will provide a water-tight seal, a shut off valve, and a threaded connection for pressure injection. A hose shall be attached to an injection pump located above-ground. Chemical sealants shall then be pumped through the hose until visible leakage has been eliminated and visible indications reveal that the sealant materials have traveled circumferentially to yield a grouted zone surrounding the grout hole.

b. Care shall be taken during the injection operations to insure that quantities and pressures do not cause damage to the manhole structure. Pressures at the grouting device (manhole wall) shall generally not exceed 25 psi at quantities of 5 gpm. The pressure shall be measured at-the manhole wall.

2 . Finishing

a. Upon completion of the injection, the grouting device shall be removed and the remaining holes filled with mortar and troweled flush with the surface of the manhole walls or other surfaces.

C. Brick Manhole Restoration

1. Application of cement epoxy

a. Each designated manhole, when directed by the Engineer, shall be structurally restored from within the manhole. The restoration shall be accomplished by forcing cement' epoxy materials,, under pressure, into the previously prepared joints and covering the brick to a thickness of approximately 1/8".

b. Prior to proceeding with the operation, each manhole shall be thoroughly water blasted (or other acceptable method) to clean

and remove all loose and decayed mortar and other material from the brick. The water blasting machine shall deliver the water in a steady stream at a minimum of 1,000 psi. After the manhole has been cleaned, the bricks shall be repainted and coated by the application, under pressure, of the cement epoxy material through the gun. Pressures shall be sufficient to insure total penetration of the joint by the cement epoxy material. After the joints are filled, a 1/8" coating shall be applied.

D. By-pass Pumping

1. Pumping Operations

a. By-pass pumping shall consist of flow diversion as necessary to prevent back-ups creating damage or nuisance and where the testing, sealing, and/or television work is in progress. By-pass shall be performed by pumping the flow from upstream to downstream of the stretch of sanitary sewer involved in the particular operation, after obtaining approval from the Engineer. The Contractor shall provide and operate all pumps, hoses, and other conduits of adequate capacity which are necessary to prevent back-up. by-pass pumping, when directed by the Engineer, shall continue until the particular item of work which is being performed in the section of sewer involved has been completed.

b. In no case will by-pass pumping be permitted at times other than and during hours of investigation or rehabilitation.

IV. Measurement and Payment

A. Joint Air Tests

1. Joint air test will be measured for payment by the each actual number of tests performed for the various sizes of pipe, at direction of the Engineer.

Payment will be made for the quantities measured at the unit prices listed for the various sizes of pipe in the bid schedule.

B. Joint Sealing

1. Sealing of joints, leaks and breaks will be measured for payment by the each actually repaired in the various sizes of pipe, at direction of the Engineer.

Payment will be made for the quantities measured at the unit prices per each for the various sizes of pipe listed in the bid schedule.

2. Payment shall include initial retesting as required by the contracting

officer.

C. Joint Sealing Material

1. Joint,, leak and break sealing material will be measured for payment by the gallon or pound of chemical sealing material actually used, at direction of the Engineer.

   Payment will be made for the quantity measured at the unit price per gallon or pound listed in the bid schedule.

D. Precast Manhole Sealing

1. Precast manhole sealing will be measured for payment by the actual number of precast manholes sealed at the direction of the Engineer.

   Payment will be made for the quantity measured at the unit price (per each) listed in the bid schedule. Payment will include cost of sealant.

E. Brick Manhole Restoration

1. Brick manhole restoration will be measured for payment by the vertical foot of brick manhole actually restored, measured from the bottom of the manhole frame, at the direction of the Engineer.

   Payment will be made for the quantity measured at the unit price per vertical foot listed in the bid schedule. Payment will include cost of sealant.

F. Non-payment Items

1. The following items will not be measured for payment but will be considered as incidental to the Contract:

   a. Records and Logs

   b. Disposal of excess material

   c. Additional sealing and re-testing afterinitial sealing and retesting

   d. By-pass pumping

STANDARD SPECIFICATIONS
SECTION 2573
SMALL DIAMETER LOW PRESSURE SANITARY SEWER SYSTEM

I. General

A. Description

This section includes requirements to provide a small diameter low pressure sanitary sewer system complete in place and in accordance with the Contract Documents.

B. System Plans and Design

The small diameter low pressure sanitary sewer system (SDLPSSS) shall be shown in its proposed entirety on a set of plans sealed by a Professional Engineer registered in the State of Maryland. The plan set shall include plan views showing the location of all system pumps, pipes, mains, manholes, valves, electrical services, and other required appurtenances in a scale no less than 1-inch equals 30 feet. Plans shall include specific references to the Frederick County DUSWM Department of Engineering and Planning Design Manual for Water and Sewer Facilities for all required equipment. Plans shall include copies of all applicable details from the Frederick County DUSWM Department of Engineering and Planning published Standard Details for Water Mains, Sanitary Sewers and Related Structures. Plans shall include profiles for all buried lines, mains, and structures. Plans shall include a SDLPSSS design summary table.

The SDLPSSS design summary table header shall include:

1. Development Name
2. Engineers name.
3. Date.

The SDLPSSS design summary table shall include the following headers with matching rows or columns:

1. Branch/line number.
2. Quantity of grinder pumps serving the branch/line.
3. Accumulative quantity of grinder pumps serving the branch/line.
4. Quantity of grinder pumps simultaneously operating on the branch/line.
5. Branch/line pipe maximum flow in GPM based on 11 GPM per each of the pumps simultaneously operating.
6. Branch/line pipe nominal diameter.
7. Branch/line pipe actual internal diameter using ASTM D2241 200 psi rated solvent welded SDR 21 PVC pipe.

8. Branch/line pipe area.
9. Branch/line maximum velocity in FPS.
10. Branch/line pipe length in feet.
11. Branch/line pipe C factor, use 150 for ASTM D2241 200 psi rated SDR 21 PVC pipe with push on gasketed connections in sizes 1½-inch to 4-inch in diameter.
12. Branch/line pipe major flow friction loss in feet of water head.
13. Accumulative pipe major flow friction loss in feet of water head.
14. Branch/line pipe centerline elevation
15. Branch/line pipe minimum pump off level elevation
16. Accumulative static lift
17. Branch/line Maximum Pump Total Head

Maximum Number of Grinder Pumps Operating

Quantity of Pumps Connected Upstream of System	Maximum Estimated Quantity of Pumps Operating Simultaneously
1	1
2 - 3	2
4 - 9	3
10 - 18	4
19 - 30	5
31 - 50	6

For other quantities contact the Frederick County DUSWM Department of Engineering and Planning

Maximum branch/line sewage velocity shall be maintained between 2 and 6 FPS. With written approval of the County Engineer design sewage flow velocities may be allowed to drop to 1.90 FPS or rise to 6.2 FPS. Except for the pump station discharge/lateral of 1-1/2-inch (1.54 FPS), will the design sewage flow velocities be allowed to drop below 1.90 FPS or rise above 6.2 FPS.

Maximum allowed head at the pump shall not exceed 165 feet of water. Maximum allowed head for any branch/line shall not exceed 40 feet of water without written approval of the County Engineer. A separate branch/line shall be listed in the SDLPSSS design summary table for each change in branch/line diameter or maximum flow.

Plans shall show the location of each Simplex Grinder Pump Installation.

Plans shall show the location of each Grinder Pump System Electrical Service.

Plans shall show the location of a Low Pressure Sewer Service Connection where each 1-1/2-inch grinder pump discharge pipe connects to a larger

diameter pressure sewer main, an existing manhole using a drop manhole connection, or Transition Manhole to connect to a new gravity sewer.

Plans shall show the location of a Low Pressure Sewer In-Line Flushing Connection. Low Pressure Sewer In-Line Flushing Connections shall be located at least every 400 feet along a length of grinder pump discharge pipe or constant diameter pressure sewer main.

Plans shall show the location of a Low Pressure Sewer Terminal Flushing Connection at the dead end of each pressure sewer main.

Plans shall show the location of a Low Pressure Sewer Service Connection where each sewer main connects to a larger diameter pressure sewer main, an existing manhole using a drop manhole connection, or Transition Manhole to connect to a new gravity sewer.

Plans shall show the location of a combination air release/vacuum relief valves. Combination air release/vacuum relief valves shall be located at each high point of a sewer lateral or sewer main, at intervals not to exceed 2,000 feet, and at the beginning of each downward leg with a 30 foot or more drop in elevation.

Plans shall include profile views of each pump discharge pipe/lateral and sewer mains. All laterals and sewer mains shall have a minimum cover of 42-inches.

Plans shall include a buoyancy and ballast calculations for each grinder pump station and each air release/vacuum relief valve station. Calculations will assume the water level is concurrent with the ground elevation. The minimum allowed concrete ballast anchor for a grinder pump station shall have a diameter of 36-inches and rise at least 10-inches from the base of the grinder pump station.

II. Materials and Equipment

All materials shall be as specified in the most current version of the Frederick County General Conditions and Standard Specifications unless otherwise specified in these SPECIAL PROVISIONS for Grinder Pumps.

A. Grinder Pump

1. The grinder pump station shall be Environment One Corporation, D-Series

   All materials exposed to wastewater shall have inherent corrosion, protection, i.e. cast iron, fiberglass, stainless steel, PVC. Any exterior steel surfaces are to be suitably protected against corrosion.

2. The Contractor shall furnish and install a factory-built and tested simplex Wetwell/Drywell Grinder Pump Station(s), each consisting of grinder pump suitably mounted in a basin constructed of high density polyethylene (HDPE) with dimensions and capacities are show on the Contract Drawings, NEMA 6P electrical quick disconnect (EQD), pump removal system stainless steel discharge assembly/shut-off valve, anti-siphon valve, check valve, all assembled in a basin, electrical alarm panel and all necessary internal wiring and controls. Component type grinder pump systems that require field assembly will not be acceptable due to the potential problems that can occur during field assembly. All components and materials shall be in accordance with this Product Specification. For ease of serviceability, all pump, motor/grinder units shall be of the like type and horsepower throughout the system.

3. Manufacturer

    a. The grinder pump station shall be “Extreme Series” as manufactured by Environment One Corporation, Schenectady, NY, Model DH071 with a tank capacity of 70 gallons for homes with no more than 3-1/2 baths or the Model DH151 with a tank capacity of 150 gallons for homes with more than 3-1/2 baths

    b. Attention is directed to the fact that these specifications are intended to provide guidelines for a standard equipment of a recognized manufacturer who already meets all the requirements of this specification.

4. Experience Clause

    a. The Contractor shall submit, as part of the bid schedule, an installation list with contact person, phone number, and dates of at least 10 installations of the type of pump specified herein that have been in operation for 5 years.

5. Operating Conditions

    a. The pumps shall be capable of delivering 15 GPM against a rated total dynamic head of 0 feet (0 psig), 11 gpm against a rated total dynamic head of 92 (40 psig), and 7.8 gpm against a rated total dynamic head of 185 feet (80 psig). The pump(s) must also be capable of operating at negative total dynamic head without overloading the motor(s). Under no conditions shall in-line piping or valving be allowed to create a false apparent head.

6. Warranty

a. The grinder pump manufacturer shall provide a part(s) and labor warranty on the complete station and accessories, including, but not limited to, the panel for a period of 24 months after notice of the Owner's acceptance, but no greater than 27 months after receipt of shipment. Any manufacturing defects found during the warranty period will be reported to the manufacturer by the Owner and will be corrected by the manufacturer at no cost to the Owner.

7. Product

a. Pump

(1) The pump shall be a custom designed, integral, vertical rotor, motor driven, solids handling pump of the progressing cavity type with a single mechanism seal. Double radial O-ring seals are required at all casting joints to minimize corrosion and create a protective barrier. All pump castings shall be cast iron, fully epoxy coated to 8-10 mil Nominal dry thickness, wet applied. The rotor shall be through-hardened, highly polished, precipitation hardened stainless steel. The stator shall be of a specifically compounded ethylene propylene synthetic elastomer. This material shall be suitable for domestic wastewater service. Its physical properties shall include high tear and abrasion resistance, grease resistance, water and detergent resistance, temperature stability, excellent aging properties, and outstanding wear resistance. Buna-N is not acceptable as a stator material because it does not exhibit the properties as outlined above and required for wastewater service.

b. Grinder

(1) The grinder shall be placed immediately below the pumping elements and shall be direct-driven by a single, one-piece motor shaft. The grinder impeller (cutter wheel) assembly shall be securely fastened to the pump motor shaft by means of a threaded connection attaching the grinder impeller to the motor shaft. Attachment by means of pins or keys will not be acceptable. The grinder impeller shall be a one-piece, 4140 alloy steel cutter wheel of rotating type with inductively hardened cutter teeth. The cutter teeth shall be inductively hardened to Rockwell 50-60c for abrasion resistance. The shredder ring shall be of the stationary type and the material shall be white cast iron. The teeth shall be ground into the material to achieve effective grinding. The shredder ring shall have a staggered tooth pattern with only one edge engaged at a time, maximizing the cutting torque. These materials have been chosen for their capacity to perform in the intended environment as they are materials with wear and corrosive resistant properties.

(2) This assembly shall be dynamically balanced and operate without objectionable noise or vibration over the entire range of recommended operating pressures. The grinder shall be constructed so as to minimize clogging and jamming under all normal operating conditions including starting. Sufficient vortex action shall be created to scour the tank free of deposits or sludge banks which would impair the operation of the pump. These requirements shall be accomplished by the following, in conjunction with the pump:

i. The grinder shall be positioned in such a way that solids are fed in an upward flow direction.

ii. The maximum flow rate through the cutting mechanism must not exceed 4 feet per second. This is a critical design element to minimize jamming and as such must be adhered to.

iii. The inlet shroud shall have a diameter of no less than 5 inches. Inlet shrouds that are less than 5 inches in diameter will not be accepted due to their ability to maintain the specified 4 feet per second maximum inlet velocity which by design prevents unnecessary jamming of the cutter mechanism and minimizes blinding of the pump by large objects that block the inlet shroud.

iv. The impeller mechanism must rotate at a nominal speed of no greater than 1800 rpm.

(3) The grinder shall be capable of reducing all components in normal domestic sewage, including a reasonable amount of “foreign objects,” such as paper, wood, plastic, glass, wipes, rubber and the like, to finely-divided particles which will pass freely through the passages of the pump and the 1-1/4” diameter stainless steel discharge piping.

c. Electric Motor

(1) As a maximum, the motor shall be a 1 HP, 1725 RPM, 240 Volt 60 Hertz, 1 Phase, capacitor start, ball bearing, air-cooled induction type with Class F installation, low starting current not to exceed 30 amperes and high starting torque of 8.4 foot pounds. The motor shall be press-fit into the casting for better heat transfer and longer winding life. Inherent protection against running overloads or locked rotor conditions for the pump motor shall be provided by the use of an automatic-reset, integral thermal overload protector incorporated into the motor. This motor protector combination shall have been specifically investigated and listed by Underwriters Laboratories, Inc., for the application. Non-capacitor start motors or permanent split capacitor motors will not be accepted because of their reduced starting torque and consequent diminished grinding capability. The wet portion of the motor armature must be 300 Series stainless. To

reduce the potential of environmental concerns, the expense of handling and disposing of oil, and the associated maintenance costs, oil-filled motors will not be accepted.

d. Mechanical Seal

(1) The pump/core shall be provided with a mechanical shaft seal to prevent leakage between the motor and pump. The seal shall have a stationary ceramic seat and carbon rotating surface with faces precision lapped and held in position by a stainless steel spring.

e. Tank and Integral Accessway: High Density Polyethylene Construction

(1) The tank shall be a Wetwell/Drywell design made of high density polyethylene, with a grade selected to provide the necessary environmental stress cracking resistance. Corrugated sections are to be made of a double wall construction with the internal wall being generally smooth to promote scouring. The corrugations of the outside wall are to be a minimum amplitude of 1-1/2" to provide necessary transverse stiffness. Any incidental sections of a single wall construction are to be 0.250" thick (minimum). All seams created during tank construction are to be thermally welded and factory tested for leak tightness. The tank wall and bottom must withstand the pressure exerted by saturated soil loading at maximum burial depth. All station components must function normally when exposed to 150 percent of the maximum external soil and hydrostatic pressure.

(2) The tank shall be furnished with one EPDM grommet fitting to accept a 4.50" OD DWV or Schedule 40 pipe.

(3) The Drywell accessway shall be an integral extension of the Wetwell assembly and shall include a lockable cover assembly providing low profile mounting and watertight capability. The accessway design and construction shall enable field adjustment of the station height in increments of 4" or less without the use of any adhesives or sealants requiring cure time before installation can be completed.

(4) The station shall have all necessary penetrations molded in and factory sealed. To ensure a leak free installation no field penetrations will be acceptable.

(5) All discharge piping shall be constructed of 304 stainless steel. The discharge shall terminate outside the accessway bulkhead with a stainless steel, 1-1/4" Female NTP fitting. The discharge piping shall include a stainless steel ball valve rated for 200 psi WOG; PVC ball

valves or brass ball/gate valves will not be accepted. The bulkhead penetration shall be factory installed and warranted by the manufacturer to be watertight.

(6) The accessway shall include a single NEMA 6P Electrical Quick Disconnect (EQD) for all power and control functions, factory installed with accessway penetrations warranted by the manufacturer to be watertight. The EQD will be supplied with 32' of useable Electrical Supply Cable (ESC) outside the station, to connect to the alarm panel. The ESC shall be installed in the basin by the manufacturer. Field assembly of the ESC into the basin is not acceptable because of potential workmanship issues. The EQD shall require no tools for connecting, seal against water before the electrical connection is made, and include radial seals to assure a watertight seal regardless of tightening torque. Plug-type connections of the power cable onto the pump housing will not be acceptable due to the potential for leaks and electrical shorts. A junction box shall not be permitted in the accessway due to the large number of potential leak points. The EQD shall be so designed to be conducive to field wiring as required. The accessway shall also include an integral 2-inch vent to prevent sewage gases from accumulating in the tank.

f. Check Valve

(1) The pump discharge shall be equipped with a factory installed, gravity operated, flapper-type integral check valve built into the stainless steel discharge piping. The check valve will provide a full-ported passageway when open, and shall introduce a friction loss of less than 6 inches of water at maximum rated flow. Moving parts will be made of a 300 Series stainless steel and fabric reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability and fatigue strength. A nonmetallic hinge shall be an integral part of the flapper assembly providing a maximum degree of freedom to assure seating even at a very low back-pressure. The valve body shall be an injection point molded part made of an engineered thermoplastic resin. The valve shall be rated for continuous operating pressure of 235 psi. Ball-type check valves are unacceptable due to their limited sealing capacity in slurry applications.

g. Anti-Siphon Valve

(1) The pump discharge shall be equipped with a factory-installed, gravity-operated, flapper-type integral anti-siphon valve built into the stainless steel discharge piping. Moving parts will be made of 300 Series stainless steel and fabric-reinforced synthetic elastomer to

ensure corrosion resistance, dimensional stability, and fatigue strength. A nonmetallic hinge shall be an integral part of the flapper assembly, providing a maximum degree of freedom to ensure proper operation even at a very low pressure. The valve body shall be injection-molded from an engineered thermoplastic resin. Holes or ports in the discharge piping are not acceptable anti-siphon devices due to their tendency to clog from the solids in the slurry being pumped. The anti-siphon port diameter shall be no less than 60% of the inside diameter of the pump discharge piping.

h. Core Unit

(1) The grinder pump station shall have a cartridge type, easily removable core assembly consisting of pump, motor, grinder, all motor controls, check valve, anti-siphon valve, level controls, electrical quick disconnect and wiring. The core unit shall be installed in the basin by the manufacturer. Field assembly of the pump and controls into the basin is not acceptable because of potential workmanship issues and increased installation time. In some cases, stations taller than 96” may be shipped on their side without the cores assembled in the basin for freight purposes but this is the only exception. The core unit shall seal to the tank deck with a stainless steel latch assembly. The latch assembly must be actuated utilizing a single quick release mechanism requiring no more than a half turn of a wrench. The watertight integrity of each core unit shall be established by a 100 percent factory test at a minimum of 5 psig.

(2) The grinder pump core unit shall have 2 lifting eyes provided in the top housing which can be used to facilitate easy removal of the core unit from the tank when necessary.

i. Controls

(1) All necessary motor starting controls shall be located in the cast iron enclosure of the core unit secured by stainless fasteners. Locating the motor starting controls in a plastic enclosure is not acceptable. The wastewater level sensing controls shall be housed in a separate enclosure from motor starting controls. The level sensor housing must be sealed via a radial type seal; solvents or glues are not acceptable. The level sensing control housing must be integrally attached to pump assembly so that it may be removed from the station with the pump and in such a way as to minimize the potential for the accumulation of grease and debris accumulation, etc. The level sensing housing must be a high-impact thermoplastic copolymer

over-molded with a thermo plastic elastomer. The use of PVC for the level sensing housing is not acceptable.

(2) Non-fouling wastewater level controls for controlling pump operation shall be accomplished by monitoring the pressure changes in an integral air column connected to a pressure switch. The air column shall be integrally molded from a thermoplastic elastomer suitable for use in wastewater and with excellent impact resistance. The air column shall have only a single connection between the water level being monitored and the pressure switch. Any connections are to be sealed radially with redundant O-rings. The level detection device shall have no moving parts in direct contact with the wastewater and shall be integral to the pump core assembly in a single, readily-exchanged unit. Depressing the push to run button must operate the pump even with the level sensor housing removed from the pump.

(3) All fasteners throughout the assembly shall be 300 Series stainless steel. High-level sensing will be accomplished in the manner detailed above by the separate air column sensor and pressure switch of the same type. Closure of the high-level sensing device will energize an alarm circuit as well as a redundant pump-on circuit. For increased reliability, pump ON/OFF and high-level alarm functions shall not be controlled by the same switch. Float switches of any kind, including float trees, will not be accepted due to the periodic need to maintain (rinsing, cleaning) such devices can their tendency to malfunction because of incorrect wiring, tangling, grease buildup and mechanical cord fatigue. To assure reliable operation of the pressure switches, each core shall be equipped with a factory installed equalizer diaphragm that compensates for any atmospheric pressure or temperature changes. Tube or piping runs outside of the station tank-mounted junction boxes providing pressure switch equalization will not be permitted due to their susceptibility to condensation, kinking, pinching and insect infestation. The grinder will be furnished with a 6 conductor 14 gauge, type SJOW cable, pre-wired and watertight to meet UL requirements with a *factory installed* NEMA 6P EQD half attached to it.

❖ The Contractor shall supply additional cable, as described above, to connect the grinder pump to the grinder pump control box at no additional expense to the County. Said cable shall extend a minimum of 2 feet beyond the top of the accessway cover.

j. Alarm Panel

(1) Each grinder pump station shall include a NEMA 4X, UL-listed alarm panel suitable for wall or pole mounting. The NEMA 4X enclosure shall be manufactured of thermoplastic polyester to ensure corrosion resistance. The enclosure shall include a hinged, lockable cover with padlock, preventing access to electrical components, and creating a secured safety front to allow access only to authorized personnel. The enclosure shall not exceed 10.5”Wx14”Hx7”D. or 12.5”Wx16”Hx7.5”D if certain options are included.

(2) The alarm panel shall contain one 15-amp, double-pole circuit breaker for the pump core’s power circuit and one 15-amp single-pole circuit breaker for the alarm circuit. The panel shall contain a push-to-run feature, an internal run indicator, and a complete alarm circuit. All circuit boards in the alarm panel are to be protected with a conformal coating on both sides and the AC power circuit shall include an auto resetting fuse.

(3) The alarm panel shall include the following features: external audible and visual alarm; push-to-run switch; push to silence switch, redundant pump start; and high level alarm capability. The alarm sequence is to be as follows when the pump and alarm breakers are on:

i. When liquid level in the sewage wet-well rises above the alarm level, audible and visual alarms are activated, the contacts on the alarm pressure switch activate, and the redundant pump starting system is energized.

ii. The audible alarm may be silenced by means of the externally mounted, push-to-silence button.

iii. Visual alarm remains illuminated until the sewage level in the wet-well drops below the “off” setting of the alarm pressure switch.

(4) The visual alarm lamp shall be inside a red, oblong lens at least 3.75”Lx2.38”Wx1.5”H. Visual alarm shall be mounted to the top of the enclosure in such a manner as to maintain NEMA 4x rating. The audible alarm shall be externally mounted on the bottom of the enclosure, capable of 93 dB @ 2 feet. The audible alarm shall be capable of being deactivated by depressing a push-type switch that is encapsulated in a weatherproof silicone boot and mounted on the bottom of the enclosure (push-to-silence button).

(5) The entire alarm panel, as manufactured and including any of the following options shall be listed by Underwriters Laboratories, Inc..

k. Service Equipment/Main Service Disconnect Breaker

(1) A separate, internal breaker rated and approved for use as “service equipment” and acts as a main service disconnect of the grinder pump station shall be provided. Each disconnect shall be a nonfusible heavy duty safety switch with a 600 VAC rating and a 30 amperage rating.

l. Run-time/Hour Meter

(1) A run-time or hour meter to display the total run-time or operation time for the pump core shall be provided.

m. Event/Cycle Counter

(1) An event or cycle counter to display the number of operations of the pump core shall be provided.

B. Low Pressure Sewer System Connection

Provide Low Pressure Sewer Service Connection per Frederick County Standard Detail, 305.1, latest revision

1. Ball Valves

a. Provide 1-1/2-inch bronze ball valve curb stop cast of red brass containing 85 percent copper and 5 percent tin, lead and zinc (the ball shall be fluorocarbon coated brass). Valves shall be suitable for the conveyance of raw sewage. Directional valves shall not be permitted. All valves shall be of one manufacturer. Seats and O-ring seals shall be of ethylene propylene diene monomer (EPDM) rubber. End Connections shall be female iron pipe threads on both ends of the valve.

b. Valves shall be rated for 300 psi pressure with a tight shut-off and shall have a full port configuration. The port through the ball and valve interior shall be constant in diameter and shape for a straight through flow pattern. There shall be no obstructions to flow through the valve interior.

c. Valves shall have a quarter-turn operation and shall be equipped for buried service and operation through a 2-3/4-inch inside diameter screw type curb box with arch pattern bottom section base. Each valve shall be equipped with a single piece brass tee operating head, 5/8 inch thick measuring 1-inch high with a length equal to the diameter of the valve

head or a minimum of 2 inches as shown on the plans and details. A stationary rod of sufficient length to extend to within 6-inches of the top of curb box shall be attached to the tee head of the valve using a brass cotter pin. The operating tee head and stationary rod shall be designed to withstand the opening and closing torques up to the full pressure rating of the valve without damage to the operating tee head, stationary rod, or valve. The operating tee head shall be positioned on the valve so the position of the valve port, open or closed, can be determined by viewing from the top of the valve. The stationary rod shall be of steel or cast iron and shall be supplied by the manufacturer of the valve. The curb box shall be provided with a lid marked “SEWER”.

d. Ball valves shall be 1-1/2-inch ball valve curb stops model B11-666 as manufactured by Ford Meter Box or equal approved by the Frederick County DUSWM Department of Engineering.

e. Curb boxes shall be domestic heavy duty series 6500 screw type of the appropriate height range as manufactured by Tyler Union or equal approved by the Frederick County DUSWM Department of Engineering.

f. PVC MPT x compression adapters shall be provided for both ends of each ball valve. PVC MPT x compression adapters shall be 1-1/2-inch model S130-15 as manufactured by Spears Manufacturing or equal approved by the Frederick County DUSWM Department of Engineering.

2. Check Valves

a. Check valves shall be 1-1/2-inch gravity operated, suitable for buried service in the horizontal position and located as shown on the plans and details. Internal parts shall be made of stainless steel, PVC and/or synthetic elastomer to insure corrosion resistance. Valves shall be rated for at least 150 psi service at 73 degrees Fahrenheit. Check valves shall be supplied with compression fittings on both ends compatible for use with the SDR-21 PVC pipe. Each check valve shall provide full-ported passageway when open and flapper or seat to assure tight seating at low back pressure.

b. Check valves shall be 1-1/2-inch ball compression utility swing check model S1500-15 as manufactured by Spears Manufacturing or equal approved by the Frederick County DUSWM Department of Engineering.

C. Low Pressure Sewer In-Line Flushing Connections and Terminal Flushing Connections

Provide Low Pressure Sewer In-Line Flushing Connections per Frederick County Standard Detail, 307.1 latest revision and Low Pressure Sewer Terminal Flushing Connections per Frederick County Standard Detail, 306.1, latest revision.

1. Ball Valves

   a. Provide 1-1/2-inch or 2-inch bronze ball valve curb stops cast of red brass containing 85 percent copper and 5 percent tin, lead and zinc (the ball shall be fluorocarbon coated brass). Valves shall be suitable for the conveyance of raw sewage. Directional valves shall not be permitted. All valves shall be of one manufacturer. Seats and O-ring seals shall be of ethylene propylene diene monomer (EPDM) rubber. End Connections shall be female iron pipe threads on both ends of the valve.

   b. Valves shall be rated for 300 psi pressure with a tight shut-off and shall have a full port configuration. The port through the ball and valve interior shall be constant in diameter and shape for a straight through flow pattern. There shall be no obstructions to flow through the valve interior.

   c. Valves shall have a quarter-turn operation and shall be equipped for buried service and operation through a 2-3/4-inch inside diameter screw type curb box with arch pattern bottom section base. Each valve shall be equipped with a single piece brass tee operating head, 5/8 inch thick measuring 1-inch high with a length equal to the diameter of the valve head or a minimum of 2 inches as shown on the plans and details. A stationary rod of sufficient length to extend to within 6-inches of the top of curb box shall be attached to the tee head of the valve using a brass cotter pin. The operating tee head and stationary rod shall be designed to withstand the opening and closing torques up to the full pressure rating of the valve without damage to the operating tee head, stationary rod, or valve. The operating tee head shall be positioned on the valve so the position of the valve port, open or closed, can be determined by viewing from the top of the valve. The stationary rod shall be of steel or cast iron and shall be supplied by the manufacturer of the valve. The curb box shall be provided with a lid marked “SEWER”.

   d. Ball valves shall be 1-1/2-inch ball valve curb stop model B11-666 or 2-inch ball valve curb stop model B11-777 as manufactured by Ford Meter Box or equal approved by the Frederick County DUSWM Department of Engineering.

   e. Curb boxes shall be domestic heavy duty series 6500 screw type of the appropriate height range as manufactured by Tyler Union or equal approved by the Frederick County DUSWM Department of Engineering.

   f. PVC MPT x compression adapters shall be provided for both ends of each ball valve. PVC MPT x compression adapters shall be 1-1/2-inch model S130-15 or 2-inch model S130-20 as manufactured by Spears Manufacturing or equal approved by the Frederick County DUSWM Department of Engineering.

2. Plug Valves, 2-1/2-inch or 3-inch

a. Provide 2-1/2-inch or 3-inch cast iron eccentric plug valves. Valves shall be suitable for the conveyance of raw sewage. Valves shall conform to AWWA standard ANSI/AWWA C-517. All valves shall be of one manufacturer. Valve body shall be cast iron conforming to ASTM A126 Class B. Plug shall be soft rubber faced cast iron. Bearings shall be 316L stainless steel. Bonnet screws shall be 18-8 stainless steel. Plug facing, stem seal, and U-ring filler shall Buna N rubber (AKA: NBR or Acrylonitrile-Butadiene). End Connections shall be female iron pipe threads on both ends of the valve. Valves shall have a factory applied exterior epoxy coating. Valves shall include required (MNA) adapter required for extended nut operation.

b. Valves shall be rated for 175 psi pressure with a tight shut-off and shall have at least a 99% port area configuration in 2-1/2-inch and 80% port area configuration in 3-inch nominal size. .

c. Valves shall have a quarter-turn operation and shall be equipped for buried service and operation through an extended 2-inch operating nut housed inside a 5-1/4-inch diameter screw type valve box with appropriate base. The 2-inch operating nut shall be rigidly connected to an extension tube of sufficient length to extend the nut to within 6-inches of the top of valve box. The extension tube shall be attached to the plug shaft of the valve using an adapter (MNA) supplied by the valve manufacturer. The operating nut, extension tube, and valve adapter shall be designed to withstand the opening and closing torques up to the full pressure rating of the valve without damage to the operating nut, extension tube, valve adapter, or valve. The valve box shall be provided with a lid marked “SEWER”.

d. Plug valves shall be model PEC Eccentric as manufactured by DeZurik or equal approved by the Frederick County DUSWM Department of Engineering.

e. Valve boxes shall be domestic heavy duty series 6860 screw type of the appropriate height range as manufactured by Tyler Union or equal approved by the Frederick County DUSWM Department of Engineering.

f. PVC MPT x compression adapters shall be provided for both ends of each plug valve. PVC MPT x compression adapters shall be 2-1/2-inch model S130-25 or 3-inch model S130-30 as manufactured by Spears Manufacturing or equal approved by the Frederick County DUSWM Department of Engineering.

3. Plug Valves, 4-inch

a. Provide 4-inch cast iron eccentric plug valves. Valves shall be suitable for the conveyance of raw sewage. Valves shall conform to AWWA standard ANSI/AWWA C-517. All valves shall be of one manufacturer. Valve body shall be ductile iron conforming to ASTM A536 Grade 65-45-

12. Plug shall be soft rubber faced ductile iron conforming to ASTM A536 Grade 65-45-12. Body bearings and bonnet bearings shall be 316L stainless steel. Thrust bearing shall be PTFE (AKA: Teflon or Polytetrafluoroethylene). Bonnet screws shall be 18-8 stainless steel. Gland nuts shall be stainless steel. Packing shall be Buna N rubber (AKA: NBR or Acrylonitrile-Butadiene). End Connections shall be mechanical joint type on both ends of the valve. Valves shall have a factory applied exterior epoxy coating.

b. Valves shall be rated for 285 psi pressure with a tight shut-off and shall have a minimum Cv value of 560 GPM of water per PSI in 4-inch nominal size. .

c. Valves shall have a totally enclosed and sealed manual actuator providing multi turn operation and shall be equipped for buried service with the valve plug oriented in the horizontal position and operation through an extended 2-inch operating nut housed inside a 5-1/4-inch diameter screw type valve box with appropriate base. The 2-inch operating nut shall be rigidly connected to an extension tube of sufficient length to extend the nut to within 6-inches of the top of valve box. The extension tube shall be attached to the plug shaft of the valve using an adapter supplied by the valve manufacturer. The operating nut, extension tube, and valve adapter shall be designed to withstand the opening and closing torques up to the full pressure rating of the valve without damage to the operating nut, extension tube, valve adapter, or valve. The valve box shall be provided with a lid marked “SEWER”.

d. Plug valves shall be model PEC Eccentric as manufactured by DeZurik or equal approved by the Frederick County DUSWM Department of Engineering.

e. Valve boxes shall be domestic heavy duty series 6860 screw type of the appropriate height range as manufactured by Tyler Union or equal approved by the Frederick County DUSWM Department of Engineering.

f. Mechanical Joint x IPS transition gaskets shall be provided for both ends of each plug valve. Mechanical Joint x IPS transition gaskets shall be of SBR (styrene-butadiene rubber) as manufactured by Romac industries or equal approved by the Frederick County DUSWM Department of Engineering.

4. Riser Assembly components

a. Provide 125# bronze UL listed fittings. Bronze fittings shall be suitable for the conveyance of raw sewage. Bronze fittings shall conform to AWWA C800. All bronze fittings dimensions shall conform to ASME B16.15. All bronze fittings shall be of one manufacturer. Bronze castings shall conform to ASTM B62, UNS Alloy C83600. End Connections shall be iron pipe threads conforming to ASME B1.20.1.

b. Provide seamless schedule 40 red brass pipe and nipples. Brass pipe and nipples shall be suitable for the conveyance of raw sewage. Seamless brass pipe shall conform to ASTM B43. All brass nipples shall conform to ASTM B687. End Connections shall be male iron pipe threads conforming to ASME B1.20.1.

c. Riser assemblies shall extend to within 12-inches of the top of the valve box. The tee, nipples, reducing couplings, and riser pipe shall be silver solder brazed at the junction of each male to female thread face to prevent any fitting from backing off when removing the pipe plug. The valve box shall be provided with a lid marked “SEWER”.

d. Bronze fittings and brass nipples shall be as manufactured by Smith-Cooper International or equal approved by the Frederick County DUSWM Department of Engineering.

e. Valve boxes shall be domestic heavy duty series 6860 screw type of the appropriate height range as manufactured by Tyler Union or equal approved by the Frederick County DUSWM Department of Engineering.

D. Sewage Air Release/Vacuum Relief Valve Station

Provide Sewage Air/Vacuum Relief Valve Stations per Frederick County Standard Detail, 310.1, latest revision.

1. Air Release/Vacuum Relief Valves

a. Provide 2-inch reinforced nylon plastic wastewater combination air release and vacuum relief valves. All valves shall be of one manufacturer. Each valve shall incorporate two cylindrical floats. The floats shall be of foamed polypropylene. End Connections shall be female iron pipe threads on the inlet of the valve.

b. Valves shall be rated for 145 psi pressure and achieve a tight shut off with no more than 3 psi. Valves shall have a vacuum relief capacity of 100 CFM at 70^0 F at 14.7 psi absolute with a 4 psi differential. The inlet port shall be 2-inch diameter and the outlet port shall have a free area of 1.2 square inches. The valve shall utilize a 316 stainless steel stem, spring, and fasteners to connect the lower float to the upper float. The upper float shall open and close off the air flow with a rolling seal mechanism. The valve shall not employ float guide brackets, levers, or ball type floats.

c. Valves shall have a conical body design composed of a cylindrical upper body and a funnel shaped lower body section. Each valve shall be equipped with a single ¼-inch round side port with integral shut off valve.

d. Wastewater combination air release and vacuum relief valves shall be 2-inch A.R.I. model D-025 as manufactured by A.R.I. Flow Control

Accessories Ltd. or equal approved by the Frederick County DUSWM Department of Engineering.

2. Ball Valves

   a. Provide 2-inch bronze ball valve cast of red brass Valves shall be suitable for the conveyance of raw sewage. All valves shall be of one manufacturer. Valve body shall conform to ASTM B584 alloy C84400. Valve ball shall be chrome plated brass. Stem packing shall be of reinforced polytetrafluoroethylene (RPTFE) rubber. Seats shall be of polytetrafluoroethylene (PTFE) rubber. End Connections shall be female iron pipe threads on both ends of the valve.

   b. Valves shall be rated for 600 psi pressure with a tight shut-off and shall have a full port configuration. The port through the ball may be a reduced diameter but shall provide a straight through flow pattern.

   c. Valves shall have a quarter-turn operation and shall be equipped with a steel, zinc plated and vinyl covered lever actuating handle.

   d. Ball valves shall be 2-inch ball valve Apollo model 32-100 as manufactured by Conbraco Industries or equal approved by the Frederick County DUSWM Department of Engineering.

3. Assembly components

   a. Provide 125# bronze UL listed fittings. Bronze fittings shall be suitable for the conveyance of raw sewage. Bronze fittings shall conform to AWWA C800. All bronze fittings dimensions shall conform to ASME B16.15. All bronze fittings shall be of one manufacturer. Bronze castings shall conform to ASTM B62, UNS Alloy C83600. End Connections shall be iron pipe threads conforming to ASME B1.20.1.

   b. Provide seamless schedule 40 red brass pipe and nipples. Brass pipe and nipples shall be suitable for the conveyance of raw sewage. Seamless brass pipe shall conform to ASTM B43. All brass nipples shall conform to ASTM B687. End Connections shall be male iron pipe threads conforming to ASME B1.20.1.

   c. Bronze fittings and brass nipples shall be as manufactured by Smith-Cooper International or equal approved by the Frederick County DUSWM Department of Engineering.

   d. PVC MPT x compression adapters shall be provided for both ends of each bronze tee. PVC MPT x compression adapters shall be as manufactured by Spears Manufacturing or equal approved by the Frederick County DUSWM Department of Engineering.

   e. Tank and Integral Accessway: High Density Polyethylene Construction

4. Valve underground vault.

   a. Each combination air release and vacuum relief valve shall be contained in an underground vault. The underground vault shall be a tank made of high density polyethylene, with a grade selected to provide the necessary environmental stress cracking resistance. Corrugated sections are to be made of a double wall construction with the internal wall being generally smooth. The corrugations of the outside wall are to be a minimum amplitude of 1-1/2" to provide necessary transverse stiffness. Any incidental sections of a single wall construction are to be 0.250" thick (minimum). All seams created during tank construction are to be thermally welded and factory tested for leak tightness. The tank wall and bottom must withstand the pressure exerted by saturated soil loading at maximum burial depth. All station components must function normally when exposed to 150 percent of the maximum external soil and hydrostatic pressure.

   b. The tank shall be furnished with two EPDM grommet fitting to accept a 4.50" OD DWV or Schedule 40 pipe.

   c. The vault accessway shall be an integral extension of the tank assembly and shall include a lockable cover assembly providing low profile mounting and watertight capability. The accessway design and construction shall enable field adjustment of the station height in increments of 4" or less without the use of any adhesives or sealants requiring cure time before installation can be completed.

E. SDR-21, Low Pressure Sanitary Sewer Pipe

1. General:

   a. PVC pipe shall meet the requirements of ASTM D2241, SDR-21 for working pressure of 200 psi.

   b. Pipe of given size and material, shall be furnished by the same manufacturer. Each pipe length and fitting shall be supplied and clearly marked as follows:

   c. PVC pressure pipe and fittings shall be produced from resins meeting the requirements of ASTM D1784 for Class 12454-B, Type 1, Grade 1, PVC1120.

   d. PVC pipe and fittings shall be produced by an extrusion process and shall be homogeneous throughout, free from cracks, holes, foreign inclusions, or other defects. The pipe and fittings shall be uniform in color.

   e. PVC pressure pipe and fittings shall have the National Sanitation Foundation (NSF) seal of approval.

f. Pipe with blisters, bubbles, cuts or scrapes on inside or outside surfaces, which damage the wall thickness, or other imperfections in the opinion of the Engineer will impair the performance or life of the pipe, will be rejected.

g. PVC pipe shall be legibility marked at intervals of 5 feet maximum with the manufacturer's name or trademark, pipe size, PVC cell classification, appropriate legend such as PVC SDR-21 ASTM D2241, manufacturer's lot number, and date of manufacture and point of origin. Pipe not properly marked will be rejected.

2. Gasketed Joint, PVC Pipe and Fittings

a. PVC pressure sewer pipe 1 ½-inch through 4-inch diameter shall utilize gasket joints. The contractor shall furnish either integral bell end PVC pipe or spigot end-double bell coupling PVC pipe.

b. PVC pipe shall meet the requirements of ASTM D2241, SDR-21 for working pressure of 200 psi. Joints shall meet the requirements of ASTM D3139 for push-on joint pipe.

c. PVC pipe with gasket joints shall utilize and connections in which provisions are made for thermal expansion and contraction at each joint and resulting in pressure tight seals up to the full pressure rating of the pipe. The rubber ring suitable for long-term contact with sewage and which meets the requirements of ASTM F477.

d. Pipe with gasket joint shall have a reference mark around the entire circumference of the pipe on all spigot ends indicating the depth spigots shall be inserted into bells or couplings. Pipe spigot ends shall be beveled to permit proper and easy assembly of the joint.

e. Couplings for joining spigot end PVC pipe shall be furnished by the pipe manufacturer. They shall have a minimum pressure rating of 200 psi. Insertion depth of the spigot end of the pipe in the coupling shall be controlled by an internal PVC mechanical stop in the coupling which permits thermal expansion and contract of each pipe section to be taken up at each end of the pipe.

f. Lubricant for the elastometric gasket shall be supplied by the pipe manufacturer and shall neither support the growth of bacteria nor have a deteriorating effect on the PVC pipe and rubber gasket.

g. Fittings shall have a minimum pressure rating of 200 psi for continuous service at 73.4˚ F and shall be manufactured by the pipe manufacturer or be approved by the pipe manufacturer for use and compatibility with said pipe.

3. Threaded PVC Pipe and Fittings

a. PVC pipe and fittings with threaded end connections shall be Schedule 80 PVC with stainless steel reinforcing meeting the requirements of ASTM D1785 and D2467.

b. Thread sealant shall be a type which gives a watertight seal, yet permits ease of disassembly. Teflon, Flouroseal, or similar compounds based on Tetrafloureotheylene resins shall be used.

III. EXECUTION

A. Grinder Pump

1. Delivery

a. All grinder pump units will be delivered to the job site 100 percent completely assembled, including testing, ready for installation. Field installation of the pump in tanks under 96 inches is not allowed. Field installation of the level sensor into the tank is not allowed. Grinder pump stations will be individually mounted on wooden pallets.

2. Installation

a. Earth excavation and backfill are specified under site work, but are also to be done as part of the work under this section, including any necessary sheeting and bracing.

b. The Contractor shall be responsible for handling ground water to provide a firm, dry subgrade for the structure, and shall guard against flotation or other damage resulting from general water or flooding.

c. The grinder pump stations shall not be set into the excavation until the installation procedures and excavation have been approved by the Engineer.

d. Remove the packing material. Users Instructions MUST be given to the OWNER. Hardware supplied with the unit, if required, will be used at installation. The basin will be supplied with a standard 4” inlet grommet (4.50” OD) for connecting the incoming sewer line. Appropriate inlet piping must be used. The basin may not be dropped, rolled or laid on its side for any reason.

e. Installation shall be accomplished so that 1” to 4” of accessway, below the bottom of the lid, extends above the finished grade line. The finished grade shall slope away from the unit. The diameter of the excavated hole must be large enough to allow for the concrete anchor.

f. A 6 inch (minimum) layer of naturally rounded aggregate, clean and free flowing, with particle size of not less than 1/8” or more than 3/4” shall be used as bedding material under each unit.

g. A concrete anti-flotation collar, as detailed on the drawings, and sized according to the manufacturer’s instructions, shall be required and shall be pre-cast to the grinder pump or poured in place. Each grinder pump station with its pre-cast anti-flotation collar shall have a minimum of three lifting eyes for loading and unloading purposes.

h. If the concrete is poured in place, the unit shall be leveled, and filled the water, to the bottom of the inlet, to help prevent the unit from shifting while the concrete is being poured. The concrete must be manually vibrated to ensure there are no voids. If it is necessary to pour the concrete to a level higher than the inlet piping, an 8” sleeve is required over the inlet prior to the concrete being poured.

i. The Contractor will provide and install a 4-foot piece of 4-inch SCH 40 PVC pipe with water tight cap, to stub-out the inlet for the property owner’s installation contractor.

j. The electrical enclosure shall be furnished, installed and wired to the grinder pump station by the Contractor. An alarm device is required on every installation, there shall be NO EXCEPTIONS. It will be the responsibility of the Contractor and the Engineer to coordinate with the individual property owner(s) to determine the optimum location for the Alarm Panel.

k. The Contractor shall mount the alarm device in a conspicuous location, as per national and local codes. The alarm panel will be connected to the grinder pump station by a length of 6-conductor type TC cable. The power and alarm circuits must be on separate power circuits. The grinder pump stations will be provided with 32’, 25’ useable, electrical supply cable to connect the station to the alarm panel. This cable shall be supplied with a *factory installed* EQD half to connect to the mating EQD half on the core.

3. Backfill Requirements

a. Improper backfilling may result in damaged accessways. The grinder pump station shall be installed at a minimum depth from grade to the top of the 1 ¼” discharge line, to assure maximum frost protection. The finish grade line shall be 1” to 4” below the bottom of the lid, and final grade shall slope away from the grinder pump station.

b. Backfilling shall be performed per Frederick County Standard Specifications, Section 2200.

4. Start-up and Field Testing

   a. The Manufacturer shall provide the services of qualified factory trained technician(s) who shall inspect the placement and wiring of each station, perform field tests as specified herein, and instruct the Owner's personnel in the operation and maintenance of the equipment before the stations are accepted by the Owner.

   b. All equipment materials necessary to perform testing shall be the responsibility of the Installing Contractor. This includes, as a minimum, a portable generator and power cable (if temporary power is required), water in each basin (filled to a depth sufficient to verify the high level alarm is operating), and opening of all valves in the system. These steps shall be completed prior to the qualified factory trained technician(s) arrival on site.

   c. Upon completion of the installation, the authorized factory technician(s) will perform the following test on each station:

      i. Make certain the discharge shut-off valve in the station is fully open.

      ii. Turn ON the alarm power circuit and verify the alarm is functioning properly.

      iii. Turn ON the pump power circuit. Initiate the pump operation to verify automatic "on/off" controls are operative. The pump should immediately turn ON.

      iv. Consult the Manufacturer's Service Manual for detailed start-up procedures.

   d. Upon completion of the start-up and testing, the Manufacturer shall submit to the Engineer the start-up authorization form describing the results of the tests performed for each grinder pump station. Final acceptance is the system will not occur until authorization forms have been received for each pump station installed and any installation deficiencies corrected.

5. Safety

   a. The grinder pump shall be free from electrical and fire hazards as required in a residential environment. As evidence of compliance with this requirement, the completely assembled and wired grinder pump, in its tank shall be listed by Underwriters Laboratories, Inc. (UL).

   b. The grinder pump shall meet accepted standards for plumbing equipment for use in or near residences, shall be free from noise, odor or health hazards, and shall have been tested by an independent laboratory to certify its capability to perform as specified in either individual or low

pressure sewer system applications. As evidence of compliance with this requirement, the grinder pump shall bear the National Sanitations Foundation seal.

B. Low Pressure Sewer Service Connection

1. Provide sewer house connections from the main line sewer to property lines or to the grinder pumps at the elevations indicated on the plans, standard details or as directed by the Engineer. Install tees, corporation stops, check valves and ball valves where indicated.

2. Mark the end of the sewer house connection at the property line with a piece of 2”x4” pressure-treated lumber, painted green its entire length, placed vertically from bottom of trench and extending 2 feet above finished grade. Place lumber so it does not interfere with blocking.

3. Sewer house connections to the pressure sewer shall be made by installing tees simultaneous with the main line installation as indicated on the plans and per Frederick County Standard Detail 305.1.

C. SDR-21, Low Pressure Sanitary Sewer Pipe, 1 ½ inch to 4-inch diameter

1. Trench excavation and backfill shall be in accordance with the General Conditions and Standard Specifications except as modified herein and by the detail shown on the plans. Excavate sufficient trench in advance to assure that no unforeseen obstructions exist before installing pipe. Work occasioned by failure to take such precautions shall be performed at no cost to Frederick County.

2. Inspect each pipe and fitting for damage and discoloration on exterior and interior. Remove damaged or discolored pipe and fittings and replace at no cost to the County. Clean each pipe and fitting of foreign substances before placing in trench and keep clean during jointing process. Should foreign substances, deleterious materials, or damaged pipe be observed in previously installed pipe, cease work until foreign material is removed or damaged pipe removed and replaced. Close open ends of pipe and fittings with a watertight seal during periods when work is not in progress.

3. Place bedding so that pipe is uniformly supported along its length. Do not drop pipe and fitting into the trench. Do not drop pipe in a manner which causes scratching of the pipe surface. Excessive amount of scratching on the pipe surface will be cause for rejection.

4. Follow the pipe manufacturer’s installation instructions for field cutting beveling PVC pipe and minimum radius of curvature of the various sizes of pipe for installing curved sections of pipe. Provide thrust blocks at bends, tees, caps and plugs in accordance with the details on the plans.

5. Perform required pressure test as described in the General Conditions and Standard Specifications for Water Mains unless modified herein by these Special Provisions.

6. Provide bedding and backfill around pipe in accordance with the Standard Details and requirements herein. Compact the bedding, haunching and initial backfill to a minimum of 6 inch loose lifts. Remainder of trench backfill shall be in accordance with the General Conditions and Standard Specifications.

7. Furnish and install 6 inch wide detectable tape over the entire length of pressure sewer line and service connection. The tape shall be installed 24 inches above the pipe crown. The tape shall be of polyethylene and have a film of 0.50 mil thickness, solid core, encased in a reinforced protective plastic jacket that is resistant to alkalis, acids and other destructive elements commonly found in soil. Overall thickness shall be 4.5 mils nominal and a width of 3 inches. Color shall be bright green with printed black letters on one side stating: “CAUTION SEWER LINE BURIED BELOW”.

8. Joints

    a. Push-on joints shall be in accordance with the manufacturer’s instructions. Spigot ends shall be inserted into bells and couplings to the depth marked on the pipe. If pipe is cut, then mark depth reference around entire circumference of the pipe. Use only lubricant supplied by pipe manufacturer and in accordance with his directions.

    b. Threaded pipe shall not be utilized except where shown on the plans and/or details. Use threaded pipe only where threaded adapters and fittings are required to make a complete fitting assembly. Do not force a threaded fitting when tightening. Do not use a pipe wrench. One-fourth to one-half turn past hand-tight will be sufficient for proper tightening.

9. Fittings and Valves

    a. Install fittings and valves where indicated on the plans. Inspect and operate valves to insure proper working order prior to installation.

10. Field Testing

    a. Field pressure test shall be performed in accordance with the test outlined in the section of the General Conditions and Standard Specifications for Water Mains with the following exceptions:

    b. Test pressure shall be 100 psi maximum at the low point of the system or as indicated on the plans, unless otherwise directed by the Engineer. The test pressure shall be 50 psi minimum at the high point of the system. If the elevation between the high and low points exceeds 115 feet, segmental testing shall be directed by the Engineer.

c. Before beginning the pressure test, the Contractor shall:

1. Cure solvent cement joints (if applicable) and concrete thrust blocks.

2. Completely backfill the pipe as specified in the Standard Details and the General Conditions and Standard Specifications.

3. No leakage allowance will be permitted for pipe with solvent cement joint or threaded joint. Maximum allowable leakage for pipe with gasketed joints will be calculated using the following formula:

$L = N*D*(P)^{1/2}*7400$

Where:
L = maximum allowable leakage, gallons/hour;
N = number of joints in test section;
D = nominal diameter of tested pipe inches;
P = average test pressure, pounds per square inch

Should test results show displacement, damage, or leakage in excess of the allowable amount, the Contractor shall repair the displacement and damage and eliminate the leakage. He shall retest until specified conditions are met, to the satisfaction of the Engineer.

D. Cast-In-Place Concrete

1. Cast-In-Place Concrete shall be performed per Frederick County Standard Specifications, Section 3300.

IV. MEASUREMENT AND PAYMENT

A. Grinder Pump:

1. Grinder Pump will be measured for payment by each grinder pump furnished and installed, complete, and will include all applicable electrical work and testing to ensure proper installation.

2. Payment for Grinder Pump will be made by the bid amount given for each.

B. Low Pressure Sewer Service Connection

1. Low Pressure Sewer Service Connections will be measured by each furnished and installed, complete and in-place.

2. Payment will be made for the quantities measured at the unit price listed. Payment includes provision for fittings and connections to new and existing facilities, pipes, concrete and installation of saddles.

Payment includes excavation, backfill and bedding as specified in Section 2200 of the Frederick County Standard Specifications.

C. SDR-21, Low Pressure Sanitary Sewer Pipe, 1 ½ Inch Diameter

1. Furnishing and installing Low Pressure Sanitary Sewer Pipe will be measured for payment by the linear foot of the size provided. No deductions will be made for the lengths of fittings or connections.

2. Payment will be made for the quantities measured at the unit price per linear foot of Low Pressure Sanitary Sewer Pipe provided on the proposal form.

   Payment will include provision of fittings, connections to new and existing facilities.

   Payment will include excavation, backfill, and bedding as specified in Section 2200 of the Frederick County Standard Specifications.

D. Non-Payment Items

The following items will not be measured for payment but the cost thereof will be considered incidental to the Contract.

a. Removal of existing facilities as necessary to complete this Contract.
b. Restoration and re-stabilization of disturbed areas.
c. Concrete and wood thrust blocking.
d. Stoppers, plugs and caps.
e. Testing
f. Lumber marking house connections
g. Replacement of various appurtenant connections and devices required for pressure-tight installation.
h. Materials and installation of the 6 inch wide detectable tape.

END OF SECTION

STANDARD SPECIFICATIONS
SECTION 2610
ROADWAY PAVEMENT

I. General

A. Description

This section includes removing and replacing paving, including driveways, within the limits indicated and providing new paving and driveways where indicated, including preparation of subgrade and provision of base courses as required, in accordance with the Contract Documents.

B. Submittals

1. Submittals shall be as set forth in the project permits and as required by the governing jurisdiction.

II. Materials

A. Concrete shall meet the jurisdictional requirements specified below as modified herein.

1. Contractor may use High Early Strength Portland Cement conforming to ASTM C150, Type 1. If High Early Strength cement is utilized, the use of calcium chloride will be permitted at the rate of one to two percent by weight of cement when temperature is below 40 degrees Fahrenheit.

2. All other materials shall meet the following jurisdictional requirements:

a. Work on state roads; Maryland State Highway Administration specifications and standard details.

b. Work on Frederick County roads; Frederick County Highway Department permit and standard details.

III. Execution

A. General

1. Construction on new roads and repaving shall be as set forth in the project permits and shall meet the following jurisdictional requirements:

a. Work on state roads; Maryland State Highway Administration specifications and standard details.

b. Work on Frederick County roads; Frederick County Highway Dept. Permit & standard details.

B. Removal of Existing Pavement

I. Cut existing pavement in advance of trenching to neat lines as shown on the standard detail utilizing the County standard trench widths. Remove paving before excavating trench.

2. Saw cut existing concrete pavement.

C. Preparation for Paving

1. Compact backfill as specified in Section 2200 and provide subgrade and subbase as set forth in Jurisdictional requirements.

D. Temporary Pavement

1. Provide temporary or permanent pavement immediately upon completion of backfill, as directed by the Engineer.

2. Temporary roadway pavement shall be cold mix, minimum three inches thick as approved by the Engineer, except where otherwise required by the Contract permits.

3. For repairs in state roads, provide temporary patch for a minimum of ten days and a maximum of 21 days.

4. Temporary driveway pavement shall be MSHA gradation CR6 crusher run stone,- minimum six inches thick.

E. Placement of Pavement

1. The extent shall be as shown on Jurisdictional standard details on the plans. If pavement has been undermined or disturbed in any way by the Contractor's operations, the extent of repaving shall be increased so that new pavement and base extends at least 18 inches over undisturbed soil.

2. Bituminious Pavement Replacement

a. Cover all cut surfaces which are to receive bituminious concrete patch with tack coat, applied under pressure at the rate of 0.01 to0.05 gallons per square yard of area.

b. Provide tack coat between each new layer of bituminious concrete at the rate of from 0.01 to 0.05 gallons per square yard of area.

c. Provide seal coats as specified in various jurisdictional requirements.

3. Concrete Pavement Replacement

a. Place concrete pavement as specified in jurisdictional requirements.

b. Place expansion joints at 40 feet on center maximum of space to match existing joints, whichever is less.

4. Driveway Replacement

a. Unless otherwise indicated, replacement of driveways will be restored to as nearly their original condition or better.

IV. Measurement and Payment

A. Pavement replacement at utility trenches

1. Removing existing roadway pavement over utility facilities and constructing new replacement during restoration will be measured for payment by the square yard based on the appropriate jurisdictional detail and utilizing the County standard trench widths, measured along the centerline of the trench.

   Payment will be made for the quantity measured at the unit price per square yard listed in the bid schedule.

B. Other Pavement Replacement

   1. Removing existing driveways and pavement in areas other than over utility facilities as described above, and constructing new replacements during restoration will not be measured for payment but the cost thereof will be considered as incidental to the Contract.

C. Pavement and driveways in new areas

   1. Constructing new pavement and driveways where indicated will be measured and paid for as set forth in special provisions.

D. Non-payment items

   1. The following items of work will not be measured for payment but the cost thereof will be considered as incidental to the Contract.

      a. Preparation of subgrade

      b. Disposal of removed pavement

      c. Replacement and restoration of pavement outside the limits of payment set forth herein which have been disturbed and damaged by the Contractor's operations.

      d. Removal and replacement of driveways at utility trenches.

      e. Temporary pavement

      f. Removal & replacement of roadway shoulders

STANDARD SPECIFICATIONS
SECTION 2620
CURB, CURB AND GUTTER AND SIDEWALK

I. General

A. Description

This section includes removing and replacing concrete curb, curb and gutter and sidewalks and providing new curb, curb and sidewalks, within the limits indicated, including preparation of subgrade and providing base courses as required in accordance with the Contract Documents.

B. Submittals

1. Submittals shall be as set forth in the project permits and as required by the governing Jurisdiction.

II & III. Materials & Construction

A. Jurisdictional Requirements

1. Materials and construction shall meet the following Jurisdictional requirements, unless otherwise indicated:

a. State facilities; Maryland State Highway Administration specifications and standard details.

b. Frederick County Highway; Design Manual and Standard details.

2. Concrete shall be Class B in accordance with the requirements of Section 03300, Cast-In-Place Concrete, except that concrete shall be air-entrained to provide an air content of 6% ± 1.5%.

3. Premolded expansion joint filler for expansion joints shall conform to ASTM D 1751 and shall be 1/2-inch thick, minimum.

B. Preparation

1. Preparation of subgrade shall meet Jurisdictional requirements stated above.

2. Provide base for pavement where required as specified in Section 2610.

3. Compaction shall meet requirements specified in Section 2200.

C. Temporary Facilities

1. Unless otherwise indicated, provide temporary facilities where so directed

by Engineer.

D . Replacement

1. Joint spacing shall match existing continguous work.

2. Patching parts of section will not be permitted. Remove and replace damaged sections at no cost to the County.

IV. Measurement and Payment

A. Curb, Curb and Gutter and Sidewalk Replacement

1. Removing existing concrete curb, curb and gutter and sidewalk and constructing new replacements during restoration will not be measured for payment but will be considered as incidental to the Contract.

B. Curb, Curb and Gutter and Sidewalk in New Areas

1. Constructing new concrete curb ' curb and gutter and sidewalk where indicated will be measured and paid for as set forth in the special provisions.

C. Non-payment Items

1. The following items of work will not be measured for payment but the costs thereof will be considered as incidental to the Contract.

a. Preparation of subgrade

b. Disposal of removed curb, curb and gutter and sidewalk outside the limits of payment set forth herein which have been disturbed and damaged by the Contractor's operations.

STANDARD SPECIFICATIONS

SECTION 2710

CHAIN LINK FENCE

I. General

A. Description

This section includes providing chain link fencing, gates, and accessories, as indicated in accordance with the Contract Documents

B. Submittals

1. Submit samples in accordance with Section 1200 for the following:

a. Wire mesh fabric: each width and type to be used-one sample, 12 inches long

b. Posts, railing, braces, gate frames: one sample of size and type to be used - 24 inches long

c. Truss rod and turnbuckles - one each

d. Tension wire - one sample, 24 inches long

e. Barbed wire - one sample, 24 inches long

f. Tension bar - one sample, 24 inches long

g. Fabric ties with hardware - four each

h. Rail and brace ends and post caps - two each

i. Barbed wire extension arms - one each type

2. Submit certified test reports before delivery of materials as specified in Section 1100 for all materials as furnished under this section.

II. Materials

A. General

1. Chain link fencing shall conform to applicable parts of FS RR-F-191 as modified herein.

2. Fabric shall be 9 gauge aluminum coated wire woven in a 2-inch diamond mesh conforming to ASTM A491. Top and bottom selvage to have a

barbed finish. Minimum weight of coating shall be 0.40 ounce per square foot of wire surface. The coated wire shall have a minimum tensile strength of 80,000 lbs. per square inch.

3. Install fabric 3 inches above ground level. Fence shall be stretched tight and securely fastened to posts at points spaced 12 inches apart maximum.

B. Posts FS-RR-F-191/3A as modified herein:

1. Posts, pipes, gate frames, caps, barbed wire and other accessories and fasteners shall be fabricated of hot dip galvanized steel, or aluminum alloy FS6063-Tt6, as applicable. Posts and rails shall be of the same type material. Weight of zinc coating shall be 1.6 ounces per square foot or greater. Posts and rails shall be galvanized standard weight pipe conforming to the requirements of ASTM F1083.

2. End, corner and pull posts shall conform to the following requirements.

a. Fences five feet and less in height; Type I, Class I, 2.374 inch diameter, weighing 3,65 pounds per foot or type I, Class 3, 2,374 inch diameter, weighing 1.264 ponds per foot.

b. Fences over five feet in height; Type I, Class I, 2.875 inch diameter, weighing 5.79 pounds per foot or Type I, Class 3, 2.875 inch diameter weighing 2.00 pounds per foot.

c. All end, corner, intermediate, and pull posts and gate leaves 6'0" wide and less shall be 2-7/8 inch O.D. galvanized Schedule 40 pipe with minimum bending strength of 381 pounds on 6-foot cantilever load. Gate posts for gate leaves shall be Schedule 40 pipe complying with ASTM F1083 of diameters as follows:

Gate Leaf Width	Pipe O.D.	Weight per Ft.
0' to 6'	2-7/8"	5.79 lbs.
Over 6' to 13'	4"	9.1 lbs.
Over 13' to 18'	6-5/8"	18.97 lbs.
Over 18'	8-5/8"	24.7lbs.

3. Line posts shall conform to the following requirements:

a. Fabric five feet and less in height; Type I, Class 4, 1.875 inch x 1,675 inch H beam weighing 2.7 pounds per foot or Type I. Class 6, 2.875 inch x 1.675 inches, H-beam weighing 0.91 pounds per foot, or type I, Class I, 1.90 inch diameter, weighing 2.72 pounds per foot, or Type I, Class 3, 1.90 inch diameter, weighing 0.94 pounds per foot or 1.875 inch C Section yield strength 50,000 psi, weighing 2.34 pounds per foot.

b. Line Posts: Line posts shall be Schedule 40, 2-3/8 inch O.D. galvanized pipe with minimum bending strength of 201 pounds under a 6-foot cantilever load. Line posts shall be spaced at a maximum 10-foot O.C.

c. Fabric over five feet in height: Type I, Class 4, 2.625 inch diameter, H-beam weighing 4.1 pounds per foot or Type I, Class 6, 2.625 inch H-beam weighing 1.25 pounds per foot, or Type I, Class I, 2.375 inch diameter, weighing 3.65 pounds per foot, or Type I, Class 3, 2.375 inch diameter, weighing 1.25 pounds per foot or c section as specified herein above.

4. Gate posts shall be in accordance with Table III, FS-RR-F-191/3a.

5. Gate frames FS-RR-F-191/2a as modified herein, shall be Type I and Type III, 1.90 inch diameter, weighing 2.72 pounds per foot or 2.00 inch square, weighing 2.60 pounds per foot.

6. Gate frames shall be made of 2-inch O.D. ASTM F1083 pipe, 2.72 lbs. per foot hot dipped galvanized. Fabric shall match fence. Gate frames shall be welded or assembled with riveted corner castings. Gate frames shall be equipped with 3/8-inch diameter adjustable truss bars. Hinges shall be ball and socket.

7. Gate shall be equipped with positive latching device with provision for padlocking. Personnel gates shall be minimum 36-inch clear opening.

8. Top rail and braces, F-RR-F-191/3a as modified herein, Shall be Type II, Class I, 1.66 inch diameter, weighing 1.35 pounds per foot or type II, Class 3, 1.66 inch diameter, weighing 0.786 pounds per foot. Fences with barbed wire above fabric may have a top tension wire in lieu of top rail.

9. Top rails shall be continuous and shall pass through the post tops. The coupling used to join the top rail lengths shall allow for expansion. Brace rails shall be provided at all terminal posts, located between the top and grade lines and extend from the terminal post to the first adjacent post. Braces shall be securely fastened at both ends. Brace ends for receiving brace rails shall be malleable iron or castings of 356.0 (formerly SG70A) alloy, or equivalent of ASTM B26 or B108.

10. Truss and stretcher bands shall be 1/8-inch x 7/8-inch pressed steel, supplied with carriage bolts and nuts. Bolts shall be 5/16-inch by 1 1/4-inch. Truss rods shall be 3/8-inch nominal diameter.

11. Barbed wire shall conform to requirements of FS-RR-F221/1a.

12. Barbed wire shall consist of three strands of 12-1/2 gauge aluminum coated steel wire with 4-point barbs of 14 gauge aluminum wire spaced 5 inches apart, conforming to ASTM A585.

13. Additional strands of barbed wire shall be added beneath the chain link fabric at all ditch crossings to maintain the security of the fence installation.

14. Accessories shall conform to FS-RR-R191/4a as modified herein.

    a. Top and bottom tension wire shall be No. 7 gauge aluminum coated steel wire. Fabric shall be securely tied to tension wire at intervals not to exceed 24-inches.

C. Chain link fabric FS-RR-F-191/1a as modified herein:

1. Fabric shall be one of the following types as shown fabricated in a two inch mesh of 0.148 inch diameter wire:

    a. Type 1, zinc coated steel, minimum 1.8 ounces per square foot coating.

    b. Type II, aluminum coated steel, minimum 0.40 ounces per square foot coating.

    c. Type V, thermally bonded vinyl coated steel, Table III, 1200 pound minimum breaking load. Precoat fabric with zinc coating minimum 0.30 ounces per square foot. Color shall be as indicated on the drawings or in the special provisions.

    d. Fabric shall be 9 gauge aluminum coated wire woven in a 2-inch diamond mesh conforming to ASTM A491. Top and bottom selvage to have a barbed finish. Minimum weight of coating shall be 0.40 ounce per square foot of wire surface. The coated wire shall have a minimum tensile strength of 80,000 lbs. per square inch.

2. Fabric shall be barbed at top and bottom.

3. Install fabric 3 inches above ground level. Fence shall be stretched tight and securely fastened to posts at points spaced 12 inches apart maximum.

D. Padlocks

1. Padlocks shall conform to requirements of FS-FF-P-1016, keyed and master keyed, with two keys for each padlock and two master keys.

E. Concrete

1. Concrete shall be as specified in Section 3300, Mix #1.

F. Grout

1. Grout shall be non-shrink as approved by the Engineer.

III. Execution

A. Fence Installation

1. All necessary clearing, excavation and filling shall be performed as required to perform clear "line of fence" runs.

2. Post shall be encased in concrete to the depth indicated, to the minimum limits contained herein and extended at least six inches below the bottom of posts. Ten inches diameter of encasement shall be provided for line posts and 12 inches diameter for end, corner, pull and gate posts.

a. Fences five feet high and less: 2.5 foot encasement

b. Fences over five feet high; 3.0 foot encasement.

c. Gate posts, six foot swing and less: 3.0 encasement, 12 inches diameter.

d. Gate posts over six foot swing, 3.0 foot encasement, 16 inches diameter.

3. Concrete shall be extended to two inches above finished ground line at posts and smoothly sloped to drain away from the posts.

4. Posts shall be placed at no more than ten feet nor less than eight feet on centers. Additional posts shall be spaced at each abrupt change in grade.

5. Where rock is encountered, drill holes two inches deeper than the depth shown or specified. The holes diameter shall be two inches greater than the outside diameter of the post or the greatest dimension of the H section. Fill the rock portion of the hole with grout with a ratio of 1:3 of cement and concrete sand.

6. Where fence is to be located on concrete structures a section of 12 inch long, steel pipe shall be cast into the concrete at the correct location for the fence posts. The fence post shall be grouted into the steel pipe with a non-shrink grout as previously specified.

7. Corner or pull posts shall be installed at each horizontal or vertical angle

point of 15 degrees or more and at no more than 500 foot intervals. Corner, end and pull posts shall be provided with a horizontal brace and tie rod on each side of the posts extending to and connecting to adjacent line posts.

8. After posts are installed and concrete has set firmly the top rail and bottom tension wire shall be placed and securely anchored at ends and to line posts before the fabric is hung.

9. Tension wire shall be placed approximately six inches above grade.

10. A brace shall be provided for gate posts, and at each corner pull and end post for fabric heights of six feet or greater.

11. Ends of fabric by the use of tension bars threaded through loops in the fabric, and secured to the posts by means of bands with bolts and nuts. Bands shall be as specified in FS RR-F-191/4a.

12. Fabric shall be placed by securing one end and supplying sufficient tension by means of mechanical fence stretchers to remove slack before fastening. The fabric shall be fastened to the post at intervals of not more than 15 inches on center, and to the top rails and bottom tension wire at intervals of not more than 24 inches. All attachments shall be made with tie wires.

13. The bottom of the fabric shall be held as uniformly as possible to two inches above finished grade.

14. Where indicated, three strands of barbed wire shall be provided above fence fabric. Stretch the fabric to remove sag and anchor firmly to the extension arms. The extension arms on line posts shall be inclined away from the County property at approximately a 45-degree angle. Extension arms on corner posts and gates shall be vertical.

15. Fence gates and gate stops shall be installed as shown.

16. engaged.

17. Padlocks and chains shall be furnished where indicated.

18. The following alternate method of post anchorage will be acceptable:

    a. Drive post into ground and hold rigidly in position by means of two steel angle anchors driven diagonally and attached to the post on opposite sides.

    b. Anchors, attachments and methods shall be in accordance with MSHA standard details.

B. Defective Work

1. Fencing which is improperly located and not true to line and grade and posts not plumb shall be removed and replaced.

2. Damaged galvanizing of components shall be repaired by thoroughly wire brushing the damaged area to remove loose and cracked zinc coating, and painting with two coats of zinc dust, zinc oxide primer, MIL-P-21035. The first coat shall be allowed to dry thoroughly before the second coat is applied.

3. Damaged, aluminum coated components shall be repaired by cleaning as specified above, and painting with two coats of aluminum paint, FS TT-P-38.

IV. Measurement and Payment

A. Fencing

1. Fencing shall be measured by the linear foot for each type and height actually placed.

   Payment shall be made for the quantities measured at the price per linear foot listed in the bid schedule.

2. Payment will include grading work, and post foundations, all materials required and all incidentals necessary to provide the finished product.

B. Gates

1. Gates will be measured by the number of each type, size and height, in place.

   Payment will be made for the quantities measured at the price per each listed in the bid schedule.

2. Payment will include gate posts.

STANDARD SPECIFICATIONS

SECTION 2800

SEEDING AND SODDING

I. General

A. Description.

This section includes seeding and sodding to the limits shown as required for restoration and restabilization of disturbed areas, and as directed by the Engineer, including preparation of seed and sod bed, fertilizer, lime and mulch, in accordance with the Contract Documents.

B. Submittals

1. Submit certificates of compliance before delivery of materials as specified in Section 1100 for the following items:

a. Topsoil

b. Seed

c. Sod

d. Fertilizer

e. Lime

f. Mulch

C. Construction Criteria

1. Unless otherwise indicated provide sod on those disturbed areas which supported a previously established stand of turf; on slopes 3:1 and steeper; and where directed by the Engineer. Provide seeding on all other disturbed and filled areas.

D. Reference Documents.

1. The Contractor shall obtain and maintain on the site at all times a copy of the requirements of Maryland Turf Grass Law and Regulations Publication No.41, available from the Seed and Turf Lab, Maryland Department of Agriculture, College Park, Maryland 20742.

II. Materials

A. Topsoil

1. General Requirements

a. Topsoil shall be considered the surface layer of soil and sod, suitable for use in seeding and planting. Topsoil shall consist of fertile, agricultural soil capable of sustaining vigorous plant growth. It shall contain not less than 1-1/2 percent organic matter as determined by MSHA standard method of testing and shall have a pH value between 6.0 and 7.6.

b. Topsoil shall be free of roots, rubbish and other objectionable materials such as Bermuda Grass, Johnsongrass, Canada Thistle, Quack Grass, Poison Ivy and kindred roots and any material harmful to plant growth. It shall contain no mixture of refuse or any material toxic to plant growth. Topsoil shall provide sufficient pore space to permit adequate root penetration.

c. Topsoil shall meet the following analysis as determined by the MSHA standard hydrometer test. Sand, silt and clay are as defined in AASHTO M146.

Min. Percent	Max. Percent
Sand 30%	50%
Silt 30%	50%
Clay 5%	20%
Humus 3%	5%

d. Special purpose topsoil shall be used where indicated. General purpose topsoil shall be used in all other areas.

2. Special Purpose Topsoil

a. Special Purpose topsoil shall meet the requirements listed above with the following gradation:

Sieve	Min. Percent Passing
2"	100%
No. 4	90%
No. 10	80%

b. Special purpose topsoil shall be capable of hand spreading.

3. General Purpose Topsoil

a. General purpose topsoil shall meet the general requirements set forth above and shall contain no stones greater than 1-1/2 inches in their greatest dimension.

4. Materials available on site which meet the specified requirements may be

utilized with the permission of the Engineer.

B. Seed

1. Seed shall be utilized and mixed by the Maryland Department of Agriculture and shall conform to requirements of Maryland Turf Grass Law and Regulations, Publication Number 41.

2. Supply the following for improved areas which will be mowed regularly, and are dry and semi shady:

   a. Mix

      Kentucky Bluegrasses
      20-30% Certified Merion
      20-30% Certified Kenblue or South Dakota Certified
      10-40% Certified Adelphi, Baron, Birka or Pennstar
      Creeping Red Fescue
      10-50% Certified Pennlawn or Jamestown

   b. Seeding Rate: Sow mixture at 140 pounds per acre, or 3 pounds per 1,000 square feet between March 1 and May 31 and between August 15 and October 31.

   c. Premixed certified seed mixture labeled "Maryland Certified 30-30-30-10 Seed Mixture" will be acceptable.

3. Supply the following for slope areas cot to be mowed (or mowed infrequently).

   a. Mix

      Same as 2a above with Crown Vetch or Lovegrass added to this mixture.

   b. Seeding rate: sow mixture at the rate listed in 2a above with and additional 10 pounds of Crown Vetch, or 4 pounds of Lovegrass per acre of area seeded.

4. Supply the following for improved areas which will be mowed regularly and are dry, in heavy shade:

   a. Mix
      Kentucky Bluegrasses
      20% Certified Merion
      30% Certified Kenblue or South Dakota, Adelph, Baron, Birka or Pennstar (any combination thereof)

Creeping Red Fescue
50% Certified Pennlawn or Jamestown

b. Seeding Rate: sow mixture at 140 pounds per acre or 3 pounds per 1,000 square feet between March 1 and May 31 and between August 15 and October 31.

5. Supply the following for unimproved areas not to be mowed (or mowed infrequently) and are drought prone:

a. Mix

Tall Fescue
80-90% Certified Kentucky 31

Kentucky Bluegrass:
10-20% Certified Kenblue, South Dakota Certified or Common

b. Seeding rate: sow mixture at 215 pounds per acre or 5 pounds per 1,000 square feet between March 1 and May 31 and between August 15 and October 31.

6. Supply the following for poorly drained areas and areas that are subject to frequent flooding: or for temporary grass stabilization.

a. Mix

Tall Fescue
75% Certified Kentucky 31

Reed Canarygrass
25% (certified not required)

b. Seeding rate: sow mixture at 60 pounds per acre or 1.5 pounds per 1,000 square feet between March 1 and May 15 and between August 15 and October 31.

C. Sod

1. General: Sod shall be certified or approved grade as designated by the Maryland Department of Agriculture and shall conform to requirements of Maryland Turf Grass Law and Regulations, Publications Number 41. Sod shall be machine cut at a uniform thickness of 3/4 inch $\pm$ 1/4 inch, excluding top growth and thatch. Each individual sod piece shall be strong enough to support its own weight when lifted by the ends. Broken pads, irregularly shaped pieces, and torn or uneven ends will not be acceptable.

2. Sod replacing previously established stand of turf shall be similar in kind to that which existed prior to construction.

3. Sod placed where no grass existed prior to construction or replacing a lawn consisting mainly of coarse textured grass without a dominate species shall be as follows:

   a. "Maryland State Approved" multi-use turf sod

      Tall Fescue
      90-100% Certified Kentucky 31

      Kentucky Bluegrasses:
      0-10% Certified Kenblue (Kentucky origin)
      Certified Merion, or South Dakota Certified.

4. Sod replacing a lawn consisting mainly of fine textured grass without a dominant species shall be as follows:

   a. Maryland Certified 30-30-30-10 sod.

D. Fertilizer

1. Fertilizer shall be a complete commercial fertilizer with components derived from commercial sources. Fertilizer analysis shall be determined from field soil sampling in appropriate number taken by the Contractor and analyzed by an independent laboratory. Contractor shall furnish fertilizer in accordance with the recommendations of the Frederick County Department of Agriculture.

2. One-quarter of the Nitrogen shall be in the form of nitrates, one-quarter in the form of ammonia salts, and one-half in the form of natural organic Nitrogen. Available Phosphoric Acid shall be free from superphosphate, bone, or tankage. Potash shall be Sulphate of Potash. Elements shall conform to the standards of Association of Official Agricultural Chemists.

3. Fertilizer shall be uniform in composition, free flowing and delivered to the site fully labeled according to applicable state fertilizer laws and shall bear the name, trade name or trademark and warranty of the producer.

4. The Contractor may submit soil samples to an approved soils testing laboratory for fertilizing recommendations. Recommendations shall be submitted to and approved by the Engineer before implementation.

5. Otherwise, fertilize at the following rates:

   a. Temporary Seeding:

Supply 10-20-10 or equivalent at the rate of 600 pounds per acre or 15 pounds per 1,000 square feet.

b. Permanent seeding:

Supply 600 pounds of 0-20-20 per acre with limestone. Immediately prior to seeding supply 400 pounds of ureaform and 500 pounds of 10-20-20 or equivalent per acre.

c. Sodding:

Supply 15 pounds of 10-20-10 per 1,000 square feet. Immediately prior to sod installation, supply 3.5 pounds of slow release nitrogen per 1,000 square feet. Slow release nitrogen shall be approximately 1/3 immediately available and 2/3 water insoluble, such as urea formaldehyde or isobutyledene urea.

E. Lime

1. Lime shall be ground limestone containing at least 50 percent total oxides (calcium oxide plus magnesium oxide). Limestone shall be ground to such a fineness that at least 50 percent will pass through a 100 mesh sieve and 98 percent will pass through a 20 mesh sieve.

2. Supply 70 pounds per 1,000 square feet (1-1/2 tons per acre) on sandy and silty soils or 100 pounds per 1,000 square feet (2.3 tons per acre) on clay or clay loam soils.

F. Mulch

1. Straw used for mulch shall be small grain hay. Hay shall be undamaged, air dry, threshed straw, free of undesirable weed seed. Straw mulch is not required for seeded areas treated with a temporary soil stabilizer.

2. Wood Cellulose Fiber Mulch

a. For use in hydroseeding grass seed in combination with fertilizers and other approved additions, shall consist of especially prepared wood cellulose fibers such as "Conwed", "Mat-Fiber", or equal, and have no growth or germination inhibiting factors, and be dyed green.

b. The wood cellulose fiber shall have the additional characteristic of dispersing rapidly in water to form a homogeneous slurry and remain in such state when agitated in the hydraulic mulching unit, or adequate equal, with the specified materials.

c. When applied, the wood cellulose fiber with additives will form an absorptive mat but not a plant inhibiting membrane, which will

allow moisture, natural or mechanical, to percolate into underlying soil.

d. The mulch shall be supplied, compressed in packages containing 50 pounds of material having an equilibrium air dry moisture content at time of manufacture of 12% plus or minus 3%. Wood cellulose fiber mulch shall be stored in a weatherproof storage area and in such a manner that effectiveness will not be impaired.

3. Mulch for protection of permanent seeding shall conform to the following requirements:

a. Straw: clean, weed free, unrotted straw (not less than 48 hours after mowing) applied at a rate of not less than 70 pounds per 1,000 square feet (1 1/2 tons per acre) and shall be anchored with: mulch anchoring tool (flat slopes), mulch nettings, cut back and emulsified asphalt (five gallons per 1,000 square feet, curasel ah (five gallons per 1,000 square feet), Tera Tack II (20 gallons per 1,000 square feet), or Petroset (manufacturer's recommendations). On slopes 8 feet or more high, the rate of liquid binders shall be increase by 60%.

b. Mulch nettings, jute or excelsor blanket

4. Mulch utilized as temporary protection and stabilization shall conform to the above materials requirements. Rate of application shall be as directed by the Engineer. Stone mulch will be permitted at the option of the Engineer.

5. Use either straw or cellulose wood fiber for landscaping.

III. Execution

A. Permanent Seeding:

1. Harow, disc or otherwise loosen subsoil to a depth of four inches. Spread topsoil evenly over prepared subsoil to the following depths:

Slopes 3:1 or steeper; two inches after compaction.

Slopes flatter than 3:1, four inches after compaction.

2. Remove objectionable material such as stones, 1-1/2 inches or larger, clods, brush, roots and trash from the top four inches of soil.

3. Apply lime and fertilizer at the rates specified in "materials", and thoroughly mix into the top six inches. Scarify the area and rake until the surface is leveled to provide a maximum of two inches in variation, and

the surface is friable and of uniform fine texture.

4. Immediately prior to seeding apply additional fertilizer at the rates specified in "materials", and work into the top two inches of the soil.

5. Perform harrowing, discing, scarifying and raking on the contour of slopes steeper than 3:1.

6. Moisten seedbed during periods of high temperatures and when directed by the Engineer.

7. Apply seed mixture uniformly with mechanical power driven seeders, mechanical cyclone hand seeders or hydroseeding equipment. (Slurry for hydroseeder may contain seed and fertilizer only.)

8. Culipack or roll one inch into soil into floodplain areas. Rake, roll or drag the seedbed in all other areas, if hydroseeder or cyclone seeder is used.

9. Apply mulch, immediately after seeding, at the rates specified in "materials".

10. Anchor mulch as specified.

B. Temporary Seeding

1. Loosen top two inches of seedbed.

2. Apply lime and fertilizer at the rates specified in "materials".

3. Moisten seedbed during periods of high temperature and when directed by the Engineer.

4. Apply seed mixture uniformly with mechanical power drawn seeders, mechanical cyclone hand seeders or hydroseeding equipment. (Slurry for hydroseeder may contain seed and fertilizer only.)

5. Culipack or roll seed one inch into soil in floodplain areas. Rake, or drag seedbed in all other areas, if hydroseeder or cyclone seeder is used.

6. Apply mulch immediately after seeding at the rates specified in "materials".

7. Anchor mulch as specified.

C. Sodding

1. Harow, disc or otherwise loosen subsoil to a depth of five inches. Spread topsoil evenly over prepared subsoil to the following depths:

Slopes 3:1 or steeper, two inches after compaction

Slopes flatter than 3:1, four inches after compaction

2. Remove objectionable material such as stones, 1-1/2 inches or larger, clods, brush, roots and trash from top four inches of soil.

3. Apply lime and fertilizer at the rates specified in "materials" and thoroughly mix into the full depth of the topsoil. Scarify the area and rake until the surface is leveled to provide a maximum of two inches in variation, and the soil is friable and of uniform fine texture.

4. Immediately prior to seeding apply additional fertilizer at the rates specified in "materials", and work into the top two inches of the soil.

5. Perform harrowing, discing, scarifying and raking on the contour of slopes steeper than 3:1

6. Deliver sod to the site within 24 hours after being cut and install sod within 36 hours after being cut.

7. During wet weather, dry sod sufficiently to prevent tearing during handling and placing. During dry weather, water sod sufficiently before lifting to insure its vitality and to prevent dropping off of soil during handling.

8. Sod which has been desiccated will be rejected and shall be replaced by the Contractor at no cost to the County.

9. Place sod in a straight line parallel to one another. Stagger lateral joints and butt tight. On slopes 5:1 and steeper lay sod with long edges parallel to the contour starting at the top of the slope. In drainage ditches and sodded channels, lay sod with the long edge parallel to the flow of water.

10. On slopes 2:1 and steeper and in surface drainage v-shaped or flat bottomed ditches, stake each strip of sod with at least two stakes, spaced not more than two feet apart, or wire staples.

11. Immediately upon completion of a section of sodding, roll, tamp, and water until the underside of the sod pad and soil surface beneath it are thoroughly wet and in contact with each other so as to eliminate air pockets. (The recommended rate of watering is one inch per acre).

12. Completion of laying, rolling, tamping and watering shall be within an eight hour period.

D. Mulch Only

1. Perform grading as required. Place and anchor mulch only at the rates specified in "materials" where indicated and where directed by the

Engineer.

E. Time Restrictions

1. When permanent seeding or sodding is specified or directed, and seeding is not allowed because of time restrictions specified in "materials", utilize one or more of the following methods to prevent erosion and sedimentation until such time as permanent seeding or sodding is allowed:

   a. Place and anchor straw mulch or wood chips.

   b. Apply temporary seeding.

   c. Prepare soil for permanent seeding and then mulch as specified; overseed during next seasonal seeding period.

   d. Provide other erosion control measures acceptable to the Engineer and the sediment control inspector.

   e. Remove straw or wood chips used as temporary mulch or work into subsoil to a minimum depth of six inches prior to installation of permanent seeding application.

F. Maintenance of seeded and sodded areas:

1. Maintain seeded and sodded areas until accepted in writing by the Engineer.

2. Water seeded and sodded areas as necessary to maintain adequate moisture in the upper four inches of soil and keep mowed to a height of two to three inches, do not remove more than 1/3 of the grass leaf during initial mowing. Do not mow sod until it is firmly rooted.

3. Inspect seeded and sodded areas for failures and necessary repairs.

4. Provide replacements during the specified planting seasons.

5. If stand of turf is inadequate as determined by the Engineer, overseed and fertilize using half of the rates originally applied, or resod.

6. If stand is over 60 percent damaged, as determined by the Engineer, reestablish following original lime, fertilizer, seed or sod bed preparation and seeding or sodding recommendations.

IV. Measurement and Payment

A. Seeding and Sodding

1. Seeding, sodding, mulch, fertilizer, lime, topsoil, preparation of seed to the limits indicated, as directed by the Engineer and as necessary to repair damage caused by the Contractor's operations will not be measured for payment but will be considered as incidental to the Contract.

IV. Special Provisions

A. TEMPORARY SEEDING AND MULCHING

1. See Section 1800, Temporary Facilities and Environmental Protection, Part I, General, Paragraph 7, Erosion and Sediment Control of Standard Specifications in Frederick County General Conditions and Standard Specifications for Water Mains, Sanitary Sewers and Stated Structures for critical area stabilization

STANDARD SPECIFICATIONS

SECTION 2830

LANDSCAPING

I. General

A. Description

This section includes provision for tree and shrub planting at locations indicated and approved by the Engineering accordance with the Contract Documents.

B. Submittals

1. Submit certificates of compliance before delivery of materials as specified in Section 1100 for all materials specified under this Section.

2. Submit samples of all materials except plants specified under this Section.

3. Topsoil sample testing shall be performed by a commercial or governmental agency approved by the Engineer.

C. Reference Documents

1. Plant measurement size and structures shall be in accordance with the "American Standard for Nursery Stock", latest edition as published by the American Association of Nurserymen.

2. "Standardized Plant Names" (1942) by American Joint Committee on Horticulture Nomenclature, shall be the authority for all plant names.

D. Inspection and acceptance of plant materials.

1. Plants shall be subject to inspection and approval at the place of growth or upon delivery for conformity to specification requirements as to quality, size, and variety. Such approval shall not impair the right of inspection upon delivery at the site or during the progress of work or right of rejection due to damage suffered in handling or transportation.

2. Rejected plants shall be removed immediately from the site by the Contractor.

3. All plants shall be labeled as to genus, species and size and shall bear an inspection certificate from the Board of Department of Agriculture, or other state agency, of the state within which the nursery, where the plants were grown, is located.

E. Guarantee

1. All materials planted by the Contractor shall be guaranteed for a period of six months from the date of conditional acceptance of landscaping.

F. Plant Replacements

1. Replace dead, weak, diseased, improperly sized and improperly marked plants and plants not true to name.

2. All replacements shall be plants of the same type and size as specified in the bid schedule or on the plans and shall carry the same guarantee as the original stock.

3. If plant rejection occurs during the planting season, the plants shall be replaced at once. If not, they shall be replaced during the next proper planting season. However, the Contractor may elect to allow the rejected plant to remain through the next complete growing season at which time, if found to be dead, in an unhealthy or badly impaired condition, the rejected plant shall be replaced by the Contractor at no cost to the County. When making plant replacements, replace planting mulch to its original specified depth and follow all procedures outlined in planting procedures.

4. Cost of plant replacement directly attributable to loss of water use due to Count directives shall be the county's responsibility.

II. Materials

A. Topsoil

1. Topsoil shall conform to requirements of special purpose as specified in Section 2800.

2. Topsoil shall be spread in place for quantity required for lawn and road shoulder seed areas at 4-inch consolidated depth, and sufficient quantity for certain plant beds and backfill for shrubs and trees as specified.

3. Do not deliver topsoil in frozen or muddy condition.

B. Fertilizers and Additives

1. Fertilizer for trees and shrubs shall be an organic form such as cotton seed meal or bone meal, or inorganic such as super phosphate. Do not use inorganic nitrate or nitrate fertilizers for starter solution in tree or shrub pits.

a. Super Phosphate shall be composed of finely ground phosphate rock as commonly used for agricultural purposes, containing not

less than 18 percent available phosphoric acid.

b. Bone meal shall be commercial raw bone meal finely ground and shall have a minimum analysis of one percent nitrogen and 18 percent phosphoric acid.

2. Peat moss shall be a phagnum peat moss and shall be free from woody substances.

3. Manure shall be dehydrated, well rotted cow manure.

4. Anti-desiccant shall be "wilt-pruf" or equal, delivered in manufacturer's containers and used according to the manufacturer's instructions.

5. Fertilizer shall be delivered in standard size bags marked with the weight, analysis of contents, and the name of the manufacturer. Fertilizer shall be stored in weatherproof storage areas and in such a manner that its effectiveness will not be impaired.

C. Soil Mixes

1. Soil mixes shall be composed of the following materials well mixed in the specified proportions.

2. Soil mix for all plants except ericaceous material shall consist of 200 pounds of manure and 36 cubic feet of peat moss to 12 cubic yards of topsoil.

3. Soil mix for ericaceous plants shall consist of 50 cubic feet of peat moss to twelve cubic yards of topsoil - to which no lime has been added.

D. Planting stakes and accouterments

1. Vertical stakes shall be rough sawn, straight grain oak, reasonably free from knot holes, bark, wane, warp, and splits. Stakes for trees over ten feet tall shall be 2 inch x 2 inch x 10 feet. Stakes for smaller trees shall be 2 inch x 2 inch x 8 feet.

2. Guying stakes shall be of wood of uniform size, free of knot holes and measure 1-3/4 inch x 1-3/4 inch x 30 inches.

3. Guying wire shall be pliable number 12 or 14 gauge galvanized.

4. Tree ties shall be 5/8 inch or 3/4 inch reinforced corded garden hose.

5. Tree wrapping shall be first quality commercial paper tree wrap, in four inch to six inch strips; or clean new burlap, seven or eight ounce weight per square yard, treated with a solution containing a bactericide, fungicide and insecticide.

6. Tree wound dressing shall be "tree-cote" or equal.

E. Mulch

1. All mulch shall be free of toxic substances or foreign materials that may harm plant life.

2. Mulch for tree and shrub planting and mulch bed construction shall be ground bark, shredded bark, peat moss, wood cellulose fibers, straw mulch, peanut hulls or stone chips as indicated.

a. Ground Bark shall be 100 percent true pine bark with organic contents of not less than 90 percent, with a white wood content not to exceed eight percent and shall be of a good uniform brown color. Not more than 50 percent shall be capable of passing through a 3/4 inch sieve.

b. Shredded bark shall be 100 percent true pine- bark peelings with organic content of not less than 90 percent. It shall be fibrous material of a good uniform brown color and of which not more than 25 percent shall be able to pass through a 3/4 inch sieve.

c. Peat moss shall be as specified herein above.

d. For use in hydroseeding grass seed in combination with fertilizers and other approved additions, shall consist of especially prepared wood cellulose fibers such as "Conwed", "Mat-Fiber", or equal, and have no growth or germination inhibiting factors.

e. The wood cellulose fiber shall have the additional characteristic of dispersing rapidly in water to form a homogeneous slurry and remain in such state when agitated in the hydraulic mulching unit, or adequate equal, with the specified materials.

f. When applied, the wood cellulose fiber with additives will form an absorptive mat but not a plant inhibiting membrane, which will allow moisture, natural or mechanical, to percolate into underlying soil.

g. The mulch shall be supplied, compressed in packages containing 50 pounds of material having an equilibrium air dry moisture content at time of manufacture of 12% plus or minus 3%. Wood cellulose fiber mulch shall be stored in a weatherproof storage area and in such a manner that effectiveness will not be impaired.

h. Straw used for mulch shall be small grain hay. Hay shall be undamaged, air dry, threshed straw, free of undesirable weed

seed. Straw mulch is not required for seeded areas treated with a temporary soil stabilizer.

i. Peanut hulls shall be unground hulls which have not been subjected to any conditions that would shorten their life or cause them to lose any of their value as a mulch.

j. Stone chips shall be either washed gravel (various colors and sizes or 3/4 inch "marble-stone" (quartz).

F. Water

1. All water used for planting and maintenance shall be obtained from fresh water sources and shall be free from injurious chemicals and other toxic substances harmful to plant life.

G. Herbicides

1. All herbicides used in mulch beds that will not contain plantings shall be of a non-selective, residual type classified as a pre-plant or a pre-plant /pre-emergence herbicide.

2. The herbicide selected shall be safe for use around ornamental plantings, have long-lasting weed control, and shall be resistant to leaching away under excessive rainfall.

3. A second application of the herbicide shall be made on the surface of the landscape gravel or riprap sometime after the first six (6) months, but not later than 12-months. Same methods and rates apply as specified previously.

H. Plant Materials

1. All plants shall be nursery grown unless specifically authorized to be collected.

2. All plants shall be hardy under climatic conditions similar to those in the locality of the project.

3. All plants shall be typical of their species or variety and shall have a normal habit of growth. They shall be sound, healthy and vigorous, well branched and densely foliated when in leaf. They shall be free of diseases and insect pests, eggs, or larvae, and they shall have healthy well developed root systems. Materials that are weak or that have been cut back from larger grades to meet specifications will be rejected.

4. All plants shall conform to the measurements specified in the bid schedule or on the plans; with the following exceptions.

a. Plants larger than specified may be used if approved by the Engineer, at no additional cost to the County. If the use of larger plants is approved, the spread of roots or ball of earth shall be increased in proportion to the size of the plant.

b. Up to ten percent of undersized plants in any one variety or grade may be used provided that there are sufficient plants above size to make the average equal to or above specified grade and provided that undersize plants are larger than the average size of the next smaller grade.

5. Digging and handling.

a. Bare root shrubs shall be dug with adequate fibrous roots retained and shall be delivered to the site of the project prior to the plant material coming into leaf. Pack roots of these plants in moist straw or peat moss immediately after digging.

b. Balled and burlaped plants shall be dug with firm natural balls of earth, of sufficient diameter and depth to include most of the fibrous roots.

c. Container grown stock shall have been grown in a container long enough for the root system to have developed sufficiently to hold its soil together firmly. No plants shall be loose in the container.

6. Handling and protection of delivered plants

a. Roots or balls of all plants shall be adequately protected at all times from sun and from drying winds or frost.

b. All balled and burlapped plants which cannot be planted immediately upon delivery shall set on the ground and shall be well protected with soil, wet straw, peat moss or other acceptable material. Bare root plants which cannot be planted immediately shall be temporarily planted or heeled-in in trenches upon delivery.

c. Bundles of plants shall be opened and the plants separated before the roots are covered. Care shall be taken to prevent voids among the roots. During planting operations, bare roots shall be covered with canvas, straw or other suitable material. No plant shall be bound with wire or rope at any time so as to damage the bark or break the branches.

I. Low Maintenance Groundcover - Crown Vetch

1. Seed mix shall be k-31 Tall Fescue at 40 pounds per acre and Crown

Vetch at 20 ponds per acre.

a. Inoculate seed with fresh inoculant as directed on package. Insure that Crown Vetch inoculant contains a sticker supplement.

b. Maintain temperatures of between 50 degrees and 75 degrees during inoculation.

c. When hydroseeding, use five times inoculant rate.

2. Other materials including lime, fertilizer, and mulch shall be as specified in Section 2800.

III. Execution

A. Seasons for Planting

1. Trees and shrubs shall be planted between October 1 and May 15 only. No plants shall be planted during periods of freezing temperatures. Preparations for planting may begin earlier than the specified season, provided locations have been approved by the Engineer.

2. Ground covers - low maintenance (shall be designated).

B. Planting Procedures

1. Excavation for tree and shrub pits.

a. Notify the Engineer prior to beginning plant operations.

b. Provide stakes and stake out locations of all plant pits as shown on the plans and as approved by the Engineer. Do not change locations without the approval of the Engineer.

c. Plant all plants in individual pits excavated with vertical sides and horizontal bottom.

d. Excavate tree pits two feet greater in diameter than the ball of earth or spread of roots of the tree and sufficiently deep to allow for a six inch thick layer of the soil mix beneath the ball or roots.

e. Plant shrubs in pits 12 inches greater than the spread of the roots and eighteen inches deep below the finished grade, or as necessary to properly set the plant at finished grade.

f. Allow a tolerance of one inch for the above dimensions.

g. If pits are excavated well in advance of planting, backfill to grade with the specified soil mix, mark locations and record on the plans.

2. Planting of trees and shrubs

a. Remove all seals and tags only after inspection and acceptance of plants by the Engineer.

b. Set plants in center of pits, plumb and straight, and at such a level that after settlement the crown of the plant will be one inch lower than the surrounding finished grade.

c. After setting balled and burlapped plants, compact soil mix around bases of balls, to fill all voids, up to one-half the depth of the balls, tamp and thoroughly water. Loosen burlap around the top half of the balls and spread out away from the ball. If too bulky cut burlap away and remove. Remove all balling and tying materials or containers, other than burlap and jute twine, from the pit completely without damage to the soil ball. Cover all burlap and twine with at least two inches of soil mix. Then fill the remainder of the pit with soil mix, tamp and again water, all within the same day of planting.

d. When container grown plants are planted, remove the plant from the container, so as not to damage the root ball, and plant as outlined for balled and burlapped plants.

e. When bare root plants are set, spread the roots of the plant carefully in their natural positions and work soil mix around the roots, thoroughly tamp into place and water, all within the same day of planting.

f. Watering shall mean full and thorough saturation of backfill in the pits the day the plants are planted. Apply water by container or open end hose under low pressure only.

g. When planted, watered, and fully settled, the plants shall be vertical and the stand shall be flush with stand in the nursery.

h. Form a three inch high soil shoulder around the outside of the pit at finished grade, to contain water.

i. Wrap all three over 1 1/2 caliper with the specified mulching material. Wrap spirally from the ground line up to the lowest main branches and overlap approximately two inches. Secure wrapping material at the bottom, middle, and top with ties spaced a maximum of two feet apart.

j. Mulch all completed plant pits with the specified mulching material. Spread mulch evenly to a minimum thickness of three inches over the entire area of the pit, and for shrubs in beds, the

entire area of the shrub bed. Apply mulch within four days after planting.

k. Prune each tree and shrub in accordance with the American Association of Nurserymen Standards to preserve the natural appearance and character of the plant. Do not cut leaders of shade trees. Remove all dead wood, broken or badly bruised branches, or suckers using only clean, sharp pruning tools. Treat cuts over on inch diameter with the specified tree paint, covering all exposed cambium.

(1) Stake all designated trees within 24 hours of the day the trees are planted in accordance with the Standard Detail. Stakes shall be neat and secure and shall evenly support the trees to true vertical line. In driving stakes, avoid damage to branches. Drive stakes just outside the pit area. Cover guying wires with specified hose material, where in contact with the trunk and branches, and wrap two full turns around the stakes.

3. Clean up after planting

a. Perform cleanup in accordance with Section 1900.

b. Remove waste materials continuously and promptly.

c. Regrade existing turf areas which the Engineer determines have been damaged and seed or sod when so directed, at no cost to the County.

4. Low Maintenance Groundcover - Crown Vetch

a. Lime soil to produce pH between 6.5 and 7.0 using ground limestone.

b. Fertilize soil with 500 pounds of 0-20-20 and 400 pounds of 38-0-0 ureaform.

c. Mulch with straw.

d. When hydroseeding proceed, in the following sequence:

(1) Apply lime and fertilizer.

(2) Apply seed mixture with inoculant.

(3) Apply straw mulch and anchor.

C. Inspections

1. Initial inspection and provisional acceptance

   a. The Engineer or inspector will inspect all or part of the completed planting work for conditional acceptance, upon written request from the Contractor. The request shall be presented to the Engineer at least ten days prior to the anticipated date of inspection. All or part of the total landscaping project may be conditionally accepted.

   b. Upon completion of all repairs or replacements considered by the Engineer, a written notification will be sent to the Contractor notifying him of conditional acceptance.

2. Final inspection and acceptance

   a. Within ten days of the end of the guarantee period described hereinbefore the Engineer will inspect planting material, upon written notice requesting such inspection, submitted by the Contractor at least ten days before the anticipated date of inspection.

   b. Upon completion of inspection and concurrence by the Engineer that all materials meet the requirements of the Contract Documents, the Engineer will furnish the Contractor a written notification of final acceptance of landscaping.

D. Maintenance

1. Maintenance of planting material shall commence immediately after each plant is planted and shall continue until final acceptance. During such time the Contractor shall perform all work necessary to establish and maintain the plants in a live, healthy condition. Maintenance shall include the following:

   a. Watering at the end of each 14 day period, if less than one inch of precipitation shall have been recorded by the Contractor and certified by the Engineer in the area for that period. Each tree pit shall receive at least five gallons of water and each shrub pit shall receive at least two gallons.

   b. Cleaning plant pits of all weeds and grasses will be acceptable only if all Maryland Department of Agriculture regulations are followed.

   c. Pruning of dead material or removal of suckering growth.

   d. Resetting settled plants to proper grade.

e. Reshaping and remulching of washed out planting pit saucers.

f. Tightening an repairing of guying and staking apparatuses.

g. Fertilizing of chlorotic or nutrient defectant plants.

h. Replacing of dead, weak, or diseased plants.

IV. Measurement and Payment

A. Trees and Shrubs

1. Trees and shrubs accepted by the Engineer shall be measured for payment by each of the various types and sizes planted.

   Payment will be made for the quantities measured at the unit prices per each listed in the bid schedule.

2. Payment will include preparatory and maintenance work and all necessary appurtenant materials and equipment.

STANDARD SPECIFICATIONS

SECTION 2950

BORED PIPE

I. General

A. Description

This section includes provisions for boring and/or jacking carrier or casing pipes beneath roadways and railways, and preparation of bored holes for insertion of carrier pipe, as indicated on the plans in accordance with the Contract Documents.

B. Submittals

1. Submit working drawings in accordance with Section 1200, including proposed method of boring and advancing casing or proposed method of preparing bored hole for installation of carrier pipe and arrangement of equipment, method of dewatering, and the size and location of pit.

2. Submit shop drawings in accordance with Section 1200 including bulkhead details and proposed positive method of anchoring carrier pipe to prevent flotation.

C. Job Conditions

1. Bore so as not to interfere with, interrupt or endanger the roadway or railway operations.

2. Comply with all applicable jurisdictional codes and MOSHA requirements.

D. Additional criteria for work under railroads

1. For work under conrail railroads, comply with specifications for pipeline occupancy of Consolidated Rail Corporation property, CE-8. All other railroads shall be as directed by the Engineer.

II. Materials

A. Casing Pipe

1. Casing pipe shall be mill-type steel water pipe, Grade A, ends for field butt welding meeting requirements of AWWA C200. Wall thickness shall be as indicated on the standard detail and/or the plans.

a. Joints shall be fully welded around the circumference of the pipe.

B. Carrier Pipe

1. Carrier pipe for water lines shall be ductile iron as specified in Section 2550 or as directed by the Engineer.

2. Carrier pipe for sewer lines shall be PVC, ABS or ductile iron as specified in Section 2570 or as directed by the Engineer.

C. Spacers

1. The spacers for the ductile iron water lines shall be concentric support insulators manufactured by T. D. Williamson, or equal, and conform to the standard detail.

2. The spacers for the PVC sewer lines shall be wood skids which should extend for the full length of the pipe with the exception of the bell and spigot areas necessary for assembly. The leading edge of the skids shall be rounded and the skids shall be notched to allow strapping to prevent undue movement of the straps. The strapping arrangement of the skids shall conform to the standard detail.

D. Closure Seals

1. The seals for closing the ends of the casing pipes shall be U-Seals or Z-Seals with all stainless steel bands from T.D. Williamson, Inc., or equal. (Representative - Kerr Engineering Sales Co., Pittsburgh, PA.)

E. Sand shall be composed of sharp, angular grains, coarse or graded from fine to coarse with the coarser grains predominating, and reasonably free from clay, loam, dirt mica, organic matter, or other impurities.

III. Execution

A. Preparation

1. Excavate pits as required in accordance with the working drawings and Section 2200.

2. Perform preliminary work including constructing backstop, placing guide timbers and placing boring apparatus.

B. General

1. If an obstruction is encountered during installation which stops the forward action of the pipe, notify the Engineer immediately. If it becomes evident that it is impossible to advance the pipe, operations will cease and the pipe will be abandoned in place and filled completely with grout.

2. When water is known or expected to be encountered, maintain at the site

pumps of sufficient capacity to handle the flow on a 24-hour basis until in the judgment of the Engineer, their operations can be safely halted.

3. Maintain close observation to detect settlement or displacement of surface facilities. Should settlement or displacement be detected, notify the Engineer immediately and take such action as necessary to maintain safe conditions and prevent damage.

C. Boring

1. Use of water and other liquids to facilitate casing implement and spoil removal will be used only when approved by the Engineer.

2. When utilizing augers or similar devices, the front of pipe shall be provided with mechanical arrangements that will positively prevent the auger and cutting head from leading the pipe and allowing unsupported excavation ahead of the pipe.

3. Provide removable auger and cutting head arrangement.

4. Overcut by cutting head shall not exceed the outside diameter of the pipe by more than ½-inch.

5. Arrange face of cutting head to provide reasonable obstruction to the free flow of soft or poor material.

6. Push the pipe into the fill with boring auger rotating within the pipe to remove the spoil.

D. FieId Quality Control

1. When boring casing pipe, or preparing bored hole for insertion of casing pipe, maintain the line and grade indicated on the plans.

E. Installation of carrier pipe in casing pipe

1. Install carrier pipe as specified in Section 2200, 2550 and 2570.

2. Install oak skids or support insulators on carrier pipe in accordance with standard detail.

3. Fill complete void between carrier pipe and casing pipe with dry blown sand prior to completing the closing of the ends of casing pipe. Grout or flowable fill is NOT acceptable.

4. Close the ends of the casing pipe with closure seals in accordance with the standard detail.

IV. Measurement and Payment

A. Bored Pipe

1. Bored payment will be measured by the linear foot of each diameter measured as recorded on cutsheets between inside faces of boring pits.

2. Payment will be made for the quantities measure at the unit prices per linear foot listed in the bid schedule.

3. Payment will include excavation, backfill, pits, casing pipe, carrier pipe and boring equipment.

B. Non-payment Items

1. The following items will not be measured for payment but will be considered as incidental to the Contract.

   a. Monitoring of Movement

   b. Dewatering

   c. Bored hole for insertion of carrier pipe.

   d. Skids

   e. Support insulators

   f. Closure seals

   g. Sand

STANDARD SPECIFICATIONS

SECTION 2951

EARTH TUNNELING

I. General

A. Description

This section includes construction of earth tunnels 60 inches and larger; furnishing and installing tunnel liners, necessary dewatering and monitoring of movement to the limits indicated in accordance with the Contract Documents.

B. Quality Assurance

1. Fabricator Qualifications

a. Where fabricated segments for tunnel lining are to be used, the segments shall be fabricated by a qualified firm with a minimum of five years experience of similar type manufacturing and which has performed at least two representative jobs three years or older of comparable type of service and size to the project.

2. Tolerance

a. Variation in thickness of liner plates shall be ± 0.01 inch maximum.

b. Fabricate similar segments with such accuracy and uniformity in dimensions that segments will be entirely interchangeable not only in individual rings but with similar segments of other rings. Space holes accurately so that any two rings can be bolted up in any relative hole.

c. Locate grout holes to a tolerance of ± 0.50 inch. Provide bolt holes to a diameter tolerance of plus or minus 0.02 inches.

d. In making the taper offset ensure that the dimensions between the bolt pad and the flange face are not increased by more than 9/16 inch or decreased by more than 1/16 inch from the dimensions indicated, provided bolt length is adjusted accordingly.

e. Replace or correct any segment which does not comply with the tolerance indicated.

C. Submittals

1. Submit working drawing as specified in Section 1200 with pertinent

descriptions, soils data, methods of dewatering, methods of excavation and support system, and the proposed tunnel access pits for approval. Include all additional soils information and locations of surface and subsurface settlement markers if not indicated elsewhere.

2. Submit shop drawings as specified in Section 1200 for tunnel linings showing sizes, shapes, methods of attachment and connection details, and of grout holes.

3. Tunneling Method

   a. Bids shall be based on tunneling by use of tunnel shields.

   b. Submit complete detail drawings of the shield and an adequate description of the proposed method of erecting, placing and operating the shield.

   c. The Contractor may submit and alternate method for performing tunneling operations on the substitution form to the Engineer for approval.

      At the request of the Engineer, submit complete details of alternate method and pertinent calculations. Should the Engineer approve and alternate method, submit shop and working drawings as stipulated in the approval.

4. Submit certified test reports before delivery of materials as specified in Section 1100 for the list below.

   a. Gravel Packing.

   b. Linear plate segments for tunnel lining.

   c. Tunnel liner plate connectors.

   d. Protective coatings.

5. Access Shaft Design

   a. When Contract Documents do not include access shaft design, submit working drawings for access shaft design for approval.

   b. When Contract Documents include access shaft designs, the contractor may submit alternate access shaft designs equal to or greater in size than those indicated. Shaft redesign and resultant additional construction costs shall be at no expense to the County.

D. Construction Criteria

1. Tunnel construction shall be performed in a manner that will minimize movement of the ground in front of and surrounding the tunnel, and prevent subsidence of the of the surface above and in the vicinity of the tunnel. During all stages of tunnel construction, the ground shall be continuously supported and controlled in a manner that will prevent loss of ground and keep the perimeters and face of the tunnel stable. The Contractor shall be responsible for all settlement resulting from tunnel operations and shall repair and restore damaged property to its original condition at no cost to the County.

2. Comply with applicable ordinances, codes, statutes, rules and regulations of the State of Maryland, SHA, applicable County building codes, affected railroad company, and applicable regulations of the Federal Government (OSHA 29CFR 1926).

E. Job Conditions

1. Maintain the tunnel air in a condition suitable for the health of the workers at all times.

2. Stop all tunneling operation and evacuate personnel from inside the tunnel under railroads prior to train passing over operation.

3. Maintain an adequate supply of straight and tapered linear segments at the site at all times.

4. Prevent damage to protective coatings during storage and delivery. Keep wire ropes, chains or hooks from direct contact with the coated surfaces.

5. Dewatering, if required, shall be performed in such a manner so that no soil particles are present after initial 12 hours of pumping and to eliminate settlement around surrounding structures. Dewater into a settlement trap and comply with applicable environmental protection criteria specified elsewhere in these Contract Documents.

II. Materials

A. Linear Plate

1. Steel liner skin shall conform to requirements of ASTM A 569. Linear plate shall have the minimum mechanical properties of flat plate before cold forming as follows:

Tensile strength	-42000 psi
Yield strength	-28000 psi
Elongation, 2 inches	-30%

2. Bolts and nuts shall conform to requirements ASTM A307. The bolts shall have rolled threads.

3. Coatings

a. Liner plate shall be hot dipped galvanized to meet requirements of area specifications for corrugated structure plate pipe, pipe arches and arches. Bolts and nuts shall be galvanized to meet the requirements of ASTM A153.

b. Liner plate shall be bituminous coated to meet requirements of area specification for bituminous coated corrugated metal pipe and arches. Provide prime coat as required to assure compatibility with galvanized surface.

c. Delete coatings for tunnels which are to be filled with concrete after carrier pipe is in place.

B. Gravel Packing

1. Gravel packing shall be rounded gravel, clean and free from objectionable material graded as follows:

U.S. Standard Sieve Passing	Total Percent
3/4	100
1/2	85-100
3/8	70-100
#4	0-55
#8	0-15
#16	0-8

C. Grout

1. Cement shall conform to ASTM C150, Type 1.

2. Water shall be free from sulfates and other objectionable quantities of silt, organic matter and other impurities.

3. Sand shall conform to requirements of ASTM C404, Size no.1.

4. Design Mix

a. Grout shall have a minimum compressive strength of 100 psi attained within 24 hours. The grout shall remain fluid long enough to be injected through the lining and to fill the voids and shall set promptly enough to avoid grout flowing into the new annular space after the next advance.

b. The Contractor shall submit proposed grout mix composition and test results to the Engineer for approval prior to grouting. Test specimens of grout shall be made and tested in accordance with

ASTM C109.

D. Concrete

1. Concrete for cast in place invert shall meet requirements of Section 3300, Mix #3.

2. Pumped concrete for filling annular spaces after carrier pipe is in place shall meet requirements of Section 3300, Mix #1.

E. Filter Materials

1. Filter materials for dewatering shall consist of material with grain size of the following requirements:

$$R(50) = \frac{D(50) \text{ of filter}}{\text{protected soil}} = 12 \text{ to } 58\ D(50) \text{ of}$$

or

$$R(15) = \frac{D(15) \text{ of filter}}{\text{protected soil}} = 12 \text{ to } 40\ D(15) \text{ of}$$

Where R = ratio

Where D(50) = diameter at 50% passing by weight

Where D(15) = diameter at 15% passing by weight

F. Carrier Pipe

1. Carrier pipe shall be ductile iron as specified in Sections 2250 and 2570.

G. Access Shaft

1. Surface settlement markers within pavement areas shall be P.K. nails.

2. Surface settlement markers within non-paved areas shall be wooden hubs.

III. Execution

A. Equipment

1. Tunneling equipment shall be of U.S. Bureau of Mines approved type.

2. Tunnel shields shall have uniform exterior surface from leading edge of head or poling plates to the rear edge of the tail. A horseshoe shaped shield may have a closed or open bottom: a circular shield shall have a closed bottom.

3. Provide a substantially proportioned hood projecting not less than two feet beyond the shield with sufficient rear overhang of tail to provide at least 12 inches of overlap beyond the last element erected, when the shield has been shoved open to the fullest extent possible. The annular space between the tail and the lining shall be as small as current practice indicates, but in no case shall it be greater than 1-1/2 inches.

4. Provide each shield with suitably designed breast-jacks or breast-tables or both, and such other bracing as is necessary to support the face of the tunnel excavation without loss of ground.

5. Provide on each shield a propulsion system, capable of moving the shield in a forward direction, while maintaining the construction with respect to line, grade, and direction. The propulsion system shall be designed to prevent the shield from moving backward despite a failure of any element of the propulsion system and shall avoid overstressing and distortion of the lining.

6. Incorporate a seal in the tail of each shield to prevent leakage of grout into the tunnel space between the shield and lining.

7. Equip the shield with an erector arm or system capable of handling the largest sizes of lining and of erecting the sections of the lining to the required tolerances without damage to the lining.

B. Power Supply

1. All power machinery and tools, within the tunnel shall be operated by either electricity, compressed air, diesel with approved scrubber or other approved power. All electrical tools and equipment shall be grounded in accordance with the latest requirements of the National Electrical Code.

2. Provide temporary electric lights to properly and safely illuminate all parts of the tunnel construction area including special illumination at the working faces. Lighting circuits shall be thoroughly insulated and separated from power circuits. All lights shall be enclosed in wire cages. Secure all electrical permits necessary for successful completion of this work.

C. Operations by tunnel shields and machines

1. On initial set-up, support the tunnel shields or tunneling machines on a concrete cradle properly set at lines and grades which will permit the correct installation of the tunnel lining. During forward movement of the shield provide sufficient support at the excavation face to prevent movement of any materials except such materials as are physically displaced by the elements of the shield itself.

2. Control the face sufficiently using such support procedures as breasting,

poling plates, face jacks, sliding tables, either singly or in combination, spaced as necessary.

3. Advance excavation for the tunnel liner in increments sufficient for the erection of one ring of liners and install liner plates immediately after each increment of excavation. Carry on excavation in such a manner that voids behind the liner plate are held to a minimum. Completely fill such voids with grout or gravel followed immediately by grout placed under pressure.

4. Whenever tunnel excavation is suspended or shut down, the tunnel invert is below the level of groundwater; and there is danger of water infiltration from any source, maintain on duty qualified personnel to observe conditions that might threaten the stability of the heading. Contractor may substitute acceptable observation devices such as closed circuit TV that enables continuous monitoring of conditions at the face by qualified observers from outside the tunnel.

5. During shut down periods, support the face of the excavation by positive means; no support shall rely solely on hydraulic pressure.

D. Installation of tunnel linings

1. Install the tunnel lining in a manner that will not damage the lining or coating.

2. Ensure that the edges are clean and free from material that could interfere with proper bearing.

3. Install bolts for liner plates in accordance with liner plate manufacturer's recommendations and retention or replace if necessary any bolt which does not meet the requirements.

4. Assemble liners to the lines and grades shown on the Contract drawings or as directed by the Engineer.

E. Gravel packing and grouting

1. Where approved, gravel packing may be used to fill voids between the excavation and support system. For voids to be filled with gravel pack, place gravel in the voids behind liner plate by compressed air through a 1-1/2 inch or two inch hose. Provide a minimum pressure of 80 psi.

2. Filling of voids with gravel shall generally proceed from the bottom grout hole of each ring to the top hole.

3. Vent air through one of the upper holes.

4. Fill voids in the gravel pack between the tunnel excavation and the tunnel

liner with grout mix.

5. The grout pump and injection system will be of a type that will deliver the grout in such a smooth even flow without surge. The grouting circuit shall contain a return line to allow return of the grout from the nozzle to the supply tanks. The grouting equipment shall be capable of developing a uniform pressure of 50 psi at the grout hole connection and equipped with hoses with a minimum inside diameter of 1-1/2 inches. The grouting equipment shall have a minimum capacity of 1/2 cubic yards.

6. Grouting between the liner plates and excavation shall follow progressively with each adjacent set of holes provided in the liner plates.

7. In general, grouting shall proceed from the lowest grout hole of each ring and proceed progressively upward. When going from lower to higher grout holes, do not make connection to the higher holes until grout has completely filled the space below. Fill all voids completely within the working day with grout, or as directed by the Engineer.

8. Continue grouting until grout appears in the next set of grout pipes, which shall be kept open during grouting to permit escape of air and water.

F. Concrete Invert

1. Place cast in place concrete invert to the limits shown on the contract drawings in accordance with Section 3300.

G. Installation of carrier pipe inside tunnel

1. Install pipe inside tunnel where indicated on the plans.

2. Pipe and joint requirements are specified elsewhere in the Contract documents.

3. Provide bedding and anchorage in accordance with the plans.

4. Provide wooden skids or other approved devices as required to eliminate damage to pipe.

5. Where so indicated, fill annular space between pipe and tunnel with concrete having a maximum aggregate size of 3/8 inch. Provide positive means to prevent flotation.

H. Field Quality Control

1. Allowable tolerances

a. For segmented tunnel linings inside dimensions of the ring measured along any diameter shall not vary by more than three

percent of the lining diameter.

b. Construct tunnel to the line or grade indicated on the plans to allow a minimum concrete cradle thickness of four inches.

c. Establish two permanent points in the access shaft for the checking alignment and grade.

I. Detection of Movement

1. Install, maintain and make observations on a regular pattern of surface settlement markers as shown on the contract drawings or as directed by the Engineer. Include a series of surface and subsurface control points along the centerline of the crossing alignment. Tie settlement markers to bench marks and indices sufficiently remote so as not to be affected by the Contractor's operations. Take readings and permanently record prior to start of excavation.

2. Report any settlement and horizontal movement immediately to the Engineer and take immediate remedial action, at no cost to the County.

J. Access Shaft Construction

1. Provide for removal and disposal of all materials of whatever nature encountered, placing and maintaining temporary bracing, tunnel bullseyes, groundwater control, construction of access shaft, backfill as shown on the drawings, restoration of all disturbed areas, and all appurtenant work necessary to complete the excavation of the shaft.

2. Construct shafts in accordance with approved working drawings or details shown on the plans.

3. Perform excavation, backfill and grading in accordance with Section 2200 and to the requirements listed herein.

4. Bullseyes for tunnel construction shall be adequately braced prior to breaking out or holing through as approved or directed by the Engineer.

IV. Measurement and Payment

A. Tunnel liners for earth tunnel

1. Tunnel liners for earth tunnel will be measured for payment by the linear foot of each diameter measured along the centerline of the tunnel between interior faces of access shafts. Payment will be made for the quantities measured at the unit price per linear foot listed in the bid schedule.

2. Payment will include liner plate, access shafts, excavation, graveling,

grouting and concrete invert, carrier pipe, timber bulkheads and filling annular spaces with concrete or sand where indicated.

B. Non-payment Items

1. The following items will not be measured for payment but will be considered as incidental to the Contract.

   a. Monitoring of movement

   b. Dewatering

   c. Pipe restraints

STANDARD SPECIFICATIONS

SECTION 3300

CAST-IN-PLACE CONCRETE

I. General

A. Description

This section includes providing normal weight cast-in-place concrete to the sizes and shapes and to the locations indicated, in accordance with ACI 301, as modified and supplemented herein, and in accordance with the Contract Documents.

B. Quality Assurance

1. Reference Documents

a. The Contractor shall obtain and maintain on the site at all times, a copy of ACI 301 and appropriate documents referred to therein.

2. Testing shall be performed by the Engineer except where otherwise indicated herein.

3. Provide visual means of identification of reinforcing steel, size and strength, and welded wire fabric designation, in accordance with CRSI manual of standard practice.

C. Submittals by Contractor

1. Submit certified concrete mix designs including proposed ad mixtures.

2. Submit certified delivery tickets for concrete showing the following information.

a. Name and location of batch plant and name of plant inspector.

b. Ticket number.

c. Load number (batch number).

d. Date and truck number.

e. Destination including name and location of Contract.

f. Concrete type and design mix designation number.

g. Actual quantities of all materials including admixtures and amount

of concrete in cubic yards.

h. Time at which mixer drum was charged with cement.

i. Amount of free moisture by percentage of permissible mixing water in aggregates, plus maximum amount of mixing water which can be added at job site to obtain specified water/cement ratio.

j. Blank space for initials of on-site receiving party.

3. Submit certified test reports before delivery of materials as specified in Section 1100 for the items listed below:

a. Admixtures

b. Aggregate

c. Cement

d. Waterstop

e. Reinforcing and accessories

f. Materials for curing concrete

g. Joint sealing materials

h. Expansion joint fillers

4. Submit shop drawings as specified in Section 1200 for the following:

a. Reinforcing steel prepared in accordance with ACI 315 including bar lists and bending diagrams, placement drawings and special details.

b. Location, types and details of joints.

c. Sequence of pours.

II. Materials

A. Reinforcement

1. A certified copy of the mill test on each load of reinforcing steel delivered showing physical and chemical analysis shall be provided, prior to shipment. The Engineer reserves the right to require the Contractor to obtain separate test results from an independent testing laboratory in the event of any questionable steel. When such tests are necessary because

of failure to comply with this Specification, such as improper identification, the cost of such tests shall be borne by the Contractor.

2. Reinforcing bars shall comply with requirements of ASTM A-615, minimum yield strength of 60,000 psi unless other indicated.

3. Welded wire fabric shall comply with requirements of ASTM A-185, size and spacing of wires as indicated.

4. Reinforcing accessories shall conform with to requirements of CRSI Manual of Standard Practice.

5. Field welding of reinforcing steel will not be allowed.

6. Use of coiled reinforcing steel will not be allowed.

B. Admixtures

1. Air entrainment admixture shall be in accordance with table 3300-2 (note b).

2. Water reducing and retarding admixtures may be used with the permission of the Engineer. Contractor is responsible for the compatibility of admixtures.

3. Admixtures containing calcium chloride, thiocyanate or more than 0.05 percent chloride ions are <u>not</u> permitted. The addition of admixtures to prevent freezing is not permitted.

4. The Contractor shall submit manufacturer's data including the chloride ion content of each admixture and certification from the admixture manufacturer that all admixtures utilized in the design mix are compatible with one another and properly proportioned prior to mix design review by the Engineer.

C. Appurtenant Materials

1. Vapor barrier.

a. Building paper shall be sisal-kraft building paper, conforming to requirements of FS UU-B-790a.

b. Polyethylene sheeting shall be 0.006 inch thick, conforming to requirements of ASTM D2103.

2. Curing Materials

a. Curing paper shall conform to requirements of ASTM C171, type I

and shall be flame resistant. Use only non-staining material over all surfaces to remain permanently exposed.

b. Curing compound shall conform to requirements of ASTM C309, White Pigmented Type II.

c. Sheet materials shall conform to requirements of AASHTO M-171.

d. Burlap cloth for curing shall be jute, kenaf or hemp and shall conform to requirements of AASHTO M-182, Class I.

3. Expansion joint filler

a. Filler not exposed to traffic and weather shall conform to requirements of ASTM D994.

b. Filler exposed to traffic and/or weather shall conform to requirements of ASTM D1752.

4. Temporary wood joint filler shall be straight, sound strips, of width and depth indicated or approved and tapered slightly from face-to-back; coated with paraffin, or equivalent, to seal against moisture and to promote ready removal with forms; and shall produce true straight joint edges.

5. Joint sealer

a. Sealer shall be cold applied and conform to requirements of ASTM D1850.

6. Water stops

a. Waterstops for waterbearing interior and exterior structures shall be nine inches long three bulb, 3/8 inch minimum diameter rubber or neoprene waterstops conforming to requirements of U.S. Corps of Engineers Specifications CRD-C513.

b. Waterstops for all other structures requiring waterstops shall be six inches long, two bulb, 3/8 inch minimum diameter polyvinyl chloride waterstops conforming to requirements of U.S. Corps of Engineers' Specifications CRD-C572.

c. Provide manufactured special accessories at intersections.

d. Field splices shall be cut on a 45 degree angle and shall be heat sealed and shall develop a water tightness equal to that of unspliced material and shall have tensile strength of not less than 50 percent of unspliced material.

7. Bonding compound shall conform to requirements of MIL-R-19235B.

8. Coat aluminum accessories and imbedded items with an inert compound capable of effecting isolation of the deleterious effect of the aluminum on the concrete.

D. Cement shall conform to requirements of ASTM C150, Types I and II. Utilize Type III cement only when approved by the Engineer.

E. Forms of an approved design shall be furnished by the Contractor and securely fastened and braced to prevent movement during the placing of concrete. Both wood and steel forms shall be properly designed, approved by the Engineer, and installed so as to resist all working stresses without buckling or warping. The condition and stability of the forms shall produce a structure that will meet the required tolerance of deviations not exceeding one-quarter inch in ten feet in either grade or alignment. Before placing concrete against any forms, they shall be thoroughly cleaned and oiled each time they are used.

III. Execution

A. Design Mix

1. Design strength

a. If not indicated otherwise specified 28 days comprehensive strength of concrete shall be in accordance with Table 3300-2.

2. Mix proportioning

a. The concrete ingredients with the exception of water shall be proportioned by weight. Water may be proportioned by volume. The mix shall be homogeneous, readily placeable, uniformly workable and meet the requirements of table 3300-2.

b. Required average strength: these requirements are applicable to mixes nos.1 through 6. Required average strength is in accordance with the American Concrete Institute Standard 214-65 with the following exceptions:

c. A specimen is defined as consisting of one cylinder, and a test is defined as the average strength of two companion cylinders. Statistical computations are based on a population size of thirty or more specimens. To estimate standard deviation and coefficient of variation. (N-1) will be used as divisor.

d. A probability of not more than one in ten test falling below the specified strength will be used to compute the required average strength for the following conditions:

(1) When past performance record are available: the documented performance records of the producer consisting of a minimum of thirty consecutive twenty-eight day strength specimens from a similar project having the same mix used within the last one year shall be analyzed to establish a coefficient of variation. The required average strength will be determined on the basis of the computed coefficient of variation.

(2) When performance records are not available: a coefficient of variation of 20 percent shall be used to compute the required average strength for mixes nos. 1 through 5. The required average for mix no. 6 shall be based on a coefficient of variation of 15 percent.

e. The air content shall be determined in accordance with AASHTO T152 or T196. The slump shall be determined in accordance with AASHTO T119 and shall conform to the requirements included in table 3300-2. Compression test specimens shall be made in accordance with the provisions of AASHTO T23. An average of two 28 day strength cylinders shall be used for the purpose of mix approval. Curing facilities, fabrication and removal of specimens from molds after the specified curing period and delivery of same to the approved laboratory will be the responsibility of the Contractor.

f. During the progress of the work, adjustments in the required average strength shall be made as follows:

(1) The average strength (x) and coefficient of variation (v) shall be computed upon availability of strength data comprising a minimum of thirty cylinders. Should these determinations indicate an excessive margin of safety, the concrete mix may be modified to produce a lower average strength as approved by the Engineer, but in no case shall the cement content be reduced to less than that indicated in table 3300-2. Should determinations indicate a lower average strength and/or a higher coefficient of variation than anticipated, corrective measures shall be taken immediately.

Acceptance of materials shall be based on the requirements outlined in Table 3300-2

For the purpose of conforming to one in ten probability, an average of two companion strength specimens shall be used. For the samples having strengths below the design specified strength. Any adjustment in mix will, however, be based on the evaluation of thirty consecutive specimens.

The Contractor shall furnish the necessary molds conforming to ASTM C470, except that paper molds will not be used.

Control testing shall be performed in accordance with the following requirements:

Table #3300-1

Tests	Method	Sampling Frequency	Responsibility
Slump*	AASHTO T 119	1 per 50 cubic yards or fraction thereof	Project Engineer
Air Content	AASHTO T 152 or T 196	1 per 50 cubic yards or fraction thereof	Project Engineer
Compression	AASHTO T 23	2 companion cylinders, 100 cubic yards or fraction thereof: as randomized and directed by the Engineer.	Molding, Curing & sample delivery to State lab is the Contractor's responsibility as monitored by the State inspector

* If first test fails, a check test shall be run. Acceptance or rejection shall be on the basis of second test.

B. Formwork design and construction

1. Design, engineering and construction of formwork shall be the responsibility of the Contractor.

   a. Chamfer all exposed concrete corners of edges not less than 3/4 inch in dimension.

   b. Removable form ties will not be permitted in water retaining structures.

2. Design and construct to support loads in accordance with ACI-347 within the tolerances specified in ACI 301.

3. Provide form coatings as required to produce desired finish.

4. Schedule for removal of forms, falsework and centering.

a. Maintain forms, falsework and centering in place until the concrete has attained the minimum percentage of strength listed below in schedule 1. When approved by the Engineer, values between schedule 1 and schedule 2 may be used for removal and shall take into account, where applicable, the following: the ratio of dead load to live load, span, height, shape, ratio of rise to span reshoring, prevailing site conditions.

Minimum percent of specified
28 days design strength, f'c

	Schedule 1	Schedule 2
Footings; sides of beams, slabs and Beams on grade----------	25	20
Free standing walls, columns and Piers----------	50	30
Exter. walls, retain. walls----------	50	30
Roofs----------	80	50
Stairways----------	80	60
Soffits of beams, slabs and girders under 20 ft. clear span between supports----------	80	60
Over 20 ft. clear span between supports	90	70
Cantilevers, canopy----------	90	70

b. The Engineer will approve removal of the forms, falsework and centering from the types of structural members listed above, and form types not listed providing the concrete has attained the design strengths between Schedule 1 and Schedule 2, and the Contractor has satisfied the following requirements:

(1) Submit to the Engineer calculations showing the concrete strength to be attained at the proposed time of removal of formwork, falsework and centering.

(2) Include in the calculations all loads and the resultant stresses and deformations to which the concrete and reinforcing steel will be subject at the time of removal, and subsequent to the removal, of forms, falsework and

centering, until the concrete has attained its design strength.

(3) The concrete strength attained prior to removal of forms, falsework and centering shall be determined from tests of job-cured cylinders which shall be cured under conditions which are not more favorable than the most unfavorable conditions for the portions of concrete which the test specimens represent.

(4) Provide three cylinder per sample as shown on Table # 3300-1. Samples of material used in structures will be taken at such times as the Engineer deems necessary. The costs of making these tests of samples will be paid by the owner of County, but the Contractor shall cooperate by assisting the representative of the Engineer in securing samples and packing them for shipment to the laboratory. Do not start removal of forms, falsework and centering without permission from the Engineer.

(5) Test shall be in accordance with ASTM C31 except as modified herein.

a. Subsequent to removal of forms, falsework and centering and prior to attainment of design strength by the concrete, the loading conditions shall not be increased so as to result in stresses and deformations beyond those permissible at the attained strength of concrete determined as specified herein.

b. It shall be the responsibility of the Contractor to demonstrate conclusively that the strength of concrete specified has been attained.

(6) The use of earth cuts in undisturbed earth as forms for small foundations will be permitted provided cuts are vertical, sharp and true.

C. Mixing

1. Batch mixing will not be allowed without the approval of the Engineer.

D. Placing

1. Place reinforcement with concrete cover as specified in ACI 318 unless otherwise indicated.

2. Notify the Engineer before placing concrete. Wet down formwork and

reinforcement before placing concrete so as to prevent leaching of water from concrete, but do not allow free water standing in the forms.

3. Place concrete within 90 minutes after cement has been mixed with aggregate and within 45 minutes after addition of water and admixtures. Discard concrete which has not been placed within these time limits off site. The free drop of concrete shall not exceed five feet without the use of adjustable length pipes.

4. Locate joints where indicated on the drawings. If not noted, provide control joints as follows:

   a. Provide bond breaker with 1/2 inch expansion joint material at junction of walls, bases and columns.

   b. Provide 1/2 inch expansion joint material at changes in direction of slabs, or abrupt changes in width and not greater than twenty (20) feet apart on slabs without control joints.

   c. Seal control joints in exterior slabs.

E. Curing and Protection

1. Concrete shall be cured in one of the following methods:

   a. Polyethylene membrane shall be placed as soon as practicable without injury to the finished concrete. The polyethylene shall be rolled out and held in place temporarily by a window of earth placed just outside the forms. The polyethylene shall be lapped about 12 inches and be held with sand.

   b. Non-bituminous liquid curing compound shall be applied before any marked dehydration has taken place, covering the structure by means of an approved hand or motor-driven spray operated at a pressure of not less than 40 pounds nor more than 60 pounds per square inch. Apply uniformly at a rate of not less than 0.034 nor more than 0.040 gallons per square yard. Unless the surface is completely sealed with one application, additional material shall be added as directed. Sealer shall be admitted for approval and shall be non-staining.

F. Finishes

1. The top surface of all structures shall be brought to a smooth and uniform texture by hand floating.

2. Honeycomb work may be rejected. Undesirable or rejected work shall be repaired, removed or replaced at the Engineer's discretion without additional compensation. Repairing or finishing shall be done

immediately after removal of forms. All holes, honeycomb spots, broken corners or edges and other defects shall be thoroughly cleaned and wetted with water and carefully pointed and trued with a mortar of the same brand or type of cement and fine aggregate mixed in the proportions used in the class of concrete being finished. All surfaces shall be kept wet during the finishing operation.

G. Removal of defective concrete

1. Concrete not meeting the requirements specified herein shall be removed, disposed of and replaced by the Contractor at no cost to the County.

IV. Measurement and Payment

A. Measurement of concrete work for payment will not be made under this section. Concrete work is considered supplemental material required in the construction of specific items that will be measured and paid for under various other items in the bid schedule.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Mix No./ MD. SHA No.	28 Day specified Design Comprehen-sive Strength	General Use	Min. Cement Content lbs/yd^3	Max. Water Cement Ratio By Wt.	Concrete Temp. (F)	Aggregate Size AASHTO M43 Size	Entrained Air (Percent)	Slump inches
1	2500	Massive Unrein-forced Sections, Slope Protection	470	0.55	70 ± 20	#57 or #67	6 1/2 ± 1 1/2	2 to 5
2	3000	Incidental Structures	560	0.50	70 ± 20	#57 or #67	6 1/2 ± 1 1/2	2 to 5
3	3500[b]	Structures and Substructures	610	0.50	70 ± 20	#57 or #67	6 1/2 ± 1 1/2	2 to 5
4	3500	Concrete Depositied Under Water	650	0.55	70 ± 20	#57 or #67	None	4 to 8
5	3500	Thin Reinforced Sections	610	0.50	70 ± 20	#7	6 1/2 ± 1 1/2	2 to 5
6	4500[b]	High Strength	650	0.45	65 ± 15	#57 or #67	6 1/2 ± 1 1/2	2 to 5

a. When concrete is exposed to water exceeding 15000 ppm salt content, or sewer gass, Type II cement shall be used. Type I or Type II cement shall be used for all other concrete.

b. Type D- Retarding admixture or Type A - Water Reducing Admixture shall be added to bridge, box culvert and retaining wall concrete.

STANDARD SPECIFICATIONS

SECTION 3360

PRECAST CONCRETE UTILITY STRUCTURES

I. General

A. Description

This section includes providing precast concrete utility structures including manholes, valve and meter vaults, to the configurations and extents indicated in accordance with the Contract Documents.

B. Quality Assurance

1. Precast concrete shall be supplied by a qualified firm with a minimum of three years of continuous operations and which has performed at least three jobs comparable to the precast work required for this contract, and which are incorporated into projects completed more than three years.

2. Inspection and testing

a. The Engineer may inspect and test all sections, fittings and joint material upon delivery to the site or at the factory. The supplier shall furnish materials to be tested and labor as required to assist the Engineer with the tests.

b. The Contractor shall provide ample space between rows of stockpiled sections to facilitate adequate inspection.

c. The Contractor shall provide the County inspector, prior to inspection of sections for an order, with the complete County Contract number, Contractor's name, section sizes and footage or number of pieces required to fill the order.

d. The Contractor shall provide evidence tot he County Inspector, prior to inspection, that there is an adequate quantity of sections available of the required sizes and designs for inspection.

e. Concrete compressive strength shall be determined from compressive tests made on concrete cylinders. Unless otherwise specified, the Contractor shall retain an independent testing facility approved by the Engineer for the purpose of molding and testing concrete cylinders in accordance with appropriate ASTM requirements. Results of all tests shall be submitted to the Engineer. The Engineer reserves the right to require core samples of finished products when he deems it necessary.

f. All concrete cylinders shall be cured under the same environmental conditions as the precast items of which they are representative.

g. The Contractor shall notify the Engineer at least three working days prior to casting any structure.

h. Based upon the above required notice, the Engineer reserves the right to perform random inspections of the manufacture of manholes, vaults, and other items being produced for the County's use for the purpose of inspecting the following:

(1)Steel placement, (2) steel size, (3) overall fabrication, (4) workmanship, (5) and any other general or specific aspect of production and specification compliance.

C. Submittals

1. Submit working drawings in accordance with Section 1200 including complete details, pertinent calculations, design loads, materials, strengths, sizes and thicknesses, joint and connection design and details.

II. Materials

A. Materials shall be in accordance with Section 3300 as supplemented herein.

1. Precast concrete manholes and vaults

a. Precast concrete manholes shall meet requirements of ASTM C-478 with configurations as shown on the Standard Details and shall be constructed of Type II cement per ASTM C150 having a compression strength of 4,000 psi.

(1) The joint design and gasket material shall be in accordance to the requirements of ASTM C 361.

(2) Precast manholes shall be supplied with either concentric cones or flat slab top as shown on Plans and the Standard Details.

B. Precast concrete manholes shall be furnished with waterstops, sleeves and openings as noted on the Drawings. Box out for wall pipes shall conform accurately to the sizes and elevations of the adjoining pipes. Precast manholes shall be watertight and conform to the requirements of ASTM C-478 with reinforcing steel of ASTM A615, Grade 60 bars and the following modifications there to:

1. The minimum wall thickness shall be 8 inches.

2. The date and time of manufacturer shall be marked inside each precast sections.

3. No more than two lift holes may be cast or drilled in each section.

4. Precast concrete vaults shall meet requirements and configurations indicated on the Plans and the Standard Details.

5. Each manhole section or other precast structure component shall be clearly marked on the outside near the top with the following information where applicable. ASTM designation, Standard Detail or drawing number, station location or manhole number designation, date of manufacture and name or trademark of manufacturer.

III. Execution

A. Execution shall be in accordance with Sections 2200, 2550 and 2570.

IV. Measurement and Payment

A. Precast Concrete Manholes and Vaults

1. Precast manholes and vaults are paid for under other sections of specifications.

STANDARD SPECIFICATIONS

SECTION 4200

MASONRY

I. General

A. Description:

This section includes providing masonry work above and below grade to the sizes and shapes and at the locations indicated in accordance with the Contract Documents.

B. Submittals

1. Samples

a. Sample wall panels for above grade work: before installation of masonry wall, erect at the job site sample wall panels four feet high and wide for each type of wall required. Panels shall show the proposed color range, texture, bond, mortar joint and workmanship of masonry materials. Provide separate panels for facing brick and glazed masonry units as composite wall, and glazed concrete block masonry unit partitions. Do not proceed with masonry wall work until the Engineer has approved the sample panel for the work involved. The approved panels shall become the standard of comparison for all masonry work built of the materials that the approved panels include. Do not alter, move or destroy the panels until all masonry work is complete.

b. Sewer and manhole brick samples; submit at least five bricks prior to purchase and delivery of each type required. Do not purchase brick until the Engineer has approved the samples.

c. Concrete block samples: submit at least five blocks of each type required prior to purchase and delivery. Do not purchase blocks until the Engineer has approved the samples.

d. Reinforcement accessories: submit two samples of each type of wall reinforcement anchor, wall ties and other accessories to the Engineer for approval.

e. Provide sample cubes of mortar to the Engineer as directed.

2. Submit certified test reports before purchasing materials as specified in Section 1100 for all materials furnished under this section.

3. Submit certificates of compliance before delivery for prepackaged mortar

mix.

4. Submit shop drawings as set forth in Section 1200 for reinforcing and lintels.

C. Delivery and Storage

1. Deliver cement, lime and other cementitious materials to the site and store in unbroken bags, barrels or other approved containers, plainly marked and labeled with the manufacturer's names and brands. Store mortar materials in dry, weathertight sheds or enclosures, in such a manner as will prevent the inclusion of foreign materials and damage by water or dampness. Handle masonry units so as to avoid chipping and breakage. Materials stored on newly constructed floors shall be stacked in such a manner that the uniformly distributed loading does not exceed 50 psf.

II. Materials

A. Brick

1. Brick shall match samples on file in the Engineer's office.

2. Facing brick shall conform to the requirements of ASTM C216, Grade SW, Type FBS. Exposed face shall contain no visible cracks.

3. Common brick shall meet requirements of ASTM C62, Grade SW, Type FBS where exposed to weather or in contact with the earth, and Grade SW or MW, Type FBS for other locations. Average dimensions shall be within the range of 2-1/8 to 2-1/2 inches high, 3-3/8 to 4 inches thick, and 7-1/2 to 8-1/2 inches long.

4. Sewer and manhole brick shall meet requirements of ASTM C32 and shall have a high and uniform degree of resistance to frost action in the presence of moisture.

All brick utilized in water and sewer structures and manholes, including the brick for channel lining, shall be sewer brick Grade SS.

B. Concrete Block

1. General

a. Concrete block units shall be made from Portland Cement and clean, well graded aggregates, free from dust or other injurious matter, and shall be thoroughly seasoned, whole, sound and free from cracks or other defects that interfere with the proper placing or impair the strength or permanence of the construction. Concrete block units shall be manufacturered not less than 30

days prior to being used and stored under cover until shipment.

b. Surfaces of units which are to be plastered or stuccoed shall be sufficiently rough to provide a suitable bond; elsewhere, exposed surfaces of units shall be comparatively smooth and of uniform texture.

c. Provide units conforming to ACI 530.1 unless otherwise specified.

2. Hollow load-bearing units shall conform to requirements ASTM C90; Grades N-1 units shall be provided for exterior and foundation walls; Grades N-I or N-II or S-I or S-II units shall be provided for other load-bearing walls and partitions.

3. Hollow non-load-bearing units shall conform to requirements of ASTM C129 Types I or II for interior non-load-bearing walls and partitions, except that load-bearing units may be provided in lieu of non-load-bearing units.

4. Solid load-bearing units shall conform to requirements of ASTM C145, Grades S-I or S-II, except that units exposed to weather shall be Grades N-I or N-II. Solid units shall be provided for masonry bearing under structural framing members as indicated.

5. Special shapes such as closures, header units and jamb units, shall be provided as necessary to complete the work and shall conform to the applicable portions of the specifications for the units with which they are used.

6. Glazed concrete masonry units shall be lightweight concrete block, with finished and exposed surfaces covered at point of manufacture with a compound containing at least 75 percent graded silica sand, cast onto base block by an external heatpolymerizing process. Block shall conform to requirements of ASTM C90 and C129 for load-bearing and non-load-bearing units.

a. Facing material shall conform to requirements of ASTM C129 Grade G with respect to imperviousness, resistance to fading (chemical resistance), opacity and tolerances on dimensions, and when tested as per ASTM E84, shall have a flame spread index and other fire characteristics as per local requirements units tested for shrinkage in accordance with ASTM C426 shall be free from crazing. The facing shall return over ends and edges of the block, forming a lip at least 1/16 inches thick, resulting in 1/4 inch exposed mortar joint. When tested for abrasion, the facing shall have a wear factor not in excess of 130 in accordance with FS 141A/0192, using a calibrase wheel and a 1,000 gram weight of 500 wear cycles.

b. The glazed surface shall be free from chips, cracks, pinholes, and other imperfections detracting from the appearance of the finished wall when viewed at five feet, at right angles to the wall.

7. Sound absorbing structural masonry units shall conform to requirements of ASTM C90 and C129 for load-bearing and non-load-bearing units. Units shall have one end of the cavities tightly closed. Slots and edges shall be straight and clean. Specially fabricated filler elements of incombustible fibrous material shall be factory installed. Where indicated, fillers shall have metal septa laminated to one side of the fibrous material and installed with the septa facing away from the slots. Where indicated, install metal septa without fibrous material. Sound absorption qualities shall meet the criteria specified in the special provisions, with noise reduction in accordance with ASTM C423.

8. Admixtures will not be allowed without the approval of the Engineer.

C. Accessories

1. Oakum and caulking compound as required for the proper installation of all concrete block masonry shall be as approved by the Engineer.

2. Horizontal joint reinforcement shall be fabricated from cold-drawn steel wire, conforming to requirements of ASTM A82. The wire shall be zinc-coated after fabrication by the hot-dip process in accordance with ASTM A153 either bright steel, copper-clad steel, or zinc-coated after fabrication. Reinforcement shall consist of two or more parallel longitudinal wires, not less than 0.1875 inches in diameter, welded connected with cross wires, not less than 0.1350 inches in diameter. Cross wires shall be crimped to provide an effective moisture drip in wall cavity. The out-to-out spacing of the longitudinal wires shall be 1-1/2 to 1-3/4 inches less than the actual width of the masonry. The distance between welded contacts of cross wires with each longitudinal wire shall not exceed 16 inches. Joint reinforcement shall be provided in flat sections, not less than ten feet in length, except that the corner reinforcements and other special shapes may be less in length.

3. Anchors and ties shall be of approved designs, and shall be of copper-clad steel, zinc-coated steel, or non-corrosive metal having the equivalent total strength of steel types. Zinc coated items shall be coated by the hot-dip process after fabrication. Zinc-coated items shall have a minimum of 1.25 ounces of zinc per square foot of surface when tested in accordance with ASTM A90.

a. Wire mesh ties shall consist of wire, not less than 0.0625 inches in diameter, in 1/2 inch mesh and of suitable width and length.

b. Corrugated metal ties shall be not less than 7/8 inches wide by approximately seven inches long and not lighter than 18 gage.

c. Rigid steel anchors shall be not less than one inch wide, 3/16, 1/4 inches thick and 18, 24 inches long between bent ends. Each end shall be bent down not less than three inches into the mortar-filled cells.

4. Fastening including suitable bolts, metal wall plugs or other approved metal fastenings shall be provided for securing furring to masonry and elsewhere as necessary.

5. Through wall flashing shall be copper or corrosion resistant steel flashing and shall be provided with factory fabricated deformations that mechanically bond flashing against horizontal movement in all directions. Such deformations shall consist of dimples, diagonal corrugations or a combination of dimples and transverse corrugations. Copper flashing shall be six-ounce weight conforming to requirements of FS-QQ-C-576. Corrosion resistant steel shall be 0.006 inch thick, conforming to requirements of ASTM A167, sheet or strip, Type 301, 302, 304, or 316, with a No. 2d or No. 2 finish sheet and strip respectively.

6. Cement for mortar shall conform to the requirements for Type II, ASTM C150.

7. Sand for mortar shall be composed of sharp, angular grains, coarse or graded from fine to coarse with the coarser grains predominating, and reasonably free from clay, loam, dirt, mica, organic matter, or other impurities. Sand containing more than five percent (5%) by weight of foreign material shall not be used. Sand shall be screened to reject all particles of a greater diameter than one-quarter inch (1/4") and shall not contain more than five percent (5%) by weight of very fine material. Sand exhibiting more than an acceptable amount of fine matter or impurities shall be washed after delivery or shall be rejected altogether.

III. Execution

A. Environmental Conditions

1. General

a. Cover completed work each day to prevent rain or melting snow from penetrating the mortar of upper courses. Do not uncover until immediately before new work is to be laid. Protect new masonry for a period of not less than 72 hours immediately following laying. This time period may be extended by the Engineer.

b. Spray masonry laid during the period from April to November, inclusive, with sufficient water so as to be moist, but not saturated with water just prior to use.

2. Cold Weather

Do not lay masonry when the air temperature is below 40 degrees Fahrenheit on a falling thermometer, or when it appears probable that temperatures below 40 degrees will be encountered before the mortar has set, unless adequate means approved by the Engineer are provided for protecting the work from freezing. protect work by heating and maintaining the temperature of the masonry materials at not less than 40 degrees but not more than 160 degrees and maintaining an air temperature above 40 degrees on both sides of the masonry for not less than 72 hours. Work will not be permitted with or on frozen materials. Masonry work may be started at 34 degrees on a rising thermometer, with the approval of the Engineer. When the temperature reaches or is above 40 degrees proceed as under warm weather conditions. However, protect the new work against freezing weather for a period of 72 hours after the masonry is laid.

3. Hot Weather

During hot weather, protect masonry from direct rays of sun. Cover, and/or wet all finished work for a period of seven days after laying.

B. Mortar

1. All mortar shall be composed of the cement and sand specified. For brick masonry, the proportions by volume shall be one part of cement to two parts of sand.

2. Mortar proportions for laying up concrete block throughout the work shall be of the following types in accordance with ASTM C270: for foundation walls, and work below grade, Type M. For all other masonry work, Type S.

3. Mix mortar in a mechanically operated batch mixer of the drum type. Hand mixing will be permitted provided the quantities of materials and water are accurately measured and provided that the method of mixing is approved by the Engineer. Thoroughly mix cement, lime and sand dry, and then mix for at least four minutes after adding water. Do not use mortar that has obtained its initial set or has been mixed for longer than 30 minutes.

4. Mortar for parging masonry walls below grade shall be composed of one part Portland cement, 1/4 part hydrated lime and three parts sand.

5. Grout shall consist of a mixture of cementitious materials and aggregate as specified hereinafter; water shall be added in sufficient quantity to produce a fluid mixture. Fine grout shall be provided in grout spaces less than two inches in any horizontal dimension or in which clearance

between reinforcing and masonry is less than 3/4 inch. Coarse grout shall be provided in grout spaces two inches or greater in all horizontal dimensions and where clearance between reinforcing and masonry is not less than 3/4 inch.

a. Fine grout shall be mixed in proportions of one part Portland Cement, 1/4 part lime paste and three parts sand.

b. Coarse grout shall be mixed in proportions of one part Portland cement, 1/4 part lime paste, three parts sand and three parts pea gravel passing a 3/8 inch sieve.

C. Placing

1. Workmanship

a. Lay masonry plumb, true to line, with level and accurately spaced courses with reveals and corners plumb and true, and each coarse breaking joint with the coarse below. The height of all coarses shall be determined by the use of a story rod. Joints shall be 3/8 inch unless otherwise indicated. All joints shall be struck vertically and horizontally.

b. Build chases and openings for pipes and castings and build in pipes and castings as indicated on the plans and standard details or as directed. Provide waterproof joining.

c. Cut masonry around frames in the best possible manner, and flush up interstices between masonry and frames solid with mortar. Do not break concrete block wall units with hammers or other tools. Cut, where required, with an electrically operated carborundum saw.

d. Build in wood blocking, adjustable wall furring anchors, strips, grounds, wedges, pipe sleeves, frames and similar items of material necessary to properly secure the work for other trades.

e. Remove mortar which has splashed or been smeared on finished surfaces with stiff bristle brushes as the work progresses. Provide jamb units of shapes and sizes required to blend with wall units.

2. Lintels

a. Provide lintels for all opening heads in masonry walls, of reinforced precast concrete or of concrete units filled with concrete plus steel angles to support exterior brick where required.

b. Reinforced precast concrete lintels unless other wise indicated shall be eight inches high and the thickness of the wall, reinforced

with two No.5 reinforcing bar unless indicated otherwise. Provide a minimum of six inches of bearing at each end.

Exposed work shall be of the same material and texture as the adjoining masonry units. Build lintels on the ground and allow to set at least six days before being moved.

c. Bond beams and lintels formed of concrete masonry units shall have the cells filled solidly with grout and concrete. Provide not less than two No. 5 reinforcing bars, unless indicated otherwise. Lap reinforcing a minimum of 24 bar diameters at splices. Break bond beam and reinforcing at control joints.

3. Reinforcing

Provide welded wire tie reinforcement where indicated in every other course and below openings in walls of concrete masonry units. Reinforcement shall be continuous except that it shall terminate on each side of control joints. Extend reinforcement above and below openings not less than 24 inches beyond each side of openings. Provide reinforcement in the longest available lengths, utilizing the minimum number of splices. Overlap splices not less than 12 inches. Provide special form pieces with the same size members at the corners and intersections of walls. Tie intersections of non-load-bearing partitions with corrugated metal anchors at maximum intervals of two feet, or bond alternate courses. Embed reinforcement in the mortar joints so that all parts will be protected by mortar.

4. Parging

Parge exterior masonry in contact with the earth with two coats of Portland cement mortar, each 3/8 inch thick. The first coat shall be cross-scratched; the second coat shall be troweled smooth, beveled at the top and covered out at the edge of the footing. Extend parging not more than four inches above grade, unless indicated otherwise, and keep damp for at least three days.

5. Flashing

Provide through-wall flashing as indicated. Unless indicated otherwise, extend flashing from a point 1/2 inch from exterior face of walls, upward across wall cavity into mortar of bed joint for backing wythe. Terminate 3/4 inch back from interior face of walls and turn back on itself not less than 1/2 inch. Firmly secure flashing to provide a watertight joint as indicated. Provide flashing in lengths as long as practicable. Lap ends not less than 1-1/2 inches for interlocking type ends and four inches for other types which require cementing to provide watertight construction.

6. Voids Filled With Grout

Perform grouting from the interior side of walls, except as approved otherwise. Protect sills, ledges, offsets and other surfaces from grout droppings; grout falling on such surfaces shall be removed immediately . Stir grout well before placing to avoid segregation of the aggregate. Assure that grout is sufficiently fluid to flow into joints and around reinforcing without leaving voids. Place grout by pumping or pouring from buckets equipped with spouts, in lifts not exceeding four feet. Keep pours 1 1/2 inches below the top of masonry units in top course, except at the finish course. "Float" bricks into grout to a position within not less than 1/2 inch nor more than two inches of grout surrounding bricks. Puddle or agitate grout thoroughly to eliminate voids without displacing masonry from its original position. Remove masonry displaced by grouting operation and lay in realignment with fresh mortar.

7. Brick

a. Lay brickwork in common bond. Fill all joints between bricks completely with mortar. Form bed joints with a thick layer of mortar. Form bed joints with a thick layer of mortar, which shall be smoothed. Form head joints by applying to the brick to be laid, a full coat of mortar on the entire end, or on the entire side, as the case requires, and then shoving the mortar covered end or side of the brick tightly against the brick laid previously; the practice of buttering at the corner of brick and then throwing mortar or scrappings into the empty joints will not be permitted. Lay closure brick with a bed joint and with head joints. Place the brick carefully without disturbing the brick previously laid. Properly bond each course of load-bearing wall and exterior wall at corners and intersections. Dry or butt joints will not be permitted. Provide grouting where indicated.

b. Brick-faced walls: brick-faced walls will consist of backing of concrete masonry units, faced with brick. Bond the facing and the backing in every seventh course with brick headers overlapping or extending not less than four inches into a recessed portion of backing units. Use bats only for closures. At the Contractor's option, anchor the facing and backing with metal ties at the rate of one tie to each 4 1/2 square feet of wall surface, staggered in alternate courses, and spaced vertically not over 18 inches and horizontally not over 36 inches. Provide additional bonding ties spaced not more than three feet apart around the perimeter and within 12 inches of the opening at all openings.

c. Fill collar joints in solid brick or brick-faced by parging the back of the facing or the outside face of the backing with a uniform trowel coat of mortar, not less than 3/8 inch thick. Apply parging so that the alignment and the bond of the masonry units will not be disturbed. Filling collar joints by slushing will not be permitted.

d. Construct brick sills as follows: lay brick on edge, sloped and projected not less than 1/2 inch beyond the face of the wall to form a wash and drip. Fill all joints solidly with mortar and tool.

8. Concrete Masonry Unit Work.

a. Lay the first course of concrete masonry units in a full bed of mortar for the full width of the unit. Lay succeeding courses with broken joints. Form bed joints by applying the mortar to the entire top surfaces of the inner and outer face shells. Form head joints by applying the mortar for a width of about one inch to the ends of the adjoining units laid previously. The mortar for joints shall be smooth, not furrowed, and shall be of such thickness that it will be forced out of the joints as the units are being placed in position. Where anchors, bolts, and ties occur within the cells of the units, fill such cells with mortar or grout as the work progresses. Use concrete brick for bonding walls, working out the coursing, topping out walls under sloping slabs, distributing concentrated loads, backing brick headers and elsewhere as required.

b. Provide control joints where indicated if the sawed type, or built-in type, as the case requires. Fill joints with a properly formed synthetic rubber or vinyl plastic sealing strip as indicated.

c. Lay sound absorbing structural masonry units with the open ends of the cavities facing downward in a full bed of mortar. Expose the slots to the area where sound absorption is required. Keep slots free of mortar and debris above the mortar joints.

9. Masonry Work in Utility Structures

a. Use sewer brick wherever brick construction is exposed to flow; otherwise, use manhole brick. Lay sewer brick on edge so that the 2-1/4 x 8 inch side is exposed to flow. In the inverts the joints shall not exceed 3/16 inch in thickness, and each brick shall be laid with full mortar joints on the bottom, sides and ends in one location. Grouting or working in mortar after the brick has been laid will not be allowed.

b. Where practicable, lay each course with a line. For courses curved or in non-parallel planes, use bonded and keyed brick construction. Do not exceed a joint thickness of 3/8 inch in straight courses in parallel planes; for courses curved or in non-parallel planes, make the thickest part of the joint as thin as practicable.

Rack or tooth uncompleted brick and block construction and parge non-exposed surfaces with 1/2 inch of mortar.

D. Finishing

a. Clean exposed masonry. At the completion of the masonry work, point holes in exposed masonry and cut out defective joints and tuck point solidly with mortar. Thoroughly wet exposed surfaces of exterior and interior brickwork with clear water and scrub with a solution of not more than one part of muriatic acid to nine parts of water, applied to an area not over 15 to 20 square feet at a time, with a stiff fiber brush. Immediately after cleaning, rinse each area thoroughly with clear water. Protect work which may be damaged, stained or discolored during the cleaning process. Restore work that is damaged, stained or discolored to its original condition, or replace, at no cost to the County.

IV. Measurement and Payment

A. Measurement of this work for payment will not be under this section. Masonry work is considered supplemental material required in the construction specific items of work that will be measured and paid for under various items in the bid schedule.

STANDARD SPECIFICATIONS

SECTION 5500

MISCELLANEOUS METALS

I. General

A. Description

This section includes providing miscellaneous metal items including all anchors, fasteners, hardware and accessories necessary to complete the work as indicated, in accordance with the Contract Documents.

B. Submittals

1. Submit shop drawings in accordance with Section 1200 showing the following:

a. Sizes, finishes, all materials, locations, attached hardware and fittings, and details for all items and fabricated metal work, threaded fasteners and welds. Indicate all welds, both shop and field, by symbols conforming to AWS standards.

b. Furnish setting diagrams, erection plans, templates, and directions for the installation of backing plates, anchors, and other items.

c. Submit catalogue descriptions of manufacturer's standard items.

C. Delivery, handling and storage

1. Identify, and match mark if applicable, all materials, items and fabrications, for installation and field assembly.

2. Wherever practicable, deliver items to job site as complete units, ready for installation or erection, with all anchors, hangers, fasteners and miscellaneous metal items required for installation.

3. Provide adequate storage facilities at the job site for the protection and storage of all delivered materials. Handle and store in such a manner as to not damage factory finishes. Repair damaged finishes at no cost to the County.

II. Materials

A. Standard items

1. Whenever practicable, items shall be standard products, meeting the requirements specified herein, of a manufacturer regularly engaged in

production of such items.

B. Shapes and bars

1. Mild steel shall conform to requirements of ASTM A36, unless otherwise indicated.

2. Corrosion resistant steel shall conform to requirements of ASTM A242, 0.25 to 0.75 copper.

3. Stainless Steel shall conform to the requirements of ASTM A276, Type 304.

4. Aluminum shall conform to requirements of ASTM B221.

C. Plate, sheet, strip

1. Mild steel shall conform to the requirements of ASTM A36, or A283, Grade C.

2. High strength Steel shall conform to requirements of ASTM A242.

3. Corrosion resistant steel shall conform to requirements of ASTM A242, 0.25 to 0.75 copper.

4. Stainless Steel

a. Over 1/8 inch shall conform to requirements of ASTM A264 with ASTM A240, Type 304 or ASTM A36 base.

b. Under 1/8 inch shall conform to requirements of ASTM, A167, Type 304.

5. Aluminum shall conform to requirements of ASTM B209.

D. Mild steel forgings shall conform to the requirements of ASTM A235, Class F.

E. Castings

1. Grey iron shall conform to requirements of ASTM A48, Grade 30.

2. Malleable iron shall conform to requirements of ASTM A47, Grade 35018.

3. Ductile iron pipe shall conform to requirements of ASTM A536, Grade 60-40-18.

4. Nodular iron shall conform to requirements of ASTM A220, Grade 45008.

5. Steel shall conform to requirements of ASTM A27, Grade 65,3,5.

6. Aluminum shall conform to the requirements of ASTM B108, alloy 356.0, TC.

F. Pipe and Tube

1. Mild Steel

a. For welding shall conform to requirements of ASTM A53, Type S, Grade B, Schedule 40, Black. Provide Schedule 80 for handrail posts.

b. For screwed connections shall conform to requirements of ASTM A120 or ASTM A53, Type E or S, Grade B, schedule 40. Provide schedule 80 for handrail posts.

2. Stainless

a. For welding shall conform to requirements of ASTM A312, Grade TP 2041, schedule 105 minimum.

b. For screwed connections shall conform to requirements of ASTM A312, TP 304, schedule 405.

c. For press fits shall conform to requirements of ASTM A312, Grade TP 304, schedule 55 minimum.

3. Aluminum shall conform to requirements of ASTM B221, alloy 6061.

G. Bolts, Nuts, Washers

1. General

a. Provide galvanized for use with galvanized material.

b. Provide stainless for use with corrosion resistant and stainless material.

b. Provide cadmium plated for use with all other materials.

2. Stainless

a. Bolts shall conform to requirements of ASTM A193, Grade B8, Type 2.

b. Nuts shall conform to requirements of ASTM A194, Grade 8.

c. Washers shall conform to requirements of ASTM 290, Type 304.

3. Expansion bolts shall be the metal shield type.

4. Steel drive bolts shall be the split shank type.

5. Headed steel anchors shall be fabricated from cold finished carbon steel conforming to requirements of ASTM A108.

H. Checkered Safety Plate

1. Steel shall conform to requirements of FS QQ F 461, Class K, flat back, standard four-way raised pattern, rolled from ASTM A36, Grade A, thickness and a span for 16 KSI maximum fiber stress.

2. Aluminum shall conform to requirements of ASTM B221, alloy 6063 T6.

I. Safety treads shall conform to requirements of FS RR T650, Type C.

J. Grafting

1. Aluminum shall conform to requirements of ASTM B221.

K. Coatings

1. Metal coatings

a. Galvanized Sheet shall conform to requirements of ASTM A446. All other galvanizing shall conform to requirements of ASTM A123 or ASTM 153 or both ASTM 385 and ASTM 386, as applicable.

b. Cadmium shall conform to requirements of ASTM A165, Type NS.

2. Galvanize touch up shall be zinc dust coating conforming to requirements of MIL P 26915.

3. Bituminous corrosion protection shall conform to requirements of MIL P23236 P, Class 2.

4. Coat aluminum accessories and items embedded in concrete with and inert compound capable of effecting isolation of the deleterious effect of the aluminum on concrete.

III. Execution

A. Fabrication

1. General

a. Fabricate all work as indicated in the Contract Documents and approved shop and working drawings. Straighten work bent by

shearing or punching.

b. Press exposed edges and ends of material smooth, with no sharp edges and with corners slightly rounded. Construct connections and joints exposed to weather to exclude water.

c. Provide sufficient quantity and size of anchors for the proper fastening of the work.

2. Fabricated Products

a. Pipe sleeves in concrete construction shall be standard weight, black steel pipe, with anchors welded to exterior, size as required to accommodate passage of conduits, pipes, ducts and similar items with proper clearance.

b. Railings

(1) Fabricate railings and handrails as indicated in accordance with OSHA from aluminum alloy or steel, hot dip galvanized after fabrication.

(2) Fabricate pipe handrails with all intersections and joints neatly fitted, fully welded and ground smooth and flush. Heat and bend smoothly, without distortion. Fabricate posts and stand-offs for pipe railing of the same material as the railing, evenly spaced as shown, with anchor flanges. Handrails along walls shall return to the wall at ends with quarter round bends and welded flanges.

(3) Fabricate flanges for posts from 3/8 inch minimum thickness plate, and for stand-offs from not less than 3/16 inch thickness plate. Coat contact side of flanges with bituminous corrosion protection.

(4) For fastening aluminum pipe railing and handrails, use stainless steel stud bolts with heavy aluminum washers and nuts. For fastening steel pipe railing and handrail, use galvanized high tensile strength stud bolts, nuts and washers.

c. Trench Covers

(1) Provide checkered safety plate not less than 1/4 inch thick, having accurately formed steel angle frames, with provisions for firm anchorage to structural floor or curb. Cut plates to convenient lengths for handling, and provide finger holes for lifting.

d. Metal stair systems, ladders and cages

e. All clips, anchors, and necessary appurtenances shall be provided for a complete and rigid installation.

f. Closure plates shall be provided for all exposed ends of stringers.

g. All exposed connections shall be welded and ground smooth, unless otherwise indicated on the Drawings.

h. Stairs and landings shall be designed to support a 100 psf live load, minimum, unless otherwise indicated on the Drawings.

(1) Fabricate metal stair systems and landings from structural shapes and plate with a minimum clear width in no case less than 22 inches with a rise angle between 30 and 50 degrees and with a rise to tread run conforming to Table D of OSHA (1910.24) 31.4806. Provide treads and platforms with a non-slip surface.

(2) For metal stairs at angles greater than 45 degrees provide open riser type with open grating type treads.

(3) For galvanized metal stair systems provide solids treads of checkered safety plate and landing kick plates of four inches by 1/4 inch thick plate.

(4) For permanent ladders; fixed type provide all steel all welded construction galvanized designed, fabricated, and installed in accordance with OSHA (1910.27) 31:4815-7 requirements for fixed ladders.

i. Backing Plates

(1) Provide 16-gauge minimum galvanized steel backing plates as necessary for installation of lavatories, fixtures, equipment and all other items requiring such support. Secure places in position by welding to studs or with bolts in expansion shields as appropriate.

j. Stair Nosings

(1) Form abrasive safety nosings for concrete stair treads and landings from FS RR T650, nonskid tread, three inches wide by eight inches less than the concrete width, with suitable approved anchoring devices. Provide bolted-on nonskid treads for all plain metal stair treads.

k. Gratings

(1) Provide gratings of the type and size indicated. Provide bearing bars not less than 1/8 inch thick. Provide structural supports for gratings, of the shapes indicated, fastened to the structure with anchors. Unless otherwise indicated, provide gratings which are removable but with locking legs and means of bolting in place.

(2) Provide serrated edges on the grating bars, or other means to provide non-skid surface. Provide solid perimeter banding.

(3) Fabricate walkway grating by the electro-pressure welding method to form a sound welded joint at intersections of all bars, with the top surfaces of all bars in the same plane or in accordance with the manufacturer's standard practice.

3. Connections

a. Shop connections in weldable materials, not designated for service removal, shall be welded. All welding shall conform to AWS D1.1 requirements. Weld behind finished surfaces whenever possible. Grind all exposed welds smooth. Remove weld, brazing, and solder spatter, flux, slag and oxides from finished surfaces. Use sheet metal lock seams only when indicated on the Contract drawings or approved shop and working drawings.

b. Complete all provisions for bolted field connections in the shop unless otherwise indicated.

c. Match exposed work to create continuity of line and design. Fabricate and fasten metal work so that the work will not be distorted, the finish impaired, nor the fasteners overstressed from the expansion and contraction of the metal. Conceal fastenings whenever practicable. Use fastenings exposed to public view of the same color and appearance as the surrounding metal.

4. Assemblies shall be fabricated such that bolts and other fastenings do not appear on finished surfaces.

5 All joints shall be true and tight, and connections between parts shall be light-proof tight.

6. Castings and Forgings

a. Fabricate castings and forgings as indicated. Castings and forgings shall be of uniform quality, true to pattern, strong, tough, of even grain, sound, smooth, without cold sheets, scabs, blisters and sand holes, cracks or other defects. Plugs, filled holes and welding will not be allowed. Castings shall be of thickness and configurations shown on the standard details. Sand blast as required to remove scale and sand and achieve a uniform smooth clean surface. Paint with asphaltum or coal tar paint meeting requirements of AWWA C203, where indicated. Provide raised letters where indicated.

b. Valve boxes shall be round head, screw type consisting of snug fitting top, bottom section and screw type extension. Lid shall be removable only by lifting straight up from the shaft shoulder.

c. Curb box assembly shall be Class 30, with bronze pentagonhead screws having tensile strength at least 65,000 psi, yield strength at least 38,000 psi. Assembly shall be two piece buffalo type with foot piece sized to accept proper size curb stop. Rods shall be of 9/10 inch hot rolled steel. Lids, screws, tops and extensions shall be standard size interchangeable with those of other manufacturers.

d. Meter yokes shall be Class 25, riser type to connect to vertical pipes with cut off valve on the water main side of the yoke, providing for expansion fitting on either side of yoke. Yoke shall be capable of holding the meter and pipe rigidly in place without strain on the piping. Brass inlet and outlet fittings shall meet requirements of ASTM B30, Class 4a. Inlet fittings shall have brass 90 degree cut off valve of inverted key-step type incorporated in the fitting. Outlet fitting shall be 90 degree, with straight line between the inlet and outlet fittings. Provide rubber gasket so as to result in watertight expansion fittings. Provide fittings for copper inlets and outlets as required with gaskets, and

manufacture the other end of fitting connections to take expanded copper connection or pipe threaded connections as appropriate.

e. Sewer manhole frames and inner lid covers shall be in accordance with the standard details.

f. Lamphole frames and covers shall be in accordance with the standard detail.

g. Meter housing frame and covers for the 1 1/2" and over water meters shall meet the requirements of the standard manhole frame and cover, they shall be lettered to read "Frederick County Water".

7. Galvanizing

a. Galvanize in accordance with reference standards set forth hereinbefore.

b. Items to be shop painted which are fabricated without welding entirely from galvanized shapes, hardware and sheet shall not be galvanized after fabrication. All other fabrications to be galvanized shall be hot dipped after fabrication.

B. Erection and Installation

1. Erection work shall be in accordance with the AISC Specification for the Design, Fabrication and Erection of Structural Steel for Buildings and the AISC Code of Standard Practice for Steel Buildings and Bridges, where applicable.

2. Upon completion of installations re-examine all work and provide additional shims, washers, anchors and corrective work as required to ensure that installation is firm, tight, anchored, in true alignment with neat fits, without distortions, unsightly fastenings, raw edges or protrusions.

IV. Measurement and Payment

A. Measurement of miscellaneous metal work for payment will not be made under this section. Miscellaneous metal work is considered supplemental material required in the construction of specific items of work that will be measured and paid for under various other items in the bid schedule.